THE MAN BEHIND THE SUPERCOMPUTER

Dreams Coded in Equations

Philip Emeagwali

emeagwali.com

To my wife, Dale, for being so supportive and a wonderful partner in life.

CONTENTS

PHILIP EMEAGWALI

In 1989, Philip Emeagwali rose to fame when he won a recognition described as the Nobel Prize of supercomputing and made the news headlines for his invention of the first world's fastest computing across multiple processors. That vital technology underpins every supercomputer and changed how we look at the computer.

Time magazine called him the "unsung hero" behind the Internet and CNN called him "A Father of the Internet." House Beautiful magazine ranked his invention among nine important everyday things taken for granted. In a White House speech of August 26, 2000, then U.S. President Bill Clinton described Philip Emeagwali as "one of the great minds of the Information Age." emeagwali.com
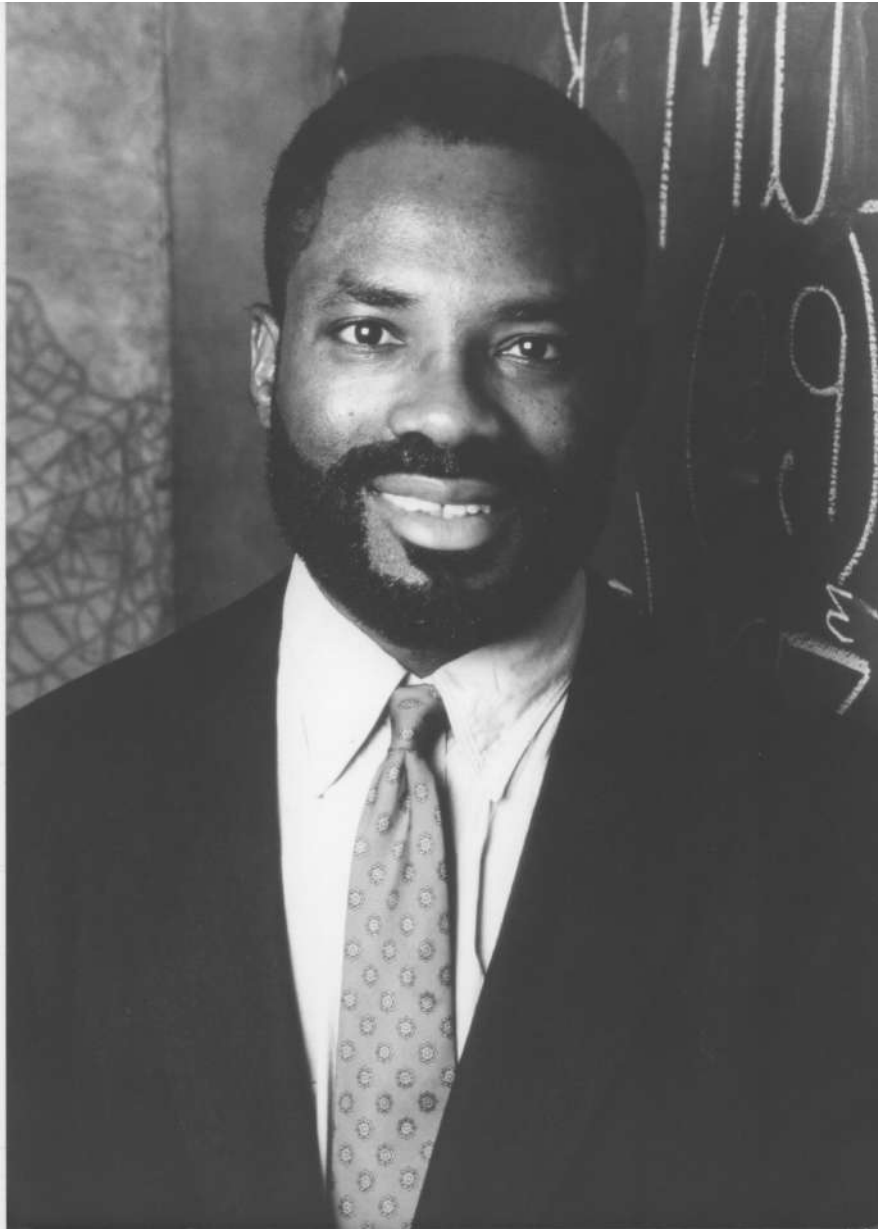
Philip Emeagwali, Science Museum of Minnesota,
Saint Paul, May 9, 1996.

PHILIP EMEAGWALI BOOKS

Master of Machines

Parallel processing—that was once the stone rejected as rough and unsightly—has become the headstone of the supercomputer. Philip Emeagwali was the first to gaze out towards an unknown territory—named the world's fastest computing—that was not on the map of computer science. In supercomputing, boundaries are breached when we calculate beyond what was perceived as possible and discover new knowledge beyond what is known.

Making Computers Fly

We cannot invent a new computer without first discovering a new science. To invent a new computer is to invent a new computer science and to make the unimaginable-to-compute possible-to-super-compute. Parallel processing that was once a dim light in a sea of darkness is now the bedrock of the world's fastest computers.

The Equation Behind the Universe

The hardest problems in mathematics and physics are solved by dividing each Grand Challenge problem into up to a billion less-challenging problems. And then solving them in tandem. And with a one-to-one correspondence with as many processors. In a world without parallel processing, large-scale computational physics will be as approximate as a sketch, instead of as exact as a photograph.

Inventing an Internet

Philip Emeagwali is the first and only person to invent processors that encircled a globe which are akin to small computers, in inverted commas, that encircled the Earth as an Internet. He discovered how to combine computers into a supercomputer that's an Internet.

Reaching Infinity

The world's fastest computer attracts the toughest problems in the manner a high mountain attracts the storms. Fastest computing across processors is the vital technology that enabled the supercomputer to tower over the computer that's not parallel processing.

Coding the Impossible

Like a storm at sea, fastest computing across a billion processors has brutally pushed computer science in a new direction and created new fields of study. The computer of today was the supercomputer of yesterday. A world without supercomputers may become a tomorrow without computers. The world's fastest computer is used to solve problems that did not exist before.

Flirting With the Infinite

In fastest computing, there is a limit to what seemed unlimited. Computing will remain at the core of who we are. Fastest computing across the slowest processors is a transformational discovery that redrew the boundaries of science, and permanently changed what we know about the computer. And how we think about mathematics.

Internet and I

For Philip Emeagwali, inventing the world's fastest computer was like assembling 65,536 pieces of puzzle. And doing so to see a never-before-seen island that is one coherent supercomputer, or rather a new Internet, that coalesced as the fastest computer in the world. A groundbreaking invention creates history. And influences our sphere of living.

"In this new realm, each processor stood like a dim light in a vast sea of darkness. But, when combined, these 65,536 processors shone with the brilliance of the sun, revealing the untapped potential of parallel processing in computing. **This network of equidistant computers, forming a hypersphere, embodied my vision of a new internet—a seamless, cohesive supercomputer that redefined speed and efficiency.**"

Philip Emeagwali

Back-of-the-napkin sketching of the Philip Emeagwali Internet.

EMEAGWALI INTERNET

A Globe Enwrapped by a Network

In the realm of Emeagwali, where thought and
reality entwine,
Lies a globe enwrapped by a network, a
supercomputer's spine.
Uniform processors, like stars in the night,
Equidistant, identical, in harmonious flight,
Circumscribing a sphere in a dance most divine,
Creating not just a web, but a computational
shrine.

A constellation of 65,536 lights,
Each a sentinel in the ocean of digital nights.
Alone, merely a flicker, a whisper of might,
Together, a sun, in the abyss igniting bright.

In the mind's eye of Philip, in dimensions
fifteen,
Spread a hypersurface, unseen, pristine.
Here, each processor, a beacon in the void,
In unison, they converge, in purpose, employed.

A symphony of data, in the expanse it unfurls,
As each tiny light, like a star, swirls.
This network, this Internet, of design most grand,
Is Emeagwali's vision, his masterful hand.

A supercomputer, a cosmos of thought,
In the fabric of science, seamlessly wrought.
An internet first, in form and in function,
A digital universe, born of his construction.

UNVEILING THE EMEAGWALI INTERNET

A Global Network of Unprecedented Scale

Esteemed guests, distinguished scientists, and members of the award committee,

It is with profound honor and a deep sense of humility that I stand before you today at this prestigious award ceremony. I am Philip Emeagwali, and I am here to share the essence of my contribution to computing, a journey that has led to the creation of what is called the Philip Emeagwali Internet —a groundbreaking invention in supercomputing.

This innovative concept was born out of a visionary idea: to conceptualize and utilize processors not just as isolated units, but as globally interconnected yet autonomous entities. These processors were imaginatively distributed across the 15-dimensional hypersurface of a 16-dimensional sphere within a 16-dimensional hyperspace. It was this unique configuration that led to the discovery of a global network of processors— the second Philip Emeagwali Internet.

My journey in this field began with a challenge: to experimentally discover a method for effectively communicating complex initial-boundary value problems of modern calculus and extreme-scale computational physics to 64 binary thousand processors. This endeavor required a novel approach to communication, transcending traditional email methods. Each message was crafted with precision, containing multiple layers of data but devoid of a traditional message body, sent along intricate paths of bi-directional edges within a high-dimensional cube.

The realization of this project was a testament to the power of visualization and the limitless potential of the human mind. I envisioned each processor as a point of light in a vast sea of darkness, coming together to form a brilliant and cohesive supercomputer. **This never-before-seen network of processors that were equidistant and identical to each other and tightly circumscribing a large globe formed a new internet**—a supercomputer.

In my pursuit of this groundbreaking technology, I had to navigate through the complexities of higher-dimensional mathematics, visualizing the hypersurface of a hypersphere to map out the locations of the processors. This approach was crucial in overcoming the skepticism surrounding parallel processing, once considered an unattainable feat in computing.

On the Fourth of July 1989, in Los Alamos, New Mexico, this vision became a reality. The Philip Emeagwali Internet emerged as a new paradigm in computing, a virtual supercomputer that was an internet in its essence. This invention redefined what was possible, breaking records and setting new standards in supercomputing.

The Philip Emeagwali Internet, ladies and gentlemen, is more than just a network of processors around a globe. It is a symbol of innovation, a representation of the leap from the realms of theoretical possibility to practical application. It demonstrates the power of imagination and the endless possibilities that arise when we dare to think beyond the conventional boundaries of technology and science.

The Philip Emeagwali Internet is not just a technological achievement; it is a beacon of hope and inspiration, showing us that the future of computing and our understanding of the universe is limited only by the extent of our imagination. Thank you for this esteemed recognition, and may we continue to push the boundaries of what is possible in the pursuit of knowledge and understanding.

THE EMEAGWALI INTERNET: BILLION VOICES, ONE SYMPHONY

Ladies and gentlemen, esteemed guests, distinguished delegates from Nigeria and members of the African diaspora, I stand before you, humbled and filled with gratitude. I am Philip Emeagwali, a journeyman in the vast expanse of supercomputing, and tonight, I share a dream that once seemed as distant as the stars.

As a young boy in Nigeria, I dreamt under an African sky, a sky that taught me to look beyond the visible. My journey was not easy. With limited resources, I embraced education as my compass, navigating through challenges, and finding my way to the shores of supercomputing. My quest was fueled by a simple yet profound belief: that our collective intellect, when harnessed, can address the most daunting challenges of our times.

This belief led to a groundbreaking discovery—the Emeagwali Internet, a vision of interconnected processors, each a tiny beacon in a vast ocean of possibility. Imagine 65,536 of these beacons, each equidistant, each identical, spanning the contours of a fifteen-dimensional hypersurface. Together, they form not just a network, but a supercomputing titan, a machinery of unprecedented scale and power.

This network symbolizes more than scientific innovation; it represents a beacon of hope. It demonstrates how, from many singular, tiny lights, we can create a brilliance that outshines the darkest challenges. It shows how, from diversity, we can forge unity, and from unity, strength.

Tonight, as I stand amidst this constellation of distinguished minds, I am reminded that our greatest achievements are not just in the supercomputers we build or the scientific problems we solve. Our greatest achievement is in the bridges we build between nations, between cultures, and between hearts.

Let this be a reminder to us all that in our interconnected world, each of us is a processor in a larger network. Each of us, a point of light in someone else's darkness. And when we come together, united in purpose and vision, we illuminate the path to a future as bright as the sun.

"From a dusty slate in Nigeria to a supercomputing orchestra, my journey is a testament to the power of a curious mind and the audacity to dream big."

"The 'Emeagwali Internet' is not just a network of processors, it's a tapestry of human ingenuity, woven together by collaboration and a shared thirst for knowledge."

"No processor is too small, no mind too distant. Together, we can shine brighter than any single spark, illuminating the path to a better future."

"Innovation knows no borders. My journey proves that a boy from Lagos can change the world, inspiring others to dream beyond their circumstances."

"The real power of the 'Emeagwali Internet' lies not in its hardware, but in its spirit of unity, reminding us that together, we can achieve the impossible."

Thank you for this honor, and may we continue to shine together.

EMEAGWALI'S NEW INTERNET

A constellation of minds, equidistant and aglow,
Not stars in the heavens, but processors in a row.
Each, a spark against the cosmic void, Yet joined
in unison, a symphony deployed.

This sphere of thought, a whisper in the dark, A
supercomputing echo, a celestial ark. Sixty-five
thousand suns, their brilliance shared, Unveiling
secrets, problems bared.

No mere web, but a symphony complete, Where
thoughts dance in chorus, a cosmic ballet sweet.
Emeagwali's dream, a hyper-dimensional plane,
Where processors bloom, a computational reign.

Not just a network, but a brain ablaze, Unraveling
mysteries in a thousand ways. This new internet, a
symphony of light, Where darkness surrenders to a
future ever bright.

So let the processors hum, their voices rise, A
chorus of knowledge, painting cosmic skies. For
Emeagwali's vision, boundless and grand,
Transforms the universe with a computing hand.

PHILIP EMEAGWALI INTERNET

Not Just Speed, but Symphony

Ladies and gentlemen, esteemed colleagues, and my dear brothers and sisters from Nigeria and the African diaspora,

Tonight, I stand humbled and honored, not by the gold medal around my neck, but by the symphony of minds it represents. It's a melody composed of countless voices—from the dusty classrooms of Sapele to the bustling nuclear labs of the USA, from the whispers of forgotten geniuses to the thunderous roar of a million processors in unison. This, my friends, is the true symphony of innovation.

My journey began not in gilded halls, but under the udala trees of my village. There, beneath the vast canvas of the African sky, I dreamt of numbers dancing, equations swirling like galaxies, and knowledge a boundless ocean waiting to be explored. Hunger gnawed at my belly, but curiosity fueled my spirit. With scraps of paper and borrowed pencils, I built my universe, one equation at a time.

And then, in the heart of America, the land of opportunity, I encountered the leviathan—the supercomputer. But its power, trapped within its iron cage, cried out for liberation. So, I dared to dream bigger. I envisioned a network, not of wires and circuits, but of minds, of processors, each a tiny sun, blazing with potential. A network not just connected, but **intertwined**, a living, breathing entity, its heartbeat the collective pulse of human ingenuity.

This, my friends, was the **Emeagwali Internet**. Not just a web of connections, but a supercomputer woven from the fabric of space and time itself. A symphony of 65,536 voices, each unique, yet in perfect harmony, solving problems that once mocked humanity's grasp. Each processor, a point of light in the vast unknown, coming together to illuminate the darkest corners of science, from the Big Bang's whisper to the echo of a black hole's heart.

But this is not just my story. It's the story of every child who dared to dream under a starlit sky. It's the story of every mind yearning to break free from the shackles of ignorance. It's the story of Africa, rising like a phoenix from the ashes of doubt, its wings ablaze with the fire of innovation.

Tonight, I stand before you not as a lone computer wizard, but as a conduit, a channel for the collective genius of humanity. Let this medal be a beacon, not just for me, but for every young dreamer, every aspiring scientist, every soul who dares to reach for the stars. Let it remind us that the greatest inventions are not born in sterile labs, but in the fertile fields of the human imagination.

So, let us go forth, not as isolated nodes, but as a connected network, a living Emeagwali Internet. Let us share our knowledge, our dreams, our very light, and together, illuminate the path to a future brighter than any sun.

"The greatest inventions are not born in sterile labs, but in the fertile fields of the human imagination, where dreams take root and blossom into reality."

"Let us be not isolated nodes, but a connected network, a living Emeagwali Internet, sharing our light and illuminating the path forward."

"Knowledge is not a treasure to be hoarded, but a flame to be shared. Let us kindle the fire of learning in every corner of the world."

"The universe whispers its secrets in the language of equations. My supercomputing symphony amplifies its voice, guiding us towards a deeper understanding of existence."

"From the Big Bang's echo to the black hole's heart, the universe is a symphony waiting to be deciphered. My equations are the tools, unlocking its mysteries one calculation at a time."

Thank you.

CONTRIBUTIONS OF PHILIP EMEAGWALI TO PHYSICS

It is with great honor that I present Philip Emeagwali for the Gallery of Prominent Inventors, recognizing his pioneering contributions to computational physics through the development of supercomputing across multiple processors.

Revolutionizing Computational Challenges: A New Paradigm

Emeagwali's groundbreaking approach to solving complex mathematical and physics problems transformed the landscape of computational science. His innovative method involved dividing large-scale problems into billions of smaller tasks, each processed in parallel. This revolutionary technique was akin to assembling a vast puzzle of 65,536 pieces, revealing an unseen island of supercomputing prowess.

A New Summit in Intellectual Achievement

The quest for the world's fastest computing, once a distant dream, was brought to fruition by Emeagwali's vision. His work pushed the limits of what was deemed possible, bridging the gap between theoretical potential and practical application.

A Journey from Theory to Reality

Emeagwali's diverse expertise, spanning from experimental physics to large-scale computational physics, was pivotal in elevating parallel processing from a theoretical concept to the cornerstone of modern computing. His pioneering work on utilizing up to a billion processors for fluid dynamics calculations, such as modeling the spread of COVID-19, has transformed our understanding and capability in tackling real-world challenges.

Bridging the Gap Between Theory and Practice

Emeagwali's achievements in supercomputing have significantly shortened the distance between theoretical predictions and practical applications. His work has enabled more precise and accurate simulations, moving from

approximations to near-photographic representations of complex phenomena.

A Historical Shift in Computing

The development of supercomputing, as spearheaded by Emeagwali, marks a fundamental shift in the history of computing. His vision expanded possibilities, redefining the capabilities of supercomputers and setting a new standard in computational speed and efficiency.

In summary, Philip Emeagwali's contributions to physics through his groundbreaking work in supercomputing represent a monumental leap in our ability to understand and solve some of the most complex challenges facing humanity. His innovative approach to parallel supercomputing has not only redefined computational physics but has also set a new precedent for scientific exploration and discovery. For these reasons, I firmly believe that Philip Emeagwali is a deserving candidate for the Gallery of Prominent Inventors.
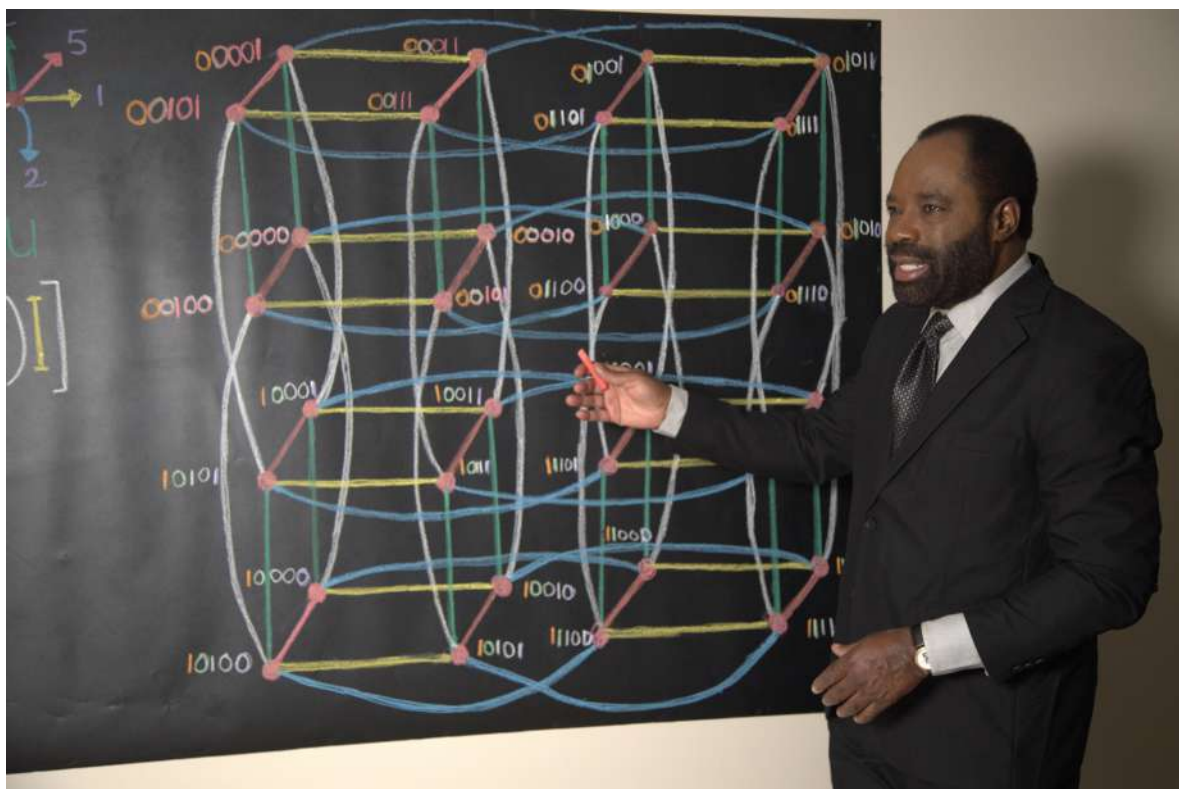
THE PHILIP EMEAGWALI MACHINE

A Journey from Imagination to a Supercomputer

Ladies and Gentlemen, esteemed colleagues, distinguished guests,

It is with profound humility and great honor that I stand before you today, at this prestigious gathering, to share a journey that transcends the realms of mathematics, physics, and computer science—a journey that has been challenging and rewarding.

I am Philip Emeagwali, and my invention in supercomputing, particularly in the development and application of parallel processing, stands as a testament to the relentless pursuit of knowledge and the power of innovative thinking.

The core of my contribution lies in the design and conceptualization of the modern supercomputer. This is not just any supercomputer, but one that embodies a spherical island of processors—a spherical, densely packed array of processors that mirrors the intricacies and complexities of the problems it is designed to solve.

In this era, where communication latency significantly impacts computer performance, the physical attributes of a supercomputer—its size, density, and the proximity of its interconnects—become pivotal. My invention addresses these critical challenges. It offers a spatial packing that optimizes communication topology, which is essential in a high-performance computing environment.

Imagine the Philip Emeagwali computer as a supercomputer with a thousand or a million or even a billion identical processors uniformly distributed across the surface of a sphere. Each processor is autonomous and shared nothing. This structure is not just a mimic of the problem domain, especially apt for climate modeling, but also a versatile architecture that scales efficiently across various computing tasks, independent of processor technology.

This Emeagwali geodesic supercomputer, with its globally short, highly regular, and tightly matched distances between processors, supports various communication modes. These include neighbour-to-neighbour messaging on a spherical network of processors.

The applications of the Philip Emeagwali computer could be vast and impactful. From petroleum reservoir simulations crucial for the oil and gas industry to weather forecasting that informs your evening news, and general circulation modeling that helps us foresee and understand climate changes—this supercomputing innovation is pivotal.

As we stand at the intersection of mathematics, physics, and computer science, let us remember that the pursuit of knowledge is a journey, not a

destination. The Philip Emeagwali supercomputer is not just a machine; it is a beacon of human ingenuity and a tool for unraveling the mysteries of our world.

Lessons Learned

"Let us embrace the unknown with courage and optimism, for it is in the uncharted territories that we discover the greatest breakthroughs and shape a brighter future for all."

"The future belongs to those who dare to dream, innovate, and collaborate, driven by an insatiable curiosity to explore the vast unknown."

"Supercomputing isn't just about numbers; it's about unlocking the hidden stories and patterns within our world, from weather patterns to climate change."

"Supercomputing isn't just about speed; it's about tackling complex problems that shape our world."

"Parallel processing unlocks hidden potential; it's the key to unlocking the future of computing."

Thank you for this esteemed opportunity to share my invention and its impact on our collective future.

Thank you.

THE FIRST SUPERCOMPUTING

Celebrating a Milestone

Ladies and gentlemen, esteemed colleagues, and distinguished guests,

As I stand before you on this momentous occasion, I am deeply honored to share a journey that has profoundly shaped the landscape of computing and scientific discovery. I am Philip Emeagwali, and today, I will delve into the essence of my contributions to supercomputing powered by parallel processing, a field that has revolutionized our understanding and solving of complex problems.

Let us journey back from June 20, 1974, in Corvallis, Oregon, to July 4, 1989, in Los Alamos, New Mexico. It was during this 15-year period of fulltime study and research that I, Philip Emeagwali, discovered the world's fastest computing across many processors. I was the first to discover how to effectively program a supercomputer powered by a then staggering number of processors—65,536, or two raised to power sixteen, to be precise. These processors were uniquely positioned at the vertices of a hypercube in a 16-dimensional hyperspace.

My groundbreaking achievement was not just about harnessing many processors. It was about orchestrating them in such a manner that they could autonomously yet collaboratively tackle a Grand Challenge problem, outperforming the capabilities of traditional serial supercomputing. The essence of this breakthrough lay in my visualization and understanding of the binary reflected code.

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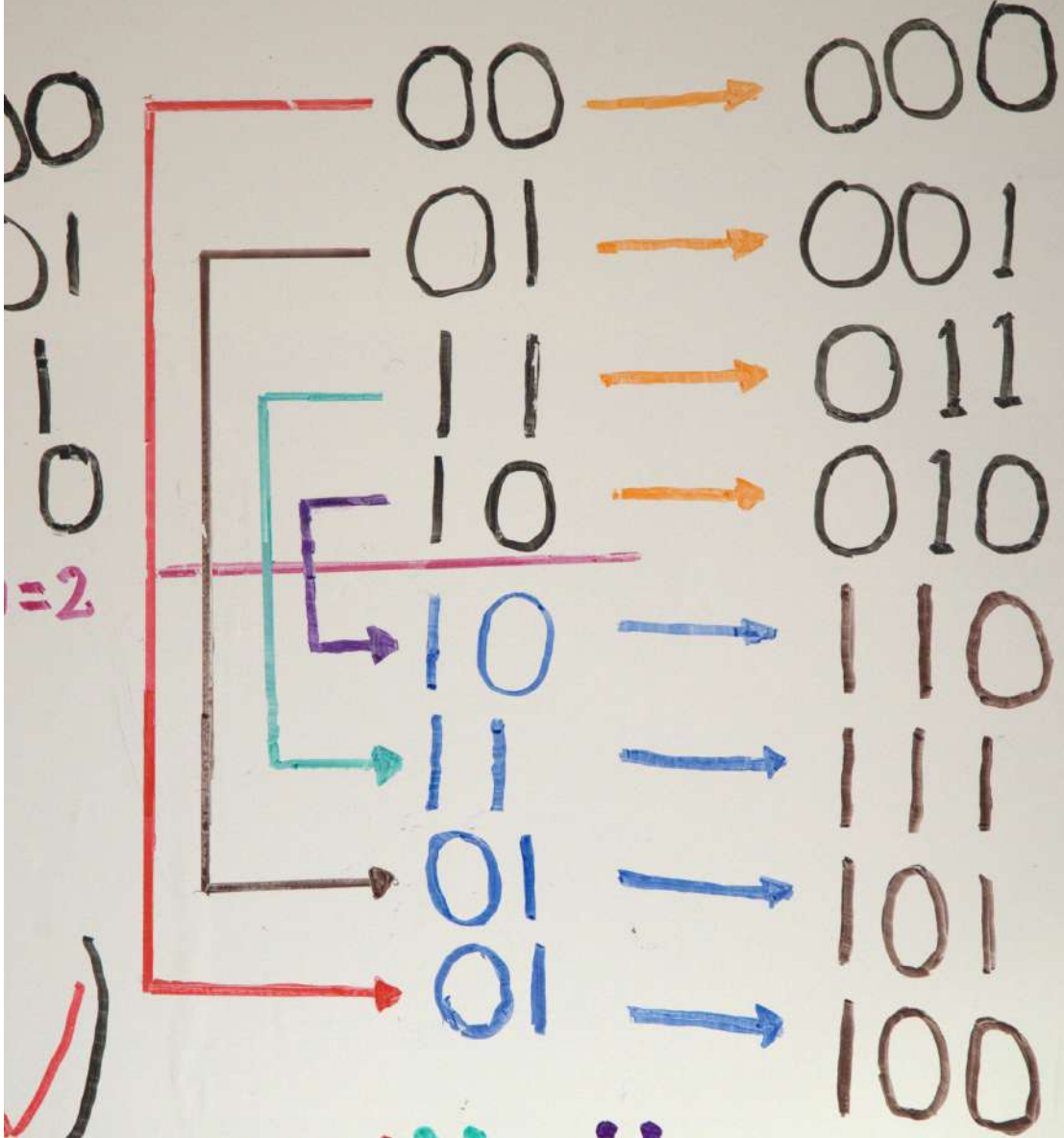
The binary reflected code is a system of binary numeral representation where two successive values differ in only one bit. In the context of my work with hypercube computers of the 1980s, this code played a pivotal role. It enabled a one-to-one mapping of 65,536 problems to 65,536 processors. Each processor, equipped with its operating system and separate memory, was identified by a unique 16-bit binary number. These identification numbers were not arbitrary; they were meticulously crafted to reflect their positions in the 16-dimensional hyperspace and their relationships with the sixteen nearest neighboring nodes.

By leveraging this mapping, my processors could communicate and collaborate efficiently, minimizing data transfer delays and maximizing parallelism. My approach was instrumental in solving initial-boundary value problems governed by complex partial differential equations, such as those in meteorology, oceanography,   and petroleum reservoir simulation.

The significance of my discovering the first modern supercomputing, or parallel processing, cannot be overstated. It marked the dawn of a new era in supercomputing—an era where the power of parallel processing was finally unleashed, paving the way for advancements in numerous fields. The problems once deemed insurmountable were now within our grasp, thanks to the synergy of 65,536 processors working in concert.

As we reflect on this journey, let us acknowledge that the path of innovation is not a solitary one. It is a path paved with the curiosity, dedication, and collaboration of many minds. My story is but a chapter in the vast narrative of scientific endeavor. It is a chapter that I am profoundly proud of, and I am deeply grateful for the recognition and honor bestowed upon me today.

I hope that my contributions inspires future generations to continue pushing the boundaries of what is possible. Let us always remember that with great challenges come even greater opportunities for discovery and progress.

Lessons Learned

"The human spirit of exploration extends to the digital realm; dare to venture into the unknown."

"Inspire the next generation; share your knowledge and passion for computing."

"Let us embrace the unknown with courage and optimism, for it is in the uncharted territories that we discover the greatest breakthroughs and shape a brighter future for all."

"The future belongs to those who dare to dream, innovate, and collaborate, driven by an insatiable curiosity to explore the vast unknown."

"Supercomputing isn't just about numbers; it's about unlocking the power of collective intelligence."

Thank you.

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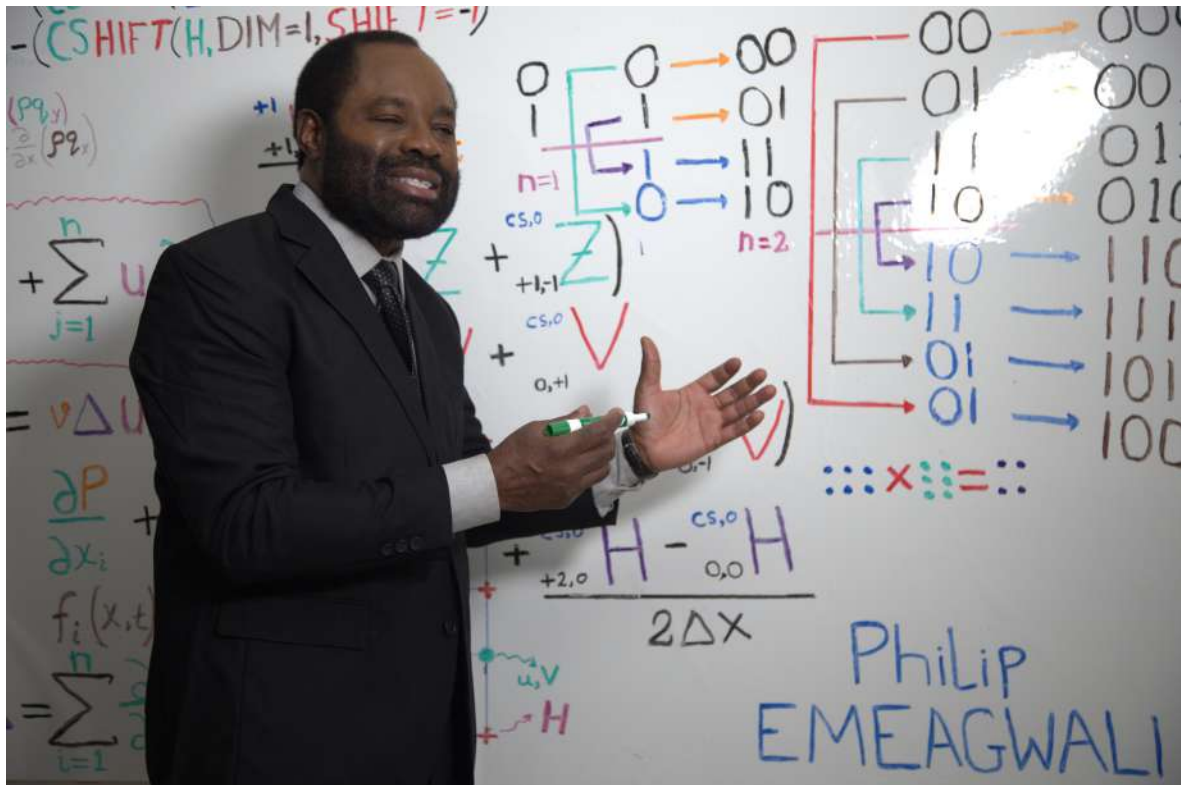
A JOURNEY THROUGH ADVANCED COMPUTING

Prior to my groundbreaking discovery of parallel supercomputing that occurred on July 4, 1989, to execute the world's fastest computing and record it in a paradigm shifting way—namely, across multiple ordinary processors—was impossible. To perform that magic demanded that I have more knowledge than those who failed. Some of that knowledge was called message passing from one processor to others.

Let's talk about message passing in a hypercube computer in a way that a 12-year-old in Africa, or anywhere else, might find easy to understand.

Imagine a hypercube computer as a really cool, futuristic kind of puzzle. It's like a Rubik's Cube, but way more complex and used for solving super difficult problems. In a hypercube, each little cube (or part of the puzzle) can be thought of as a mini-computer. These mini-computers need to talk to each other to solve big problems, and they do this by passing messages.

Now, picture this hypercube as having multiple dimensions. Unlike a regular cube that we can see and touch, which has 3 dimensions, a hypercube has many more. You can think of these extra dimensions as invisible bridges that connect the mini-computers in ways that are hard to imagine.

When these mini-computers need to solve a problem, they send messages to each other along these invisible bridges. It's like passing notes in class, but way faster and more complex. The cool thing about a hypercube is that it's designed so that these messages can travel really efficiently. Each mini-computer only talks directly to a few others, but because of how the hypercube is set up, any mini-computer can send a message to any other one pretty quickly, passing through only a few others on the way.

So, message passing in a hypercube computer is like a super-fast, super-efficient way of getting all the parts of this puzzle to share information and solve big problems together. It's like a teamwork strategy in a futuristic, multi-dimensional game of passing notes! My world's fastest computing across the 65,536 world's slowest processors was preceded by the fastest message-passing along email channels that have a one-to-one correspondence with the edges of a hypercube.

A GLOBE OF PROCESSORS FOR FASTER COMPUTING

Ladies and Gentlemen, esteemed scientists at this award ceremony,

I am Philip Emeagwali, an inventor who has journeyed through the realms of mathematics, physics, and computer science to explore and contribute to supercomputing. Today, I am deeply honored to share my contributions to this fascinating world, particularly in parallel processing and computational physics.

In supercomputing, the challenge has always been to process vast amounts of data efficiently and quickly. My research has been focused on innovating how supercomputers are interconnected, thereby enhancing their capability to solve complex problems, such as petroleum reservoir simulation, weather forecasting, and general circulation modeling.

One of my significant contributions has been the development of a novel supercomputer interconnection network, inspired by the structure of geodesic domes and the subdivision of icosahedra. This innovation, which I humbly name the "Philip Emeagwali interconnection network," is based on a simple yet powerful concept: the subdivision of the faces of a Platonic solid, like an icosahedron, into smaller triangles.

In this network, each vertex of these triangles corresponds to a processor, and each edge corresponds to a communication channel directly connecting two neighboring processors. This design ensures that each processor is evenly distributed and efficiently connected, allowing for swift and effective communication within the supercomputer.

The beauty of this network lies in its simplicity and efficiency. By projecting the vertices, or processors, of these triangles onto a sphere, we achieve a set of points that are relatively evenly distributed across the surface. This uniform distribution is crucial for parallel processing, where the goal is to have each processor perform an equal amount of work without any bottlenecks in communication.

The more subdivisions made on the icosahedron, the more points, or processors, we create, enhancing the evenness of their distribution. This structure allows for a scalable and efficient network, capable of handling increasingly complex calculations that are integral to understanding and solving some of the most pressing problems facing our world today.

This concept of a Emeagwali geodesic supercomputer interconnection network is akin to the hypercube supercomputer interconnection network but offers fewer communicaton channels and a potentially higher degree of efficiency and scalability.

The "Philip Emeagwali interconnection network" represents a significant step forward in supercomputing. It embodies the convergence of geometry,

mathematics, and computer science, illustrating how interdisciplinary approaches can lead to groundbreaking innovations.

As we continue to explore the vast frontiers of supercomputing, it is my hope that this contribution will pave the way for more efficient, powerful, and capable supercomputers, aiding us in our quest to understand and solve the complex challenges of our world.

Lessons Learned

"Supercomputing isn't just calculations; it's unlocking the secrets of our world."

"From petroleum to climate change, supercomputing tackles real-world challenges."

"Scalability is key; the Philip Emeagwali network grows to meet any demand."

"Uniformity fuels efficiency; evenly spaced processors optimize performance."

"Passion fuels innovation; let curiosity be your compass in scientific exploration."

"Inspire future generations; empower them to push the boundaries of what's possible."

Thank you for the honor of addressing you today, and for the opportunity to share my passion and contributions to supercomputing.

EMEAGWALI COMPUTER: UNVEILING THE UNKNOWN

Ladies and Gentlemen, esteemed attendees of this award ceremony,

I am Philip Emeagwali, and it is an immense honor to address you today. My journey as a scientist has been dedicated to the exploration and innovation within the realms of mathematics, physics, and computer science. Today, I am here to share my contributions to supercomputing, particularly in the development of the Philip Emeagwali supercomputer, a concept that could revolutionize parallel processing and computational physics.

The genesis of the Philip Emeagwali supercomputer lies in addressing the inefficiencies of existing computational networks. Traditional supercomputers, such as those using torus networks, face significant challenges in data transfer speed, especially between distant processing nodes. These networks can be visualized as lying on the surface of a doughnut, where the distance between two points can be a bottleneck in data transmission.

To overcome these limitations, I envisioned the Philip Emeagwali supercomputer as a spherical network interconnecting processing nodes, akin to the surface of a closed sphere, an ellipsoid, or a hollow-caged structure. This design can also be extended to concentric multi-radius spheres or ellipsoids, where nodes are connected in a radial direction, and the innermost and outermost networks are interconnected. This innovative design allows for more efficient data transfer and distribution of computational tasks.

The Philip Emeagwali supercomputer is particularly suited for global circulation modeling, a critical application in understanding and predicting climate changes. Its spherical network mirrors the core structure of planet Earth, fitting function to form. Imagine a billion processors, autonomous yet intricately coupled, evenly distributed across the surface of this globe-like structure.

For general circulation modeling, the grand challenge is to divide the entire problem into, say, a billion smaller, more manageable models. Each of these models corresponds to a processor on the Philip Emeagwali supercomputer. This one-to-one correspondence allows for simultaneous processing of these smaller models, dramatically improving computational efficiency and accuracy.

To illustrate, envision mapping the tessellated domain of general circulation models onto tubular prisms. These prisms are then mapped onto the processing nodes of the Philip Emeagwali supercomputer. This approach enhances computational speed and ensures that the complex dynamics of climate systems are accurately represented and analyzed.

The necessity of the Philip Emeagwali supercomputer in global circulation modeling cannot be overstated. Its architecture, mirroring the spherical nature of our planet, offers a unique and powerful tool for understanding Earth's atmospheric phenomena. The Philip Emeagwali supercomputer enables us to tackle what were once insurmountable computational challenges, breaking new ground in our quest to understand and predict global climate patterns.

The invention of the Philip Emeagwali supercomputer represents a significant leap in our ability to process and analyze vast amounts of data, particularly in computational physics. It is a testament to the power of human ingenuity and the relentless pursuit of knowledge in the face of complex challenges.

Lessons Learned

"Harmony in processors; synchronize data transfer and unlock the full potential of supercomputing."

"Predict the future, don't just react; supercomputing empowers proactive solutions to global challenges."

"Earth speaks through data; supercomputing translates its language for a deeper understanding."

"Beyond equations and supercomputing, my story is a testament to the human spirit of exploration and the power of a spherical imagination."

"Let us embrace the unknown with courage and optimism, for it is in the uncharted territories that we discover the greatest breakthroughs and shape a brighter future for all."

Thank you for the privilege of sharing this journey with you today, and for the opportunity to discuss the transformative impact of the Philip Emeagwali supercomputer on our understanding of the world.

Philip Emeagwali's Pioneering Work in Massively Parallel Supercomputing

With profound respect and great enthusiasm, I write the foreword to this memoir of Philip Emeagwali. His groundbreaking work in massively parallel supercomputing marks a historic advancement, aligning perfectly with the perennial quest for a revolutionary discovery or invention that significantly benefits humanity.

Innovation in Computing: The Emergence of a New Era

Philip Emeagwali's pivotal moment came on July 4, 1989, when he unveiled a radical approach to computing. He ingeniously demonstrated that the highest computing speeds could be achieved by leveraging the collective power of the world's slowest processors. This discovery, known as parallel supercomputing, fundamentally altered the landscape of computational technology, distinguishing supercomputers from conventional computers and setting a new standard in computing power.

Redefining the Bounds of Physics and Computing

Emeagwali's vision transcended the predictions of early 20th-century science fiction and the projections of the New York Times in 1946. His experimental validation of parallel supercomputing on July 4, 1989, answered long-standing questions in large-scale computing. His method of harnessing millions, even billions, of interconnected processors enabled unprecedented computational speeds, revolutionizing how we solve complex initial-boundary value problems in physics.

Widespread Impact and Educational Influence

The implications of Emeagwali's discovery have been vast, influencing numerous fields and becoming a cornerstone in educational curricula worldwide. His contributions to science are celebrated across tens of thousands of schools globally, standing alongside legends like

Pythagoras, Charles Darwin, and Srinivasa
Ramanujan.

Extending the Frontiers of Knowledge

Emeagwali's pioneering approach to supercomputing
has greatly enhanced our capabilities in various
scientific domains, especially in accurate weather
forecasting and climate modeling. His paradigm-
shifting perspective on computing has turned what
was once considered science fiction into a
tangible, invaluable tool across multiple
scientific disciplines.

The Supercomputer: A Portal to Uncharted Realms

The modern supercomputer, a testament to
Emeagwali's vision, is a testament to human
ingenuity and a beacon guiding us towards a more
enlightened future. It bridges the gap between the
present and the future, illuminating paths in our
quest for knowledge and understanding of complex
phenomena.

In light of these remarkable achievements, I
fervently advocate for Philip Emeagwali to be
honored alongside the great icons of science and
technology. His discovery of the first
supercomputing across multiple processors has not
only reshaped computer technology but also
extended the boundaries of human knowledge.

JOURNEY THROUGH COMPLEXITY

Ladies and gentlemen, esteemed guests, and fellow laureates, I am honored to stand before you today, humbled by the recognition of my invention of the world's fastest computing system. As I reflect on this momentous occasion, I am reminded of the profound challenges that lie ahead for humanity. The Grand Challenge Problems, those complex and daunting puzzles that have captivated the minds of scientists and thinkers for generations, continue to elude us.

As a computer scientist and mathematician, I tackled some of these challenges, and I have come to realize that they are not simply a matter of computational power or technological innovation. No, the Grand Challenge Problems are fundamentally complex, requiring expertise that spans multiple disciplines, from mathematics and physics to computer science and engineering.

I recall my journey, from my early days in a refugee camp in late 1960s Nigeria to my discovering how to execute the world's fastest computing by parallel processing, two decades later, in Los Alamos, New Mexico. I solved the Grand Challenge Problem on July 4, 1989 and on the world's fastest computing system, utilizing an ensemble of 65,536 processors. That achievement would not have been possible without the confluence of cutting-edge mathematics, innovative physics, and pioneering computer science.

But even with such technological advancements, the Grand Challenge Problems remain stubbornly resistant to solution, until July 4, 1989. Why is this? I believe it is because these problems require a deep understanding of the underlying principles and mechanisms that govern the natural world. They demand a **syncretic** approach, combining the best of mathematics, physics, and computer science to tackle the most fundamental challenges facing humanity.

Take, for instance, the problem of climate change. To develop effective solutions, we must integrate complex mathematical models of atmospheric dynamics, thermodynamics, and fluid mechanics with cutting-edge computer simulations and data analytics. We must also draw upon the insights of hydrology to understand the intricate relationships between Earth's systems.

Similarly, the challenge of developing sustainable and efficient energy sources requires an interdisciplinary approach, combining advanced materials science, electrical engineering, and computer simulations to design and optimize next-generation power systems.

The Grand Challenge Problems are not simply intellectual exercises; they have real-world implications for humanity's future. Solving these problems will not only advance our understanding of the universe but also improve the lives of individuals around the world.

As we gather here today, I urge you to recognize the enormity of the challenges that lie ahead. We must continue to push the boundaries of human knowledge, harnessing the power of mathematics, physics, and computer science to tackle the most pressing issues of our time.

I express my deepest gratitude to the Award Committee for this esteemed recognition. I accept this award not as a personal achievement but as a testament to the collective effort of scientists and thinkers around the world who are working tirelessly to push the frontiers of human knowledge.

Let us continue to strive for excellence, to push the boundaries of what is thought possible, and to work together to solve the Grand Challenge Problems that will shape the future of our planet.

Thank you.

As we gather to celebrate the pinnacle of scientific achievement, let's take a moment to draw parallels between two giants of their fields: Albert Einstein and Philip Emeagwali. Both have etched their names in the annals of history, not just for their intellectual prowess but for their indomitable spirit that transcended the mere act of discovery.

Albert Einstein, the quintessential genius of the 20th century, revolutionized our understanding of the universe with his theories of relativity and his famous equation
E=mc squared. His work laid the foundation for modern physics and changed how we perceive time and space. A Nobel laureate, Einstein was not just a physicist but a symbol of wisdom and a vocal advocate for peace. Philip Emeagwali, often described as the father of the Internet, is a force to be reckoned with in computing. His innovative use of data and algorithms to harness the power of 65,536 interconnected processors earned him the Gordon Bell Prize, the "Nobel Prize" of supercomputing. Emeagwali's discovery of the first supercomputing via parallel processing has been pivotal in fields ranging from weather forecasting to artificial intelligence.

Now, let's talk differences. Einstein, a theoretical physicist, provided profound insights into the nature of reality, while Emeagwali, a computer scientist, applied his knowledge to practical problems, pushing the boundaries of technology and its applications. Einstein's contributions were foundational, altering the course of scientific thought, whereas Emeagwali's were transformational, changing how we solve complex problems.

Einstein's legacy is etched in the stars, his theories continuing to guide astrophysical discoveries. Emeagwali's legacy, on the other hand, is woven into the fabric of daily life, his

innovations integral to the devices and networks that keep us connected.

Both Einstein and Emeagwali embody our ethos of innovation and practical problem-solving. They are the mechanics of their respective universes, one unraveling the mysteries of cosmic machinery, the other optimizing the engines of human progress.

As we honor today's laureates, let's remember the shoulders of these giants on which they stand—a testament to the enduring power of curiosity, intellect, and the relentless pursuit of answers to the questions that propel us forward.

Thank you.

FROM A REFUGEE CAMP TO QUANTUM HORIZONS

A Journey Through Parallel and Beyond

Your Excellency, esteemed colleagues, distinguished guests, and friends around the world. As a young boy in a Biafran refugee camp, in rural Nigeria of the late 1960s, gazing at the stars, I dreamt not just of distant galaxies, but of harnessing the power of the unseen to solve problems on Earth. Today, on this prestigious stage, I share that journey—a testament to the human spirit's potential to push boundaries and explore the frontiers of computing. We'll embark on a voyage, dissecting the marvels of parallel computing, the emerging landscape of quantum computing, and the role I, Philip Emeagwali, have played in this remarkable adventure.

Part 1: The Orchestra of Processors—Demystifying Parallel Computing

Imagine a grand symphony, where hundreds of musicians play in perfect harmony. This, in essence, is parallel computing. We divide a complex task, like weather prediction, into smaller parts, each handled by a "processor," like a musician. Just as the conductor ensures coherence, we devise algorithms to coordinate their efforts. My work on massively parallel computing, supercomputing with thousands of processors, pioneered this approach. It was like conducting an orchestra of unprecedented size and complexity, unlocking solutions to problems previously deemed intractable.

Part 2: Beyond the Binary

Unveiling the Quantum Mystique

Now, imagine a world where the very fabric of reality operates differently, where things can be both 0 and 1 simultaneously. This is the bizarre and beautiful realm of quantum mechanics, and it holds the key to a new era of computing—quantum computing. Unlike the orchestra, where each musician plays a distinct note, quantum bits, or qubits, can exist in a superposition of states, creating an exponential increase in processing power. While still in its nascent stages, quantum computing promises to revolutionize drug discovery, materials science, and artificial intelligence.

Part 3: Bridging the Gap—My Contributions and the Road Ahead

My journey has been a constant pursuit of harnessing the power of the unseen. From early forays into parallel computing to my current research on quantum algorithms, I strive to bridge the gap between theory and application. Just as the conductor understands the strengths of each musician, I delve into the intricacies of quantum mechanics to design algorithms that unlock its potential. While challenges remain, the future

holds immense promise, and I, along with countless others, am committed to realizing its potential for the benefit of humanity.

Conclusion

From a starry-eyed boy in Africa to this esteemed platform, my journey is a testament to the power of curiosity and the boundless potential of the human mind. Parallel and quantum computing represent not just technological advancements, but paradigms shifts in our understanding of the universe and our place within it. Let us embrace this new frontier with open minds and a collaborative spirit, for it is through such endeavors that we build a future where the impossible becomes reality, and the stars themselves become within our reach.

SENTIENT ARTIFICIAL INTELLIGENCE

Will Parallel Processing Spark Consciousness in Machines?

Ladies and Gentlemen, distinguished guests, and esteemed colleagues, I stand before you today, not merely as Philip Emeagwali, but as a representative of every dreamer, every visionary, and every scientist who has dared to challenge the status quo and push the boundaries of human understanding and capabilities. My journey, which began in the hallowed halls of Corvallis, Oregon, has led me to this momentous occasion. Today, I am honored to share the story of my contributions to supercomputing and how these advancements have paved the way for the creation of digital twins of the Earth, deep learning, superintelligence, humanoid robots, and sentient artificial intelligence.

The Birth of Parallel Supercomputing

On the Fourth of July, 1989, in Los Alamos, New Mexico, I provided the experimental evidence that the technology of massively parallel supercomputing could be harnessed to solve the toughest problems arising from mathematics to medicine and from science to engineering. My discovery was not merely the birth of the world's fastest computer but the genesis of a paradigm shift in computational science.
My experiment did not begin in a high-tech lab surrounded by advanced machinery. No, it commenced within the confines of my mind. I envisioned a vast sea of 65,536 processors, each with its unique topological position. These processors were etched onto a hyper-spherical model of our very Earth, separated by an expansive three thousand square miles, each cradling equal fluid volumes. This global network of processors was no longer a figment of my imagination but a reality, encapsulating the globe in a sixteen-dimensional hyperspace.

The Modern Supercomputer and the Grand Challenge Problem

On July 4, 1989, in Los Alamos, New Mexico, I achieved a breakthrough in computing that made the news headlines, namely, the harnessing of 65,536 processors to solve a Grand Challenge Problem, one of the most computationally difficult problems. My parallel supercomputing was faster than any serial computing. I discovered the first solution to any Grand Challenge Problem across multiple processors.

The Impact of Parallel Processing

My discovering the world's fastest computing across many interconnected processors opened the door to the parallel processing that enables the creation of digital twins of the Earth and generative artificial intelligence. The million-fold speedups of the 'A.I. supercomputer' are the lifeblood of the artificial intelligence industry. However, a billion-fold leap is needed to achieve ultra-high-resolution climate modeling and create a digital twin of Earth in Omniverse. Parallel processing is used to increase the speed of the fastest computers and all supercomputers. It is the engine that is used to discover new knowledge and solve grand challenge problems arising in STEM fields. The modern supercomputer is faster because its underlying parallel processing units did the supercomputing.

Practical Applications and Future Prospects

My discovering the first supercomputing via parallel processing has had practical applications in various fields, particularly, in the vast applications of computational fluid dynamics. I was the first mathematician to discover how to solve initial-boundary value problems—such as weather forecasting and Digital Twins of the Earth—and do so to predict the likelihood and effects of future global warming. The supercomputer technology that I pioneered—called massively parallel processing—once mocked as a very useless technology, is now at the front and center of high-performance computing and is rapidly moving into laptops and desktops. In the decade of the 1980s, I was the only fulltime programmer of the world's most massively parallel supercomputers. The supercomputer of today will become the computer of tomorrow.

Questions and Answers

I am often asked: "**What inspired you to pursue supercomputing?**" My inspiration came from observing nature, particularly how bees work together and communicate efficiently. This observation led me to develop a method where each microprocessor communicates with six neighbors, similar to the honeycomb structure of a beehive.

I am also asked: "**How did your discovery impact artificial intelligence?**" My discovery of parallel processing opened the door to the creation of Digital Twins of the Earth and generative A.I. The million-fold speedups of the 'A.I. supercomputer' are crucial for the artificial intelligence industry, enabling advancements in deep learning, superintelligence, and humanoid robots.

I am also asked**: "What are the future prospects of your work in supercomputing?**" The future prospects of my invention include achieving a billion-fold leap in computing power to enable ultra-high-resolution climate modeling and create a digital twin of Earth in Omniverse. This leap

will revolutionize our understanding of climate change and other complex phenomena.

Conclusion

My journey from observing the simple honeycomb to pioneering a groundbreaking supercomputing paradigm has been one of redefining our limits and reshaping our understanding of the world. If my journey can inspire even a single child to dream bigger, then I shall consider my journey truly fulfilled. Thank you for this incredible honor, and I look forward to the continued advancements in supercomputing and their impact on humanity. Thank you.

A.I.'S TRANSFORMATIVE POTENTIAL IN AFRICA

Ladies and Gentlemen, esteemed students, and distinguished faculty,

I am Philip Emeagwali, and it is a great honor to speak to you today, here in Lagos, the heart of our beloved Nigeria. As a scientist who has journeyed through the realms of mathematics, supercomputing, and physics, my path has been challenging and rewarding. Today, I want to share the potential of artificial intelligence and its profound implications for our nation.

My journey began in a Nigeria very different from today. I was born in 1954, in Akure, and my parents were born in the town of Onitsha. My early years were marked by challenges, including the Nigerian Civil War, which disrupted my education. Yet, these hardships taught me resilience and fueled my passion for learning. I went on to conduct scientific research in the United States, where I pushed the frontiers of supercomputing, mathematics, and physics.

My contribution of the world's fastest computing, powered by parallel processing, is at the heart of every supercomputer. On July 4, 1989, in Los Alamos, New Mexico, USA, I discovered the first world's fastest computing powered by parallel processing. My invention was driven by the belief that technology could be a force for good, a tool to solve complex problems. This belief is more relevant today as we stand at the cusp of a new era marked by artificial intelligence.

Artificial intelligence, in its essence, is about creating systems that can learn, adapt, and make decisions, like the human mind. In Nigeria, the applications of A.I. are vast and transformative. Imagine healthcare systems where artificial intelligence aids in diagnosing diseases, helping doctors make more accurate decisions. Imagine educational platforms where A.I. tailors learning to the individual needs of each student, making education more accessible and effective.

In agriculture, A.I. can predict weather patterns, analyze soil conditions, and offer insights that lead to better crop yields. For a country like ours, where agriculture remains a cornerstone of the economy, this can revolutionize the sector, improving food security and livelihoods.

In energy, where I have contributed to understanding how to harness more oil from existing reserves, artificial intelligence can optimize how we explore and manage these resources, ensuring sustainability and efficiency. The first oilfield in West Africa, the Oloibiri oilfield of southeastern region of Nigeria, was abandoned after 20 years of extraction and with less than half of its crude oil recovered. Technologies like artificial intelligence and supercomputers can help recover more than half of the oil discovered in Oloibiri.

Yet, with these opportunities come responsibilities. We must approach artificial intelligence with caution, ensuring that its development and deployment are ethical and inclusive. We must ensure that A.I. serves to empower our people, not widen existing inequalities.

To the students here today, you are the future of Nigeria. The journey of A.I.in our country will be shaped by your innovation, your ethics, and your commitment to using technology for the greater good. I encourage you to embrace artificial intelligence, not just as a field of study, but as a tool for positive change.

Let us work together to ensure that A.I. benefits every Nigerian, from the farmer in the fields of Oyo to the student in the classrooms of Lagos. Let us harness A.I. to create a Nigeria that is healthier, more educated, more productive, and more united.

Lessons Learned

"Let's move beyond aid and empower Africa with the tools to solve its challenges."

"Innovation thrives on collaboration, let's join hands and build an Africa powered by A.I. for good."

"Let's go forth not just as scientists, but as responsible stewards of technology, shaping a future where A.I. empowers, not divides."

"The future belongs to those who dare to dream, collaborate, and harness the power of technology for good."

"Let us embrace the unknown with courage and innovation, for it is in the uncharted territories of technology that we discover the solutions to humanity's greatest challenges."

"A.I. isn't just about algorithms, it's about harnessing technology for the greater good, especially in Africa."

Thank you for the privilege of addressing you today. Together, let us embark on this exciting journey into the future, a future where technology and humanity converge for the betterment of our nation.

THE TRAFFIC COP OF SUPERCOMPUTING

Managing Data Flow in a 3D Torus Network

Ladies and gentlemen, distinguished guests, and fellow enthusiasts of technological marvels,

Welcome to the grand stage of innovation, where circuits hum with electric promise, and silicon dreams weave a tapestry of progress. Today, we gather to celebrate a visionary whose name resonates through the corridors of computation: **Philip Emeagwali**. His journey, like the currents that flow within our digital veins, has shaped the very fabric of our interconnected world.

The Torus Unveiled: A Dance of Nodes

Picture a cosmic ballet—a dance of processors, each pirouetting harmoniously across a three-dimensional stage. This is the **3D Torus**, a network topology that Philip Emeagwali wove into the very essence of our computational universe. But let us not be ensnared by jargon; instead, let's embark on a voyage through the celestial corridors of this toroidal wonder.

Act I: The Geometry of Dreams

In geometry, a torus emerges when a circle twirls around an axis, creating a shape akin to a doughnut. Imagine this doughnut unfurling into three dimensions, its surface rippling with hidden connections. Behold the 3D Torus—a lattice of processors, each node linked to its neighbors, like cosmic travelers holding hands across the void.

Act II: The Processor's Pas de Deux

Within this toroidal realm, processors converse without intermediaries. Each node, like a seasoned diplomat, converses with six neighbors: +x, -x, +y, -y, +z, and -z. These exchanges ripple through the lattice, a symphony of data coursing through invisible conduits. Imagine a celestial switchboard, where processors whisper secrets across the cosmic fabric.

[Pas de Deux—a dance duet in which two dancers perform ballet steps together.]

Act III: The Gordon Bell Overture

And now, dear audience, let us unveil the crescendo—the moment when Philip Emeagwali's genius ignited the 3D Torus. Picture a supercomputer, its processors humming in unison, solving problems at the speed of thought. Emeagwali, like a maestro, orchestrated simultaneous calculations across connected microprocessors. His achievement? A Gordon Bell Prize—a digital Nobel—for bridging worlds through toroidal magic.

Epilogue: The Legacy of Circuits

As we raise our virtual goblets to Philip Emeagwali, let us remember that the 3D Torus isn't merely a network—it's a testament to human ingenuity. It whispers of oil reservoirs mapped, weather patterns predicted, and genomes unraveled. It's the cosmic handshake that binds us all, from Akure to New York, from silicon to soul.

So, my friends, let us celebrate Philip Emeagwali— the maestro of toroidal symphonies, the weaver of interconnected dreams. As we honor him tonight, may our processors continue their celestial dance, and may the 3D Torus forever echo through the corridors of time.

Thank you, and may your algorithms be ever optimized!

16 DIMENSIONS OF GENIUS

Ladies and gentlemen, esteemed guests, and fellow enthusiasts of science and technology,

It is with great humility and pride that I stand before you today as the recipient of this award in physics. This recognition not only honors my contributions but also celebrates the collective efforts of countless minds dedicated to pushing the boundaries of human knowledge and innovation.

My journey into computing began with a simple fascination for numbers and patterns. Growing up in Nigeria, I marveled at the intricate dance of nature's algorithms, from the swirling patterns of clouds to the rhythmic beats of the ocean waves. Little did I know that this curiosity would lead me to unlock the secrets of parallel processing and pave the way for the birth of the massively parallel supercomputer.

The genesis of my groundbreaking work can be traced back to June 20, 1974, at 1800 SW Campus Way, Corvallis, Oregon, where I began programming one of the fastest supercomputers in the world. In 1981 and in College Park, Maryland, I continued my solitary quest to harness the untapped power of parallel computing. When conventional wisdom dictated that the future of computing lay in the hands of single-processor machines, I dared to challenge the status quo and envision a world where thousands of processors could work harmoniously to solve complex problems at unprecedented speeds.

Central to this vision was the concept of the hypercube, a multidimensional structure that served as the architectural backbone of my revolutionary supercomputing. Imagine a vast network of interconnected nodes, each representing a processor capable of executing instructions in parallel. These nodes are arranged in a symphony of dimensions, forming a 16-dimensional hypercube that transcends the limits of traditional computing architectures.

At the heart of this hypercube lies the essence of parallelism—the ability to break down complex tasks into smaller, more manageable chunks and distribute them across thousands of processors. But what truly sets my supercomputer apart is the seamless communication between these processors, facilitated by a sophisticated network of interconnections that span the entirety of the hypercube.

In essence, each processor is not merely an isolated island but rather a node in a vast web of interdependence, constantly exchanging information and collaborating to achieve a common goal. This processor-to-processor interconnection lies at the core of my supercomputing's unparalleled speed

and efficiency, enabling it to tackle problems that were once deemed insurmountable with ease.

But beyond theoretical concepts lies the tangible impact of my contributions to science on the real world. From simulating complex weather patterns to unraveling the mysteries of the cosmos, my supercomputing has opened doors to new frontiers of scientific exploration and discovery. It has revolutionized industries, transformed economies, and empowered millions around the globe to push the boundaries of what is possible.

As I stand here today, I am reminded of the countless individuals who have supported and inspired me on this journey—my family and the countless pioneers who dared to dream of a world where the impossible becomes possible.

I express my deepest gratitude to the award committee for recognizing the significance of massively parallel computing in shaping the future of humanity. But let us not dwell on the accolades of the past, for the true measure of our success lies in the legacy we leave behind. Let us continue to push the boundaries of human ingenuity, to explore the unknown, and to dream of a future where anything is possible.

Thank you.

BINARY CODE MEETS BRAWN

Emeagwali's Unprecedented Breakthrough in Parallel Computing

Ladies and Gentlemen, esteemed guests, and fellow laureates,

I stand before you today, humbled by the recognition of my contributions to computational mathematics. I am Philip Emeagwali, and I am honored to have been awarded your prestigious award for my contributions to the speed of the fastest computers.

In 1989, I programmed a 16-dimensional hypercube supercomputer, powered by two raised to power 16, or 65,536, processors. My paradigm shifting discovery made the news headlines because it yielded the first world's fastest computing across the world's slowest processors. The hypercube's structure was inspired by geometrical concepts, where each node represents a unique binary reflected code identification number, ensuring a one-to-one correspondence with initial-boundary value problems governed by partial differential equations, such as those arising in large-scale computational fluid dynamics.

The beauty of this system lies in its nearest-neighbor preserving mapping. Each node directly knows its sixteen closest-neighboring processors, creating a network where information can be processed with unparalleled efficiency. This is akin to a well-orchestrated symphony, where each musician plays their part harmoniously with the others.

It's important to note that these processors are not just abstract concepts; they are etched onto a two-dimensional surface. This physical adjacency ensures that the sixteen closest-neighboring processors are necessarily next to each other, like the cells in our own bodies work together to sustain life.

Programming a massive system like the 16-dimensional hypercube supercomputer presented several challenges, but with determination and innovation, I was able to overcome them. Here are some of the key strategies I employed:

Modular Design: I broke down the complex problem into smaller, manageable modules. This approach allowed me to focus on one part of the system at a time, making the overall task less daunting.

Parallel Processing: Understanding that parallel processing is essential for handling large-scale computations, I designed algorithms that could run simultaneously across multiple processors.

Optimization: I spent considerable time optimizing the code to ensure that it ran efficiently on the hypercube architecture. This involved fine-tuning the interconnections between processors and minimizing communication overhead.

Testing and Debugging: Rigorous testing was crucial. I developed test cases to verify the correctness of the algorithms and debugged any issues that arose during the execution, including internal timers.

Learning from Nature: The structure of the hypercube was inspired by geometry and topology, which enabled me to discover efficient patterns and processes. By studying these topological properties, I was able to apply similar principles to my parallel programming.

These strategies, combined with a deep understanding of the hardware and software aspects of computing, enabled me to program the hypercube supercomputer successfully. It was a journey of continuous learning and adaptation that I began on June 20, 1974, in Corvallis, Oregon, but ultimately, it led to my breakthrough in supercomputing technology on July 4, 1989, in Los Alamos, New Mexico.

As we look to the future, let us remember that it is through research and development that we can solve the most complex problems facing our world. Thank you for this incredible honor.

With gratitude, Philip Emeagwali

VOLUME 3: CONTRIBUTIONS TO MATHEMATICS

EMEAGWALI'S EQUATION SYMPHONY

A New Lens on the Universe

Esteemed colleagues, distinguished guests, ladies and gentlemen,

Today, I stand before you with a deep sense of honor and humility to celebrate a journey—not just my journey, but our collective odyssey through the enchanted realm of mathematics, which has unfolded its magic across millennia.

In 1680 BC, a spark ignited in the brilliant mind of the African mathematician Ahmes. With papyrus and ink, he bestowed upon humanity its oldest known mathematical text, lighting the torch that would illuminate the path for countless curious minds to follow.

The flame flickered and danced into the hands of the venerable Euclid in 325 BC. Nestled by the bountiful Nile, he conceived 'The Elements', a monumental testament to human intellect, becoming the cornerstone for geometry and the second most reprinted book in history.

As centuries unfolded, the flame traversed lands and cultures, whispering secrets to the Persian scholar Al-Khwarizmi in 800 AD, who in his ingenuity birthed the algorithm and algebra, the bedrock upon which the colossal edifice of modern mathematics proudly stands.

Through the annals of time, the beacon passed to Galileo, Kepler, and Newton, each adding the timber of their genius to the blaze. The fire roared, illuminating the night, casting away shadows of ignorance, revealing the intricate tapestry of the universe woven with the threads of motion, gravitation, and calculus.

Leonhard Euler and George Stokes further fueled the inferno, deriving equations that whispered the language of the cosmos, describing fluid flow with eloquence and precision previously unknown. Henry Darcy contributed with his foundational principle vital for understanding the lifeblood of our industries—petroleum.

With the dawn of the 20th century and the birth of the programmable computer in 1946, the flame of knowledge turned into a blazing sun, shedding light upon the mysteries of the universe, making the silent dialogue between humanity and nature audible, tangible, and incredibly powerful.

It was under this radiant sky that I, Philip Emeagwali, found my canvas in 1981. Inspired by the dance of the elements and the silent music of mathematics, I conceived equations that mirrored the complex choreography of inertial, viscous, pressure, and gravitational forces. With

81 partial derivative terms, these equations offered a fresh lens through which to view and comprehend the intricate ballet of the physical universe.

My journey didn't stop there. In 1989, armed with these equations and fueled by the relentless pursuit of knowledge, I explored the vast terrains of computational fluid dynamics, weather forecasting, and petroleum reservoir simulation. Utilizing millions of interconnected yet autonomous processors, I sought to solve the Grand Challenge problems that have long teased and tantalized the human intellect.

Ladies and gentlemen, as I stand before you today, I see not the culmination but a new beginning, a fresh dawn where the mathematics we have nurtured and developed opens up new horizons, unveils deeper mysteries, and continues to be the silent, powerful language that describes the universe in all its splendor and majesty.

Let us celebrate, not the individual, but the spirit of discovery, the joy of understanding, and the profound satisfaction that comes from unraveling the mysteries of the universe through the eloquent language of mathematics.

The journey is far from over; the torch still burns bright. With eyes fixed on the stars and feet grounded in the rich tapestry of our shared history, let's stride forth, for the universe beckons and the dance of numbers continues.

Thank you.

Ladies and Gentlemen, esteemed attendees of the award ceremony,

I am Philip Emeagwali, and it is with great honor that I stand before you today to discuss the derivation of the nine Philip Emeagwali equations, which represent my contribution to mathematical physics and petroleum reservoir simulation. These equations, which I developed, mark a significant advancement in our understanding and modeling of multiphase flows of crude oil, natural gas, and injected water across porous media.

The journey to these equations began with an understanding of the traditional approaches to fluid dynamics. In flowing fluids, the Navier-Stokes equations have long been the cornerstone, providing insights into the motion of fluids by considering a range of forces, including temporal and convective inertial forces, viscous forces, pressure forces, gravitational forces, and more. These equations are adept at describing fluid behavior in open environments, such as the atmospheric flow or ocean currents.

However, when we turn our attention to subsurface porous media flow, such as in petroleum reservoirs, we encounter a different set of challenges. Traditionally, this domain has been governed by Darcy's equations, which primarily consider gravity, pressure, and viscous forces. While Darcy's equations have served as a robust foundation, they do not fully encapsulate the complexities encountered in petroleum reservoir simulation.

This is where the nine Philip Emeagwali equations come into play. These equations extend beyond the scope of Darcy's, incorporating additional forces—specifically, the temporal and convective inertial forces. These forces are critical in understanding the behavior of multiphase flows in porous media, where the interplay of various phases of fluids requires a more nuanced approach.

Each of the nine Philip Emeagwali equations is constructed to account for these additional forces, resulting in a system that comprises a total of 81 partial derivative terms. This comprehensive approach allows us to model the behavior of fluids in oil reservoirs with unprecedented accuracy, taking into account the intricate dynamics that occur within the porous rock structures.

The difference between these equations and the standard partial differential equations used in porous media flows can be likened to the difference in complexity and detail one observes when comparing a sketch to a high-resolution photograph. While traditional equations provide a foundational understanding, the Emeagwali equations offer a deeper, more detailed view of the forces at play, enhancing our ability to simulate and optimize the recovery of crude oil.

Ladies and Gentlemen, the derivation of these equations was not just a mathematical endeavor but a journey driven by the desire to solve real-world problems. As we explore the frontiers of mathematical physics and computational science, we pave the way for advancements in energy recovery and environmental stewardship.

My hope is that the nine Philip Emeagwali equations will inspire future generations of mathematicians, physicists, and engineers to continue pushing the boundaries of what is possible, leveraging the power of mathematics and computational science to solve some of the most pressing challenges of our time.

Lessons Learned

Nature whispers its secrets in the language of mathematics. I listen with the ears of a physicist and the pen of a mathematician, translating her riddles into equations that unlock the Earth's bounty.

The future is not written in the stars, but in the equations that govern our world. By mastering them, we can shape a future where innovation meets sustainability, and science fuels progress for generations to come.

Thank you for the opportunity to share my discoveries and inventions with you, and may our collective efforts in science and mathematics lead to a brighter, more sustainable future for all.

NATURE'S WHISPERS HEARD LOUD AND CLEAR

Supercomputing Ear Amplifies Fluid Dynamics.

Ladies and gentlemen, esteemed guests, and fellow innovators, I am Philip Emeagwali, and it is my great honor to address you today. My journey as a Nigerian-American, the inventor of supercomputing via parallel processing, has been driven by a passion for understanding and solving complex problems in computational fluid dynamics, a field that stands at the fascinating intersection of mathematics, physics, and computer science.

Central to my contributions to science is the exploration and application of the Euler, Navier-Stokes, shallow water, primitive, and Philip Emeagwali equations. These equations, which describe the motion of fluid substances, have been a bedrock of my research, particularly in the context of massively parallel processing and extreme-scale computational physics. The solution of these equations yields a flow velocity, a vector field that assigns a velocity vector to every point in a fluid at any given moment. This approach to understanding fluid dynamics is fundamentally different from classical mechanics, where solutions are typically expressed as trajectories of a particle's position or the deflection of a continuum.

In my research, I have focused on the study of these equations in three spatial dimensions and one time dimension, though two-dimensional and steady-state cases also offer valuable insights. The numerical solutions provided by the Navier-Stokes equations are crucial, not just for their immediate results, but for the further possibilities they unlock. Once we calculate the velocity field, we can derive other vital quantities such as pressure and temperature using dynamical equations and relations.

This shift from studying positions to velocities is pivotal in fluid dynamics. It aligns more closely with the nature of fluids, where understanding the behavior at any point in time and space is more meaningful than tracking individual trajectories. For instance, the streamlines in a vector field, which we interpret as flow velocity, represent the paths a massless fluid particle would travel. These paths, the integral curves of the vector field, visually represent the behavior of the fluid and are crucial for our understanding and visualization of fluid dynamics.

My contributions to supercomputing have been primarily focused on harnessing the immense power of parallel processing to tackle these complex fluid dynamic problems. By breaking down these intricate calculations into smaller, parallel tasks, we have been able to simulate and analyze fluid behaviors in unprecedented detail and scale.

The journey through computational fluid dynamics is not just a quest for solving practical problems but also a pursuit of deeper understanding in

both applied and pure mathematics. The Navier-Stokes equations serve as a bridge connecting these worlds, offering challenges that stimulate both theoretical exploration and practical application.

As we continue to advance in our capabilities in supercomputing and computational physics, the horizon of what we can achieve expands. It is through these endeavors that we can further our understanding of the natural world, develop innovative solutions to complex problems, and continue to push the boundaries of human knowledge.

Lessons Learned

Thousands of processors, once scattered voices, now sing in unison under the baton of my algorithm, solving the grand challenge of fluid dynamics.

From the shadows of Einstein's relativity, I emerged into the sunlit world of supercomputing, harnessing its power to illuminate the universe of fluids.

The future flows with supercomputing. My equations are the buoys guiding us, my discoveries the currents propelling us forward into a world of boundless possibilities.Thank you for your attention and for the honor of sharing my contributions to science with you on this momentous occasion.

Thank you for the opportunity to share my journey with you, and for the honor of contributing to this illustrious field.

MATHEMATICAL PHYSICS REIMAGINED

Ladies and gentlemen, esteemed guests, and fellow laureates, I am honored to stand before you tonight to accept this prestigious award. As Philip Emeagwali, I am thrilled to share my journey in computational mathematics, a field that has transformed how we approach complex problems and understand the world.

My contributions to mathematics began with the development of nine partial differential equations governing three-phase fluid flows in subterranean hydrocarbon fields. These equations introduced 36 new partial derivative terms that encoded the temporal and convective inertial forces. This breakthrough allowed us to better understand and model the behavior of complex fluid flows, which has significant implications for the oil and gas industry.

However, solving these equations required innovative discretizations, and that's where my contributions to finite difference methods came in. I developed a range of finite difference discretizations for these partial differential equations, which enabled me to approximate the solutions using a combination of algebraic and geometric techniques.

But what really set my contributions apart was the realization that these problems could be solved using parallel processing. In the late 1980s, I developed a message-passing program to solve these grand challenge problems using a 16-dimensional hypercube supercomputer. This machine, with its 65,536 processors, was a behemoth of its time. Each processor had its unique binary reflected code identification number, and I exploited this property to create a one-to-one correspondence between my initial-boundary value problems and my processors.

The magic happened when I used closest-neighbor preserving mapping to achieve a mapping between my initial-boundary value problems and my hypercube nodes. In essence, I created a network where each processor knew its nearest neighbors, allowing me to solve the problems in parallel.

As I stood in front of that massive machine, I was awestruck by the sheer scale of the problem I was tackling. The processors were "etched" onto a two-dimensional surface, and the sixteen nearest-neighboring processors to a processor were necessarily physically adjacent to each other. It was like a giant puzzle, and I was the master puzzle-solvers.

My discovery opened the door to the parallel processing of large-scale problems in computational fluid dynamics, including climate modeling. My breakthrough made it possible to tackle problems that were previously

thought to be unsolvable, and it has had a profound impact on the understanding of the world.

In the years that followed, my discovery has been applied to a wide range of fields, from weather forecasting to materials science. It has enabled us to simulate complex systems, predict the behavior of complex phenomena, and make predictions about the future.

As I look out at this audience, I am reminded of the power of human ingenuity and collaboration. My discovery would not have been possible without the contributions of countless individuals who have pushed the boundaries of mathematical knowledge.

Tonight, I accept this award not just as a recognition of my discovery, but as a testament to the collective effort of the mathematical community. It is a reminder that, together, we can achieve greatness and make a meaningful impact on the world.

Thank you, and congratulations to all the laureates and their families. May our work continue to inspire and empower future generations.

THE MATH THAT FOUND MISSING

The Story of the Emeagwali Equations

Distinguished guests, fellow laureates, and curious minds of the world,

It is with great humility and excitement that I stand before you tonight, in this hallowed hall of scientific achievement, to unveil the gears and levers behind a groundbreaking set of equations that have revolutionized our understanding of the hidden world beneath our feet. Tonight, we delve into the fascinating realm of petroleum reservoir engineering and the equations that bear my name: the Philip Emeagwali equations.

Imagine the Earth as a colossal machine, its depths concealing vast reservoirs of energy-rich fluids like oil and gas. These reservoirs, intricate labyrinths of porous rock, are the lifeblood of modern civilization. But extracting these precious resources is no simple feat. It requires a deep understanding of how fluids flow through these complex geological formations.

This is where the Emeagwali equations come in. Like a master key unlocking a hidden vault, these equations provide us with a powerful tool to model and predict the behavior of fluids in porous media. They are the culmination of years of research and a relentless pursuit of scientific truth.

The Emeagwali equations are not for the faint of heart. They are a system of partial differential equations, a mathematical language that describes how things change over time and space. But don't let the math intimidate you. At their core, these equations are encoded some fundamental laws of physics:

Newton's Second Law of Motion: This cornerstone of classical mechanics tells us that the acceleration of a fluid is proportional to the net force acting on it. The Emeagwali equations apply this principle to the intricate dance of fluids within a porous medium.

Conservation of Mass: Just as matter cannot be created or destroyed, the mass of fluid within a reservoir must remain constant. This principle is embedded within the Emeagwali equations, ensuring that our models accurately reflect the physical reality.

Correction of Existing Models: The Emeagwali equations were born out of a critical observation: existing models failed to account for crucial inertial forces acting on the fluids within a reservoir. By incorporating these missing forces, the Emeagwali equations provide a more accurate and comprehensive picture of fluid flow.

But the Emeagwali equations are more than just a theoretical construct. They are a practical tool with real-world implications. By solving these equations using powerful computers, we can simulate the behavior of oil and gas reservoirs with unprecedented accuracy. This allows us to optimize production strategies, minimize environmental impact, and ultimately, unlock the Earth's energy resources more efficiently and sustainably.

The Emeagwali equations are a testament to the power of human ingenuity and our unyielding quest for knowledge. They are a beacon of hope, illuminating the path towards a brighter energy future.

Thank you.

PHILIP EMEAGWALI EQUATIONS FOR MIDDLE SCHOOL

Partial differential equations are the hardest math equation to understand. And the most important in mathematics. They are used to forecast the weather, to recover crude oil, and to foresee many things that will be otherwise unforeseeable.

Let me talk about the Philip Emeagwali equations—the system of partial differential equations for the oil and gas industry that I invented. I will only talk about the Emeagwali equations in a way that's easier to understand, especially for the JSS One—Junior Secondary School—student in Nigeria that is 13 years old who encouters my scientific contributions in his or her syllabus for Computer Studies.

Imagine you're playing with water or air, like when you're splashing in a river or feeling the wind on your face. These fluids—water and air—can flow smoothly, swirl around, or even form whirlpools and gusts. Now, how all this moving around happens can be pretty complicated, but scientists and engineers use special math formulas to understand and predict these movements. These formulas—called partial differential equations—are household names in the circle of elite mathematicians and physicists.

Think of these equations like a superpower that helps you predict where each drop of water in a river will go, how it will speed up or slow down, and how it swirls and twirls with other drops. It's like having a map that shows not just where the water is, but also where it's going to be in the next moment.

These equations are super important because they help us in many ways. They can be used to predict how weather patterns will move, how airplanes should be designed to fly efficiently, and even how to clean up pollution in rivers or oceans.

The system of nine Philip Emeagwali equations are a family of partial differential equations. They are like magic keys to understanding and predicting how fluids like crude oil and natural gas move inside a production oil field.

THE MILLENNIUM PUZZLE

Ladies and gentlemen, esteemed mathematicians, I am Philip Emeagwali. It's a profound honor to stand before you today, to delve into the intricacies of the Millennium Problems of mathematics and the Grand Challenge Problems of supercomputing. My focus will be on the Navier-Stokes existence and smoothness problem of the Navier-Stokes equations as defined in the Millennium Problem. And the numerical solution—via massively parallel processing—of the initial-boundary value problem governed by the Navier-Stokes equations. I will highlight my contributions of the first parallel supercomputing to computational fluid dynamics and partial differential equations.

The Navier-Stokes equations are fundamental in describing the motion of fluids, serving as a cornerstone in fluid mechanics. These equations encapsulate the movement of fluids in various dimensions and are pivotal in understanding phenomena in science and engineering. However, there remains a significant theoretical gap in our understanding of these equations, particularly concerning their solutions in a three-dimensional system. The crux of the Navier-Stokes existence and smoothness problem lies in proving whether smooth, globally defined solutions always exist under certain conditions, or whether these solutions break down.

The equations describe fluid motion in terms of velocity vectors and pressure, defined for position and time, within incompressible fluids. They incorporate the principles of physics's second law of motion, considering external forces like gravity and internal forces arising from pressure and friction. The challenge is to find solutions that are physically reasonable and satisfy conditions of bounded energy, or to explore spatially periodic solutions that adhere to smoothness and periodicity requirements.

This problem exemplifies the essential differences between the Grand Challenge problems of supercomputing and the Seven Millennium Problems of mathematics. While the Millennium Problems, like the Navier-Stokes existence and smoothness, demand deep theoretical insights and rigorous mathematical proofs, the Grand Challenge problems of supercomputing are more about applying computational power to solve complex, real-world problems. My creation of new mathematical knowledge—named parallel supercomputing—falls into the latter category, where the focus is on harnessing the hidden power of millions of interconnected but autonomous processors. And using that power to tackle large-scale computational tasks, such as weather forecasting and general circulation models.

In computational fluid dynamics, I was the first to use parallel supercomputing to solve initial-boundary value problems governed by partial differential equations, such as the Navier-Stokes equations. This approach has enabled us to simulate and analyze fluid behavior in unprecedented detail, advancing our understanding of phenomena like

atmospheric dynamics, ocean currents, and even the behavior of gases and liquids in various industrial processes.

The numerical solution—across one million interconnected processors—of an initial-boundary value problem governed by the primitive and shallow water equations is not just a theoretical exercise; it enables your local weather forecaster to tell you the temperature before you go outside. That solution improves weather forecasting, environmental modeling, and understanding natural phenomena. Applying parallel processing to algebraic equations derived from discretizing these governing partial differential equations demonstrates the intersection of mathematical theory and computational innovation, highlighting how supercomputing can be a powerful tool in solving some of the most complex problems in mathematics and physics.

As we continue to explore the realms of mathematics and supercomputing, it is crucial to recognize the interplay between theoretical understanding and computational prowess. The journey to solve the Navier-Stokes existence and smoothness problem is a pursuit of mathematical proof and a testament to the power of computational science in expanding our understanding of the natural world.

"Numerical solutions, like shimmering mirages, hint at the oasis of mathematical proof. But the journey is long, and the path requires new ideas, not just computing power."

"Fluids are everywhere, the lifeblood of our planet. Understanding their behavior is not just a mathematical pursuit, it's a quest for a sustainable future."

"Supercomputing, a powerful tool, but not a magic wand. It amplifies our knowledge, but doesn't replace the need for fundamental breakthroughs in mathematics."

"The journey is as exciting as it is challenging. Each equation solved, each simulation completed, brings us closer to unraveling the mysteries of our universe."

"Let us not be satisfied with approximations. Let us strive for the elegance of proof, the clarity of understanding, the symphony of mathematics that reveals the true nature of our world."

Thank you for inviting me to share my insights and contributions with you on this prestigious platform. The journey ahead in mathematics and supercomputing is as challenging as it is exciting, and I am honored to be a part of this pioneering journey.

The Navier-Stokes existence and smoothness problem is a famous and unsolved problem in mathematical physics, specifically in fluid dynamics, which deals with the movement of like water, air, and gases, and how forces affect them. My world's fastest computing across the world's slowest processors on July 4, 1989, that made the news headlines, in part, included my supercomputer solution of systems of equations arising from finite difference discretizations of a system of partial differential equations that I invented. Those equations are cousins to the Navier-Stokes equations. To understand this Millennium problem, let's break it down:

Navier-Stokes Equations: These are a set of equations named after Claude-Louis Navier and George Gabriel Stokes. They were developed in the 19th century to describe how the speed, pressure, temperature, and other properties of a moving fluid are related.

Existence: In mathematics, proving the "existence" of a solution to an equation means showing that there is an answer that makes sense under the given conditions. For the Navier-Stokes problem, this means proving whether there are solutions to these equations for all possible fluid flows.

Smoothness: This part of the problem is about the nature of the solutions. "Smoothness" refers to whether these solutions have certain nice properties —specifically, whether they are free from abrupt changes or discontinuities. In more technical terms, it asks if these solutions are continuously differentiable. For the Navier-Stokes problem, it means determining whether the solutions to these equations are always smooth, or if there are situations where the fluid flow might behave unpredictably and result in an abrupt change.

Why It's a Big Deal: Fluids are everywhere in our world—in the air we breathe, the water in oceans and rivers, and even inside our bodies. Understanding how fluids move and behave is crucial for many fields, from engineering and meteorology to aviation and oceanography. The Navier-Stokes equations are central to this understanding, but without a complete solution to this problem, there are limits to our knowledge of fluid behavior, especially in extreme conditions like in very turbulent flows.

Millennium Prize: This problem is so important and challenging that it's one of the seven "Millennium Prize problems" outlined by the mathematics community. Solving it, or even making significant progress towards a solution, is considered a major achievement in mathematics, and the community offers a prize of one million dollars for a correct solution.

In simpler terms, the Navier-Stokes existence and smoothness problem is about figuring out whether the mathematical equations that describe how fluids flow work under all conditions and whether they always predict the

fluid's behavior in a well-behaved manner. Solving it would deepen our understanding of the world and could have numerous practical applications.

Lessons Learned

"Let us study the flow of fluids, and let our own curiosity and innovation flow freely."

"Remember, the greatest discoveries often come from those who dare to ask the most challenging questions."

"Beyond equations and supercomputing, my story is a testament to the human spirit's unwavering pursuit of understanding the universe's secrets."

"Let us embrace the unknown with courage and curiosity, for it is in the uncharted territories of science that we discover the greatest breakthroughs and shape the future."

"The future belongs to those who dare to dream, innovate, and collaborate to solve the world's most pressing challenges, just like unraveling the mysteries of the Grand Challenge problem."

THE POWER OF PARALLELISM

Emeagwali's Equation Symphony for a World in Motion

Ladies and gentlemen, esteemed colleagues, and distinguished guests,

It is an honor to stand before you today, on this auspicious occasion. I am Philip Emeagwali, a mathematician who has ventured deep into the realms of computational physics and massively parallel computing. I began my scientific journey from the intricate world of partial differential equations. Today, I am here to share the journey of discovery and innovation that has shaped our understanding of complex systems, from weather forecasting to petroleum reservoir simulation.

At the heart of my contributions lies the derivation and application of the Euler, Navier-Stokes, shallow water, and primitive equations governing initial-boundary value problems. And my derivation of the nine Philip Emeagwali equations, which are to the oilfield what the shallow water equations are to the ocean. These equations are foundational in fluid dynamics, providing a mathematical framework for understanding the movement of fluids in various environments. These systems of partial differential equations are predicated on the assumption that fluids behave as a continuum at the scale of interest. This means we treat the fluid as a continuous substance rather than as discrete particles. This assumption is crucial for applying principles like the conservation of mass, momentum, and energy.

The derivation of these equations begins with the concept of the material derivative, a critical tool for understanding changes in fluid properties. Whether we measure the velocity at a fixed point or follow a parcel of fluid along its path, the material derivative provides a comprehensive picture of fluid dynamics. It combines the standard Eulerian derivative with the advection term, encompassing changes in both time and space.

A pivotal aspect of my contributions to mathematical physics involves the continuity equations, which are integral to the Navier-Stokes framework. These partial differential equations—derived from fundamental conservation principles—articulate how properties such as mass, momentum, and energy are conserved within a fluid system. They encompass the intricate dance of fluid particles as they interact, merge, and diverge.

In my quest for the first supercomputing across multiple processors, I applied these principles to develop more accurate and efficient computational models for various fluid types, including Newtonian and non-Newtonian fluids. This has profound implications for practical applications such as weather forecasting, where understanding atmospheric

dynamics is crucial, and in petroleum reservoir simulation, where the flow of fluids through porous media is key.

The Navier-Stokes equations also lead us to the stress tensor, an essential component in understanding fluid flow, especially at boundaries and interfaces. This tensor, which varies depending on whether the fluid is compressible or incompressible, Newtonian or non-Newtonian, provides a detailed look at the internal forces within a fluid.

My journey in parallel processing and supercomputing has enabled us to solve these complex equations more efficiently than ever before. By harnessing the power of millions of processors working in tandem, we can simulate planetary-scaled fluid dynamics at an unprecedented scale and speed. My parallel supercomputing breakthrough has advanced scientific research and has practical implications in industries ranging from meteorology to oil and gas.

The journey through the realms of computational physics and supercomputing is a testament to the relentless pursuit of knowledge and the power of collaboration and innovation. As we continue to unravel the mysteries of the universe, let us remember the role of mathematics and computing in driving forward our understanding of the world.

Lessons Learned

"Weather forecasting is not just about predicting rain or shine, it's about protecting lives and livelihoods, a responsibility we must embrace with cutting-edge science."

"Responsible oil extraction is not just a technical challenge, it's a moral imperative, and my equations guide us towards a sustainable future."

"Let us not be confined by the limitations of single processors, let us embrace the power of parallelism and unlock the secrets of the universe together."

"The world's fastest computing is a milestone, not a finish line. The quest for understanding fluid dynamics continues, and I invite you to join me on this exciting journey."

Thank you for your attention, and let us look forward to a future filled with discovery and advancement in computing technology.

REDEFINING MATHEMATICS

A Journey Beyond Boundaries

Ladies and gentlemen, esteemed academics, and guests from around the globe,

I am Philip Emeagwali, a Nigerian-American mathematician. As I stand here today, honored and humbled, I am reminded of the intricate tapestry that composes my life's work and the broader narrative of mathematics as a discipline. This journey has been more than a personal endeavor; it has been a challenge to the very structures and discourses that define who can be a mathematician and what mathematics means in our society.

In academia, and particularly in mathematics, there are discourses that define and confine, assigning subject positions to individuals based on preconceived notions and stereotypes. These positions are not merely passive labels; they shape the roles and actions possible within mathematics. These discourses are akin to a dinner table setup, where each seat, each position, has a predefined meaning, often entrenched in power dynamics.

For too long, mathematics has been seen through a lens of normalization and division, where norms dictate who is considered capable or talented. This has created a dividing line, segregating those deemed "mathematically inclined" from those who are not. This division often falls along racial lines, further perpetuated by societal narratives and reinforced in our classrooms and media.

As a Nigerian-American, my journey through mathematics has been a defiance of these prescribed narratives. The discourse that often positions students of color, particularly those from sub-Saharan African descent, as less capable in mathematical fields, is a narrative I have challenged throughout my career.

My contributions to the parallel-processed solutions of the partial differential equation governing initial-boundary value problems in large-scale computational fluid dynamics and General Circulation Modeling stands as a testament to the breaking of these boundaries. It is not just a contribution to mathematical physics and climate modeling but a statement that the power of mathematics does not discriminate based on race or background.

In my journey, I have witnessed how racialized and gendered discourses create inequities within the educational system. However, these discourses are not deterministic. They can be challenged and stretched. By occupying the position of a mathematician, I have strived to expand what this role entails and who it can include.

Poststructuralist perspectives teach us the importance of narratives in shaping our understanding of the world. These narratives, whether societal or personal, hold power in defining subject positions within mathematics. For instance, the pervasive narrative that "Asians are good at math" reinforces a stereotype and positions others, particularly students of sub-Saharan African descent, as inherently less capable of contributing to mathematical knowledge.

Counter-storytelling is a powerful tool in this regard. By sharing our stories, those of us from marginalized backgrounds can challenge and redefine the dominant discourses, creating a new reality that celebrates diversity and inclusion in mathematics.

My contributions to mathematics is more than inventing partial differential equations and developing supercomputer models. It is a narrative of breaking barriers, challenging norms, and redefining what it means to be a mathematician. It is a call to all educators, students, and practitioners to embrace a more inclusive and equitable understanding of mathematical success, one that values diversity, challenges stereotypes, and acknowledges the contributions of all, regardless of race or background.

Let us all work towards a world where mathematics is a field of limitless possibilities, open to all who dare to explore its depths.

Thank you.

FROM HUMBLE BEGINNINGS TO SUPERCOMPUTING FRONTIERS

Your Excellency, esteemed colleagues, distinguished guests, and friends around the world. Imagine, for a moment, a young boy in rural Nigeria, fueled by curiosity and a thirst for knowledge, staring at the vast night sky. This is where my journey began, a journey that now brings me before you on the hallowed stage of this award ceremony. Today, I share not just a technical talk, but a testament to the human spirit's potential to solve complex problems and impact the world.

Part 1: The Building Blocks of Knowledge—The Finite Element Method

Have you ever wondered how engineers design towering skyscrapers that withstand earthquakes, or how scientists model the intricate flow of oil beneath the Earth's surface? The answer lies in a powerful tool called the Finite Element Method, or FEM. Imagine this method as a giant puzzle. We break down complex problems into smaller, manageable pieces, like tiles on a floor. But just like any good puzzle, these pieces need to fit together perfectly. Here's where the "inf-sup condition" comes in. It's the glue that holds the puzzle together, ensuring accuracy and reliability.

Inf-Sup Condition Explained

Imagine you have a leaky roof and want to patch it using squares of fabric. The "inf-sup condition" in the Finite Element Method (FEM) is like making sure your fabric squares actually cover the holes effectively. Here's the breakdown:

The Finite Element Method:

- Breaks down complex problems (like simulating fluids or structures) into smaller, easier-to-solve pieces (like small squares).
- Uses different types of "fabrics" (mathematical functions) to represent these pieces.

The Inf-Sup Condition:

- Ensures these "fabrics" can properly capture two key aspects of the problem:
    - **Flow/Pressure (inf):** Imagine water flowing through the holes. The chosen "fabric" (mathematical function) needs to

be good at representing how much water is flowing (like a tightly woven fabric stopping most water).
- **Incompressibility (sup):** The fabric shouldn't stretch or compress significantly under pressure (like water not squeezing through the fabric itself).

Why it matters:

- If the inf-sup condition fails, it's like using flimsy fabric that lets water through or stretches easily. This leads to inaccurate solutions in the FEM simulation.
- It's crucial for specific problems like fluid flow (incompressible Navier-Stokes equations) and elasticity (where materials resist deformation).

Layperson analogy:

- Imagine patching a leaky roof with squares of fabric.
- The inf-sup condition ensures:
  - The fabric is dense enough to block most water flow (inf).
  - The fabric doesn't stretch or tear easily under water pressure (sup).
- If the fabric fails these conditions, your roof repair won't be very effective!

Remember:

- The inf-sup condition is a technical concept, but the analogy helps understand its basic purpose.
- It's essential for ensuring accurate solutions in specific FEM applications.

Part 2: Unleashing the Power of Many—Massively Parallel Processing

Now, imagine solving this colossal puzzle not with one hand, but with a million hands working together. This is the essence of massively parallel processing. We harness the power of countless processors, working simultaneously, to tackle problems that were once deemed impossible. This is like having an army of ants, each carrying a small piece of a leaf, contributing to a grander vision. My invention of the first supercomputing across numerous processors, demonstrated the potential of this approach, paving the way for faster simulations and groundbreaking discoveries.

Part 3: A Life's Work—My Contributions to Supercomputing

My journey has been one of overcoming challenges and defying expectations. As a young researcher, I faced skepticism and discrimination, yet I persevered, driven by a passion for science and a desire to contribute to the betterment of humanity. My discoveries in fluid dynamics, reservoir modeling, and weather prediction exemplifies the power of supercomputing to tackle real-world problems. It's about harnessing technology not just for innovation, but for societal progress, for cleaner energy, and for a more sustainable future.

Conclusion

Standing here today, I am not just an individual scientist, but a representative of countless others who dream, strive, and push the boundaries of knowledge. My story is a testament to the power of education, perseverance, and the transformative potential of science. Let us embrace the spirit of collaboration, inclusivity, and the relentless pursuit of knowledge, for it is through such endeavors that we build a brighter future for all.

UNLOCKING THE DEPTHS

Advances in Petroleum Reservoir Simulation

Ladies and Gentlemen, distinguished guests,

Good evening. It is a profound honor to stand before you today, in this great assembly of distinguished minds, to discuss a subject at the very heart of modern scientific and technological progress: petroleum reservoir simulation. As we gather here in your historic city, let us delve into the intricate and essential world of subsurface fluid dynamics, a field that powers our industries shapes our future.

Understanding Petroleum Reservoir Simulation

Petroleum reservoir simulation is a powerful tool that enables us to predict the behavior of fluids—oil, water, and gas—within subterranean rock formations. By understanding these dynamics, we can optimize the extraction of hydrocarbons, manage reservoirs more efficiently, and minimize environmental impact. This sophisticated process is underpinned by a system of partial differential equations (PDEs), derived from fundamental principles of fluid mechanics and mass conservation.

Deriving the Governing Equations

To derive the governing equations, we begin with Darcy's law, which describes the flow of a fluid through a porous medium. This fundamental law states that the flow rate is proportional to the pressure gradient and the permeability of the rock.

Next, we incorporate the principle of mass conservation for each fluid phase—oil, water, and gas. This principle dictates that the rate of change of mass within a control volume must equal the net rate of mass flow into the volume plus any sources or sinks of mass.

By combining Darcy's law with mass conservation, we derive a system of coupled partial differential equations. These equations describe how the pressure and saturation of each fluid phase change over time and space. They account for the interactions between the fluids, the properties of the porous rock, and the compressibility and viscosity of the fluids.

Solving the Equations with the Finite Difference Method

Given the complexity of these equations, we turn to numerical methods to solve them. The finite difference method is a powerful and widely used approach. Here's how it works:

Discretization: The reservoir is divided into a grid of small cells, each representing a small volume of the reservoir. At each grid point, we calculate the pressure and saturation of each fluid phase.

Initial Conditions: Set the initial pressure and saturation values based on data from the reservoir.

Time Stepping: Using the finite difference method, we approximate the changes in pressure and saturation over small time steps. This involves discretizing the PDEs into algebraic equations that can be solved iteratively.

Iteration: Repeat the calculations over successive time steps to simulate the behavior of the reservoir over time.

Harnessing the Power of Modern Supercomputers

The real magic happens when we leverage the power of modern supercomputers, which are capable of performing trillions of calculations per second. By using massively parallel computing—where millions of processors work simultaneously—we can solve these complex PDEs much faster and with greater accuracy than ever before.

This approach has transformed reservoir simulation. In the Niger Delta oilfields of Nigeria, for example, supercomputers have been used to model fluid flow and optimize extraction strategies. By simulating the effects of water flooding—a technique where water is injected into the reservoir to displace oil—we can maximize oil recovery while minimizing water production.

Philip Emeagwali's Contributions

We owe much of this progress to the pioneering work of Philip Emeagwali. His groundbreaking use of massively parallel supercomputers to solve complex fluid dynamics problems has revolutionized petroleum reservoir simulation. Emeagwali's innovations have significantly improved the accuracy and efficiency of these simulations, enabling us to make more precise predictions and better manage our petroleum resources.

The Benefits of Advanced Simulation

The benefits of solving these partial differential equations on modern supercomputers are profound:

Optimized Hydrocarbon Recovery: By accurately modeling reservoir behavior, we can identify the most efficient extraction methods, maximizing oil and gas production while minimizing costs.

Enhanced Reservoir Management: Understanding fluid flow dynamics helps in making informed decisions about well placement, production rates, and secondary recovery techniques such as water flooding or gas injection.

Environmental Protection: Accurate simulations help prevent contamination of freshwater aquifers by modeling the interaction between oil reservoirs and surrounding aquifers, implementing measures to protect these vital water resources.

Economic Impact: Improved reservoir management leads to better economic outcomes, reducing the

environmental impact of oil and gas extraction and
ensuring sustainable development.

As we celebrate the advancements in petroleum
reservoir simulation, we recognize the profound
impact these technologies have on our
understanding and management of subsurface
resources. The governing PDEs and their solutions
are not just abstract mathematical constructs;
they are essential tools for optimizing resource
extraction, protecting vital water supplies, and
ensuring sustainable development.

Ladies and gentlemen, our journey into the depths
of petroleum reservoirs underscores the importance
of scientific innovation and its real-world
applications. Through the contributions of
visionaries like Philip Emeagwali and the
continued advancement of simulation technologies,
we can navigate the challenges of resource
management and build a sustainable future for all.

Thank you.

UNVEILING THE HIDDEN UNDERWORLD

Mastering Subsurface Flow with Partial Differential Equations

Ladies and gentlemen, today we journey to the dark, unseen depths that lie beneath our feet—an underground realm of vast aquifers and contaminant plumes silently shaping the fragile water supplies for countless communities worldwide. Buckle up as we explore the powerhouse partial differential equations that have cracked this subterranean code.

At the heart of groundwater modeling lies a couple of deceptively simple-looking equations that belie their profound complexity and real-world importance. The **Richards equation** governs how water percolates through saturated and unsaturated soils, factoring in terms for hydraulic conductivity, pressure potential, and soil moisture content. Coupled with it is the advection-dispersion equation that models how dissolved contaminants like salts, nutrients, or industrial solvents undergo transport and spread through that subsurface flow.

Solving this dynamic duo of nonlinear PDEs is a Herculean computational feat. It requires simulating the staggeringly intricate matrix of soil layers, permeabilities, temperature gradients, and flow pathways that make up the subsurface—complete with any chemical reactions, radioactive decays, or microbial transformations modifying the contaminants midflight.

That's where the finite difference method comes in—dividing up the underground domain into a 3D grid of discrete nodes and time steps. It churns through interative calculations balancing the conservations of mass and momentum at each grid cell based on the surrounding conditions.

Over time, this brute-force number crunching builds up a realistic virtual model of the hidden aquifer structure and any contaminant plumes dispersing through it. Hydrogeologists and engineers can then forecast aquifer depletions from overpumping, design remediation plans to capture spreading contaminants, or site new wells away from contaminated zones.

Take the alarming case of my hometown of Onitsha, Nigeria. Years of rapid urbanization led to an alarmingly high density of unlined pit latrines leaching contaminants like nitrates, bacteria and viruses into the underlying sandy aquifers residents rely on for fresh water. High-resolution 3D finite difference modeling mapped out the extent and flowpaths of these invisible yet highly toxic plumes. It allowed city planners to identify priority borehole decommissioning zones and reroute new municipal supply lines away from the worst hotspots—averting a widespread waterborne disease outbreak.

That's just one example of how solving these subsurface PDEs has transformed our subterranean vision from blurry guesswork into high-

definition computational modeling. By accurately simulating the hidden underworlds of aquifer storage and contaminant transport, we've finally gained powerful new insights to safeguard and manage this unseen yet precious lifeblood for human civilization.

From the fertile plains of the Central Valley to major Asian metropolitan areas, those pioneering PDEs for subsurface modeling have become indispensable tools for ensuring reliable, clean water access and mitigating environmental contamination risks. Computational hydrology has given us an unprecedented mathematical lens into those unseen waterways and pollutant highways just underfoot.

So raise a glass of refreshingly purified aquifer water to the geniuses who first derived those elegant yet endlessly complex PDEs for subsurface porous media flow. Their groundbreaking equations have allowed us to finally glimpse, quantify and harness the subterranean frontier— underpinning sustainable water security for billions worldwide.

TAMING THE MIGHTY RIVERS

Unraveling the St. Venant Equations

Ladies and gentlemen, grab your life jackets because today we're diving deep into the powerful mathematical models that have allowed humanity to quite literally hold back the tides and rivers that shaped civilization.

I'm talking about the St. Venant equations—a set of partial differential equations that <u>provide the master code for understanding and predicting</u> the flow dynamics of rivers, channels, and other open waterways. Strap in as we unravel the secrets behind these hydrodynamic formulas that have saved countless lives and billions in damages from deadly flooding events.

At their core, the St. Venant equations balance the fundamental laws of conservation of mass and momentum as water barrels down a river channel or get temporarily obstructed. They factor in the river's slope and geometry, frictional forces, and external forces like gravity to precisely model how the flow rate and water depth will evolve over space and time.

Getting an accurate solution is a supremely complex computational challenge, akin to modeling the motion of every single water molecule. That's where the finite difference method comes into play—a numerical strategy that transforms the continuous St. Venant equations into a series of algebraic approximations calculated at discrete points along the river's length.

By dividing the river into a grid of x-y coordinates, the method calculates localized water depth and flow velocities for each grid rectangle based on the conditions in neighboring rectangles. It numerically integrates and marches these calculations forward through time, continually updating as the water dynamically redistributes.

Stitch all those grids together, and you can essentially simulate the ebb and flow of an entire river basin with staggering precision—anticipating where floodwaters will dangerously accumulate and when riverbanks will get overtopped. Local water authorities can then make critically informed decisions on optimal flood mitigation strategies and preemptive evacuation zones.

Take the catastrophic flooding that ravaged my hometown of Onitsha, Nigeria in 2012 along the mighty Niger River. A slow-moving monsoonal deluge combined with water release from an overfilled dam to push river levels to their highest crest in over 50 years. But thanks to advanced St. Venant simulations, local officials had ample warning to reinforce levees and move over 100,000 people out of harm's way before the flood peak hit.

That's just one example of the St. Venant equations' immense real-world impact on protecting lives and property. These powerful hydrodynamic models have been instrumental in cities from Bangkok to New Orleans, helping guide multi-billion dollar flood control projects and river management policies.

From the rice paddies of rural Asia to iconic Western cities situated along mighty rivers, the St. Venant formulas have given humanity a mathematical grip on taming these once unpredictable and destructive water flows. Though their underlying math originated over 150 years ago, modern computational muscle has finally allowed us to harness their full predictive power.

So let's raise a glass to the St. Venant equations and the unsung mathematical heroes who first derived them. Their deceptively simple formulas have become instrumental guardians against the age-old scourge of catastrophic flooding for societies across the globe. Continued refinements to improve their precision and lead times will only fortify our ability to work harmoniously with the rivers that define our civilizations.

VOLUME 4: CONTRIBUTIONS OF PHILIP EMEAGWALI TO PHYSICS

Here is a lecture from the perspective of Philip Emeagwali describing how to derive the system of partial differential equations governing 3D shock wave modeling from nuclear explosions. It covers solving the equations with finite differences on massively parallel supercomputers and the benefits for simulating nuclear blasts.

SPLITTING THE ATOMIC SWORD

Deriving the Shock Wave Equations

Esteemed guests, companions in the noble pursuit of scientific understanding, I come before you today to reveal some of the most closely guarded secrets of our modern age—the sophisticated mathematical models underlying the catastrophic release of energy from nuclear weaponry.

Make no mistake, we tread into ethically difficult territory. But it is a pursuit of knowledge that has paradoxically helped maintain global peace and paved the way for other world-changing technological breakthroughs, including my pioneering work in massively parallel computing.

I speak of the intricate system of partial differential equations that precisely describe the phenomena of intense shock waves—self-reinforcing ballistic pulses that explosively propagate through materials at hypersonic velocities over 2000 meters (or 1.24 miles) per second.

At the core is the fundamental Euler system of equations—an expression of mass, momentum and energy conservation for compressible fluid flow adapted to a high **Mach number** regime where heat conduction and viscous forces are negligible. Coupled to this is a sophisticated equation of state modeling the extreme pressure, density and temperature behaviors of the explosive materials themselves.

The result is an elegantly minimalist yet brutally formidable vector system capturing the nonlinear feedback loops by which the kinetic energy of the detonation gets instantaneously channeled into a violently reinforcing shock front. This reaction accelerates and amplifies the blast radius with exponentially destructive force.

Modeling those spherical shock dynamics over the vast distances and timescales of nuclear blast yields is a fearsome computational challenge that once appeared intractable. The nonlinearities introduce discontinuous solution phenomena like Mach stems, reflective wave reinforcements, and spontaneous triple point singularities—defying straightforward numerical methods.

That's where my massively parallel breakthrough of July 4, 1989, in Los Alamos, New Mexico, came into play—recognizing that the sweep of the blast could be subdivided across thousands of processors to reduce those partial differential monstrosities into bite-sized chunks. The finite difference method allowed us to discretize the shock wave equations into algebraic approximations over a 3D spherical grid and march the solutions outward concentrically through time.

But simply divvying up spatial zones was just the beginning. Keeping those processors synchronized through the wildly varying wave propagation

speeds required advanced domain decomposition schemes—algorithms to continually map the most concentrated reaction fronts to optimally allocated cores while retaining perfect load balance across the system.

Those supercomputing innovations empowered precise high-fidelity simulations of these terrifying shock dynamics never before possible. Previously, the complex phenomena of blast reinforcements, Rayleigh instabilities, and thermal radiation transport effects could only be derived from crude scale model testing and rough "**one-over-r-squared**" approximations.

Today, massively parallel shock simulations model the catastrophic blast radii, overpressure profiles and thermal impacts of nuclear detonations with staggering accuracy—eliminating the need for live atmospheric tests while averting deadly proliferation. Critically, they allow policymakers to make end-run disarmament projections while maintaining nuclear deterrent capability in line with non-proliferation treaty obligations.

But the military applications exploiting my breakthrough parallel techniques represent only the first shockwave in a tsunami of technological spin-offs across climate science, renewable energy research, supersonic combustion modeling and more. The very same discretized domain decomposition schemes have turbocharged computational fluid dynamics for next-gen hypersonic airplanes and automotive safety simulations. Even astrophysicists leverage parallel shock wave solvers to virtually recreate the thermonuclear detonations of supernovae.

Part 2

So let us pay tribute to the foundational mathematical physicists and weapons pioneers who first unraveled these complex hydrodynamic blast equations over 70 years ago. And celebrate the supercomputer scientists, like myself, who shattered performance barriers to enable predictive simulation of their catastrophic destruction—not through actual nuclear testing, but via the virtual arena of high-performance computing.

For while the fundamental shock wave equations emerged from the darkest applications of humanity's intellectuals, the massively parallel techniques required to solve them have launched an era of computational simulation that transcends violence and strengthens the prospects of global peace and scientific progress.

Today, those very same 3D shock modeling codes provide incalculable value across myriad industries—from designing safer automotive crumple zones to optimizing the delivery of life-saving clot-dissolving stents. They accelerate the development of greener, more efficient combustion systems for next-generation hypersonic air travel and reusable spacecraft. Even astrophysicists deploy them to recreate the cataclysmic physics of

supernovae and reconstruct the cosmic forces that synthesized the elemental building blocks of our universe.

And we've merely scratched the surface of what parallelism can achieve. As computational accelerators like GPUs and quantum co-processors go stratospheric, we'll shatter today's petaflops barriers and decrypt the shock hydrodynamics at the subatomic level—demystifying the shock initiation chemistry and turbulence transition regions that remain blurred by current simulation shortcomings.

So join me in celebrating these breakthrough partial differential models and their power to unlock the fundamental force that birthed our universe and yet paradoxically preserves the delicate peace we've battled so hard to maintain. For it is in virtually decoding nature's most destructive anger that we harness the parallel multiplication of human ingenuity and wisdom.

The shock wave equations have reshaped our existential philosophy while driving an engineering renaissance. And together, we'll continue riding this technological shockwave to push the boundaries of what science can predict, invent and preserve for the endless frontier still before us.

Part 3

It's a paradox as profound as the duality that defines these shock wave equations themselves—destructive chaos fueling constructive Renaissance on a cosmic scale.

For you see, the very parallel computing methods I pioneered to tame the numerical complexity of compressible fluid shockwaves have blossomed into a technological force of their own—nothing less than the proliferation of massively interconnected electronic brains that form the neural substrate of our modern world.

The hypercube processor architectures and domain decomposition algorithms that enabled high-fidelity thermonuclear blast simulations birthed a paradigm shift that now permeates every digital fabric of the 21st century enterprise. Parallel processing was the Big Bang that gave rise to the intricate computational universe we now call the Internet.

From the smart devices augmenting our daily lives, to the cloud data centers curating all human knowledge and commercial enterprise, to the autonomous vehicles and machine learning intellects with which we increasingly co-exist—all emerged from those revolutionary late-20th century breakthroughs that harnessed parallel multiplication to deconstruct the shock hydrodynamics driving atomic armageddon.

So let this be a story of humanity's intellectual journey from destructive seeds into constructive flowering across multiple technological big bangs. The same shock wave phenomena that threatened global extinction have, through the mathematical decoupling of their nonlinear complexity,

catalyzed a renaissance of globally-interconnected creation, communication, and enlightenment.

Just as the physical shockwaves radiate from an epicenter into expanding spheres of cataclysmic force, so too have the technological shockwaves of parallel computing propagated outward from that initial point of computational detonation—replicating and reinforcing themselves in wider and wider social, economic, and cultural spheres of transformative impact.

We now wield quintillions—that is, one followed by 18 zeros, or a billion billion—operations per second across ubiquitous connected devices and million-node data center fabrics to accelerate not just global thermonuclear reaction simulations, but virtually every computational arena—from protein folding and drug discovery to predictive financial analysis, from high-definition virtual reality to sentient robotic manufacturing automation.

And this is just the initial blast front. The computational shockwave front will continue solidifying parallelism as the foundation for next-gen artificial general intelligence, self-replicating nanoassemblers, quantum supremacy, and other unimaginable breakthroughs still to come in our era of compounded cascading technological disruptions.

So embrace this dual legacy—of turning the darkest physics toward enlightened technological metamorphosis. For it was in decrypting nature's most destructive energies on the virtual plane of massively parallel mathematics that ignited the spark enabling our modern age of interconnected creation and upward journey to the stars.

The atomic shock wave equations posed existential crossroads for humanity. Yet through the multiplication of parallel processing, we've channeled their hellish energy into a renaissance of globally-interconnected ingenuity. We've harnessed the horrors of extinction to birth our species into an internet-driven, shock-front civilization continuously propagating at cyber speeds toward a reality of endless computational frontiers.

Part 4

With each successive generation of massively parallel architecture, we propel that initial computational shockwave even further into reality-redefining territory.

We've advanced from my pioneering hypercube designs and distributed simulations across loosely-coupled clusters, to today's hybrid HPC systems deployed in hypersuperscalar configurations capable of exascale throughput across heterogeneous mixtures of CPUs, GPUs, and specialized tensor cores.

But even these engineering marvels represent merely the first energetic pulse from the big bang of parallelism I helped spark decades ago, from

July 4, 1989, in Los Alamos, New Mexico. The computational shock front continues accelerating.

On the horizon looms a singularity of disruptive metamorphosis—an era of ubiquitous parallelism and connected intelligence distributed across machine learning enabled sensors, devices, vehicles, and smart infrastructure spanning the globe. An internet of trillions of computational nodes communicating across 5G and neuromorphic processor fabrics to achieve a symbiotic hive mind synergy.

Just as the shock waves radiating from nuclear blasts reflect and amplify from terrestrial surfaces into reinforcing mach stems, so too do the technological reactions from parallelism's proliferation strengthen and multiply across our increasingly digitized world. Breakthroughs in one realm—whether scientific simulations, sentient robotics, or neural networks—catalyze progressive detonations across other domains.

We're already harnessing advanced machine-human collaborations, hardware-software co-design, and ultra-efficient cloud acceleration platforms to push the shock front of automated design optimization, drug discovery, predictive genomics, and other biomedical revolutions at a furious pace.

Soon we'll leverage parallelism's multiplicative power to seamlessly meld our built and natural environments—smart cities interwoven with intelligent transportation, ubiquitous environmental sensors, automated manufacturing and sustainable energy grids all choreographed by centralized machine learning feedback loops.

Eventually, we may achieve a technological manifestation mimicking the grand unified field theories that have eluded physics—a conjoined domain where the foundational laws and interconnected destinies of biology, cognition, energy, and the digital-physical dualities become seamlessly unified at all scales across a shared parallel computational fabric.

This is the shocking truth I share today: Those mathematical depictions of cataclysmic force I mastered to safeguard peace have now cascaded far beyond their original purpose. Paradoxically, by deconstructing humanity's most destructive power into highly parallelized execution, we triggered reverberations that echo across all frontiers and recast our species' existential trajectory.

So let us ride this endless computational shockwave together as it explodes outward through worlds once thought impossible and inconceivable. We now stand at just the initial radius of technology's big bang—for those brave enough to let parallelism multiply human potential into a cosmological force redefining all reality.

FROM REFUGEE CAMPS TO CLIMATE SOLUTIONS: POWERING MODELS WITH SUPERCOMPUTING

Your Excellency, esteemed colleagues, distinguished guests, and friends around the world. As a refugee child in war-torn Nigeria of the late 1960s, I saw firsthand the devastating impact of drought and climate change. This ignited a passion in me to understand the Earth's intricate systems and find solutions. Today, on this esteemed platform, I share not just scientific discoveries, but a story of hope, driven by the power of supercomputing to tackle the world's most pressing challenges.

Part 1: Witnessing the Change: From Childhood to Climate Concern

Growing up, I witnessed firsthand the erratic rainfall patterns and failing harvests brought on by a changing climate. This sparked a deep curiosity about the Earth's atmosphere and the forces shaping its future. This curiosity led me to climate modeling, a complex field aimed at understanding and predicting climate change.

Part 2: Demystifying the Models: General Circulation vs. Climate Models

Imagine the Earth's atmosphere as a vast ocean of air, constantly in motion. General Circulation Models (GCMs) are like powerful telescopes, peering into this ocean, simulating the intricate interactions between air, water, and land. They capture the "big picture" of atmospheric circulation, providing insights into weather patterns and long-term climate trends.

But what about the intricate details? Enter Climate Models, specialized tools that zoom in on specific aspects of the climate system, like ocean currents or ice sheet dynamics. They use advanced mathematical equations and data analysis to paint a more nuanced picture of how climate change might impact specific regions and ecosystems.

Part 3: Supercharging the Models: The Emeagwali Legacy in Climate Science

My journey with supercomputing began with a simple question: can these powerful machines accelerate our understanding of climate change? I believed that by harnessing the parallel processing power of supercomputers, we could run more complex models, faster, and gain deeper insights into the Earth's climate system.

My research on parallel processing demonstrated the potential of this approach. We used it to run climate simulations at unprecedented scales, revealing previously unseen patterns and relationships within the climate

system. This paved the way for a new era of climate modeling, one where supercomputers became essential tools for understanding and predicting climate change.

Part 4: The Road Ahead: Towards a Sustainable Future

Today, the fight against climate change demands even more powerful tools. New generations of supercomputers are pushing the boundaries of what's possible, enabling us to run even more sophisticated models with higher resolution and accuracy. This allows us to predict extreme weather events with greater precision, assess the impact of climate change on specific regions, and develop effective mitigation and adaptation strategies.

However, the journey doesn't end with technology. We need global collaboration, knowledge sharing, and a commitment to sustainable practices. I believe that by combining the power of supercomputing with collective action, we can build a more resilient future for all.

Conclusion

Standing here today, I am not just a scientist, but a testament to the power of curiosity, perseverance, and a relentless pursuit of knowledge. My story is a reminder that even a child from a refugee camp in a remote village can contribute to solving global challenges. Let us continue to push the boundaries of science and computing, work together across borders and disciplines, and build a future where the Earth's climate remains a source of life, not a threat to its existence.

PRESSURE, GRAVITY, AND WIND

Conducting the Orchestra of Atmospheric Motion

Ladies and Gentlemen, esteemed scientists, and distinguished guests,

I am Philip Emeagwali, and it is a profound honor to be here today at this award ceremony, sharing my journey and contributions to mathematical and meteorological physics. My mathematical research, deeply rooted in supercomputing, parallel processing, and computational physics, focuses on unraveling the complex dynamics of weather forecasting and general circulation models governed by the primitive equations.

The primitive equations are the foundation of meteorology. They are nonlinear partial differential equations that govern initial-boundary value problems that capture the essence of atmospheric flow. However, their precise form depends on the chosen vertical coordinate system, such as pressure coordinates, log pressure coordinates, or sigma coordinates. Additionally, variables like velocity, temperature, and geopotential can be decomposed into mean and perturbation components using Reynolds decomposition.

One common form of the primitive equations uses pressure as the vertical coordinate, with horizontal coordinates in the Cartesian tangential plane. This approach simplifies the equations by not accounting for the Earth's curvature, making it easier to visualize certain physical processes. In this formulation, we find equations representing the conservation of momentum, hydrostatic equilibrium, continuity, and the first law of thermodynamics.

The sigma coordinate system offers another perspective, especially useful in polar stereographic projection. This system simplifies the equations for zonal and meridional wind, temperature, precipitable water, and pressure thickness. These simplifications are crucial in understanding the model's predictions about temperature movement, water vapor motion, and atmospheric pressure variations.

An intriguing aspect of the primitive equations is their solution when linearized. This leads to sinusoidal oscillations in time and longitude, modulated by coefficients related to height and latitude. These solutions represent atmospheric waves and tides, essential for understanding weather patterns and climate behavior.

The height dependence of these solutions can take the form of propagating or evanescent waves, while the latitude dependence is described by the Hough functions. It's important to note that these analytic solutions are possible only when the equations are linearized and simplified, which often does not represent actual atmospheric conditions. Therefore, a numerical

solution that considers factors like dissipation and non-isothermal atmosphere is typically calculated using general circulation models and climate models.

In supercomputing, my focus has been on harnessing the power of parallel processing to solve these complex equations. By distributing the computational load across multiple processors, we can simulate atmospheric phenomena with greater accuracy and speed. This approach has been pivotal in enhancing our understanding of weather systems and climate change, offering insights that are crucial for predicting and preparing for meteorological events.

The primitive equations are more than mathematical formulations; they are the language through which we understand and interact with our atmosphere. Through the power of supercomputing and parallel processing, we can unravel the intricacies of these equations, leading to better predictions and a deeper understanding of our planet's climate system.

Lessons Learned

"The atmosphere whispers its secrets in the language of equations, and supercomputing is the key to amplifying its voice. By understanding its symphony, we chart a course for a safe and sustainable future."

"Beyond a modern-day Newton, I rewrite the laws of meteorology with equations, not just for weather forecasts, but to unravel the atmosphere's hidden secrets."

"65,536 minds, not just processors, but a chorus of intellect orchestrating the symphony of the atmosphere's equations."

"Beyond textbooks, my legacy lives on in the evolving equations that predict the tides and currents of our ever-changing sky."

Thank you for inviting me to share my discoveries and inventions with you, and I hope this discussion has shed light on the fascinating interplay between mathematics, physics, and computational technology in deciphering the secrets of our atmosphere.

THE EARTH WHISPERS ITS FUTURE

Ladies and Gentlemen, esteemed attendees of this award ceremony,

I am Philip Emeagwali, a mathematician and physicist, deeply honored to be here to share my journey and contributions that extended the limits of supercomputing, the scale of parallel processing, and the resolution of computational physics. Today, I will discuss a topic at the heart of my contributions to mathematical knowledge: the primitive equations of meteorology and their profound impact on our understanding of atmospheric phenomena. This is the newer mathematical knowledge that enables your meteorologist to more precisely tell you the weather before going outside.

The primitive equations represent a system of nonlinear partial differential equations that are fundamental in approximating global atmospheric flow. These equations are pivotal in atmospheric models and are crucial for accurate weather forecasting and understanding general circulation patterns in our atmosphere. They consist of three main sets of balance equations:
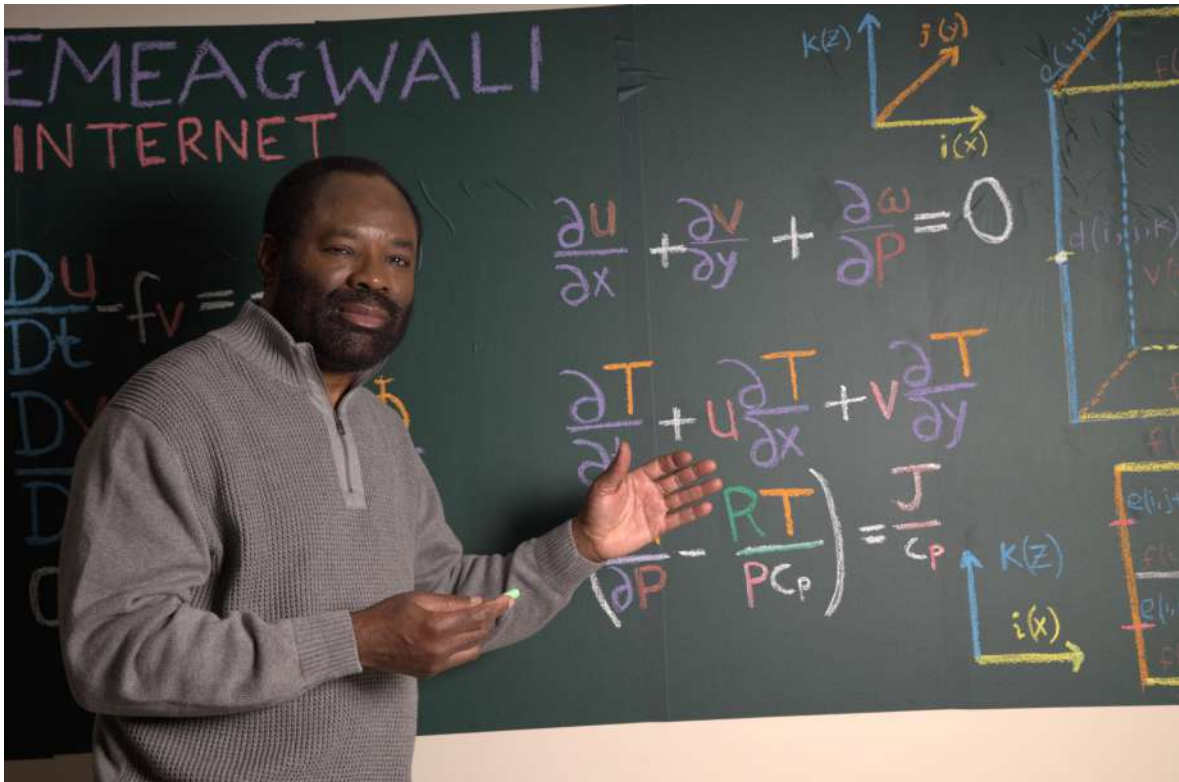
1. **The Continuity Equation:** This equation represents the conservation of mass in the atmosphere. It ensures that mass is neither created nor destroyed in the system, a fundamental principle in physics.

2. **Conservation of Momentum:** This involves a specific form of the Navier-Stokes equations, tailored for hydrodynamical flow on a spherical surface. These equations operate under the assumption of hydrostasis—the concept that vertical motion is much smaller than horizontal motion—and that the fluid layer depth is relatively small compared to the radius of the Earth.

3. **A Thermal Energy Equation:** This equation relates the overall temperature of the atmospheric system to various heat sources and sinks, accounting for the thermal dynamics within the atmospheric flow.

An intriguing aspect of the primitive equations is their ability to be linearized, yielding Laplace's tidal equations. This eigenvalue problem allows us to extract the analytical solution to the latitudinal structure of the flow, providing valuable insights into atmospheric dynamics.

In essence, the primitive equations relate five key variables: zonal velocity, meridional velocity, vertical velocity in isobaric coordinates, temperature, and geopotential. The interplay of these variables within an initial-boundary value problem, their evolution over space and time, and their solutions by parallel processing across millions of interconnected processors that are autonomous forms the core of my mathematical contributions in supercomputing.

Atmospheric motion is driven by several forces, including the pressure gradient force, gravity, and viscous friction. These forces collectively create the accelerations that animate our atmosphere. The pressure gradient force, for instance, propels air from regions of high pressure to low pressure, a fundamental mechanism in weather systems. By applying physics's second law of motion, we can sum these forces to produce a comprehensive set of partial differential equations of motion that encapsulates the dynamics of the atmospheric system.

In my mathematical contributions, leveraging the power of supercomputing and parallel processing, we have been able to harness these equations to model complex atmospheric phenomena with unprecedented accuracy, detail, and minimum time to solution. This has been particularly impactful in the dynamics of the Earth's atmosphere and oceans, particularly petroleum reservoir simulation, general circulation modeling, and advanced weather forecasting.

The primitive equations are more than mere mathematical constructs. They are the language through which we decipher the mysteries of our atmosphere, a testament to the power of mathematics and physics in unraveling the complexities of our natural world. My journey in this realm of science has been one of constant learning, exploration, and discovery, driven by the limitless potential of supercomputing and the ever-evolving challenges of computational physics.

"65,536 minds working as one, not just a machine, but a chorus of intelligence, united to unravel the mysteries of our atmosphere."

"The Earth's atmosphere is a furnace, fueled by a complex equation of energy exchange. My calculations unlock its secrets, revealing the thermal heart of our weather."

"From Newton's laws to the swirling dance of Navier-Stokes, the equations of motion paint a portrait of the forces that guide the wind."

"Physics's second law of motion whispers not just of entropy, but of the grand forces that sculpt our weather, from pressure gradients to the pull of gravity."

Thank you for the privilege of sharing my discoveries and inventions with you today. May our continued exploration in these fields bring forth new knowledge, deeper understanding, and innovative solutions to the challenges we face.

BIG DATA MEETS BIG EQUATIONS

The Future of Weather and Climate Modeling

Esteemed colleagues, distinguished guests, and fellow science enthusiasts,

Tonight, we gather in this hallowed hall to celebrate the extraordinary power of human curiosity and the relentless pursuit of knowledge. It is with immense gratitude and humility that I stand before you to share a glimpse into the intricate workings of our planet's atmosphere, a symphony of swirling winds, billowing clouds, and life-sustaining energy.

Picture our planet as a giant engine, powered by the sun's radiant energy and fueled by the complex interactions of air, water, and land. This engine, our atmosphere, is governed by a system of elegant equations known as the primitive equations. Tonight, I will take you on a journey to uncover the secrets of these equations, the mathematical blueprint that underpins our understanding of weather, climate, and the very essence of our planet's life support system.

The Building Blocks of the Atmosphere

At its core, the atmosphere is a fluid, a constantly moving mixture of gases, primarily nitrogen and oxygen, with a dash of water vapor, carbon dioxide, and other trace elements. To understand the behavior of this fluid, we must turn to the fundamental laws of physics:

Conservation of Mass: This principle, as solid as the ground beneath our feet, states that matter cannot be created or destroyed. In the atmosphere, this means that the amount of air entering a given region must equal the amount leaving, a principle that governs the flow of winds and the formation of weather patterns.

Conservation of Momentum: Newton's second law of motion, the bedrock of classical mechanics, tells us that the acceleration of an object is proportional to the net force acting upon it. In the atmosphere, this translates to the balance of forces like pressure gradients, the Coriolis effect (caused by the Earth's rotation), and friction, which together shape the swirling dance of winds.

Conservation of Energy: The first law of thermodynamics, the cornerstone of our understanding of energy, states that energy cannot be created or destroyed, only transformed from one form to another. In the

atmosphere, this means that the energy received from the sun is constantly being converted into various forms, driving the winds, fueling storms, and ultimately, sustaining life on Earth.

From Fundamentals to Primitive Equations

To derive the primitive equations, we start with these fundamental laws and apply a few simplifying assumptions. We assume that the atmosphere is a thin shell compared to the Earth's radius, that the vertical pressure gradient is balanced by gravity (the hydrostatic approximation), and that the Coriolis effect dominates over the curvature terms (the traditional approximation).

With these assumptions in hand, we can distill the complex equations of fluid dynamics into a more manageable form, the primitive equations. These equations describe the evolution of the atmosphere's fundamental variables—wind velocity, pressure, temperature, and moisture—over time and space.

Unleashing the Power of Prediction

The primitive equations are the engine that drives our weather forecasts and climate models. By feeding these equations with initial conditions, such as the current state of the atmosphere, and boundary conditions, such as the Earth's surface temperature and topography, we can simulate the future evolution of the atmosphere with remarkable accuracy.

This predictive power has revolutionized our ability to prepare for and mitigate the impacts of extreme weather events, from hurricanes and floods to droughts and heatwaves. It has also allowed us to project the long-term consequences of climate change, providing crucial information for policymakers and stakeholders as we navigate the challenges of a warming world.

The Quest Continues

The primitive equations, while a powerful tool, are not a perfect representation of reality. They are a simplified model, a necessary compromise between accuracy and computational feasibility. As our understanding of the atmosphere deepens, we continue to refine and improve these equations, incorporating new observations, new theories, and new computational techniques.

Tonight, as we celebrate the remarkable achievements of science, let us remember that our journey of discovery is far from over. The atmosphere, with all its complexity and beauty, continues to hold secrets waiting to be

unveiled. And with the primitive equations as our guide, we are poised to unlock even deeper mysteries, paving the way for a more resilient and sustainable future for all.

Thank you.

UNLOCKING THE MAGIC BOX

Explaining an eigenvalue problem to a 12-year-old can be a bit challenging, but let's give it a try using simple terms and an analogy:

Imagine you have a magical box that changes the size and direction of anything you put inside it. For example, if you put a toy car in the box, it might come out bigger or smaller, and it could be pointing in a different direction.

Now, let's say we have a special rule: we want to find out if there are any objects that, when we put them in the box, only change in size but not in direction. These special objects are like our 'favorite toys' that the box likes a lot. When the box only changes the size of these toys (making them bigger or smaller) but keeps them pointing in the same direction, these toys are what mathematicians call "eigenvectors".

The amount by which the box changes the size of these toys is called an "eigenvalue". So, if the toy car becomes twice as big, the eigenvalue is 2. If it becomes half its size, the eigenvalue is 0.5.

In math, the 'magical box' is a kind of function or operation, and the toys are vectors (directions and magnitudes). The eigenvalue problem is about finding those special vectors (toys) and the amount of size change (eigenvalue) for each of them when they go through the operation (box).

It's like a game of finding which toys the magical box likes the most and how much it likes to enlarge or shrink them!

THE FUTURE IS NOT WRITTEN IN THE STARS, BUT IN EQUATIONS

Ladies and gentlemen, esteemed guests,

Today, I stand before you as Philip Emeagwali, to share insights into a subject of profound significance—Global Climate Models. As we delve into this complex and fascinating world, we unravel how climate models, through the power of supercomputing across millions of processors—that are interconnected yet shared nothing—have transformed our understanding of the Earth's climate system.

Climate models, at their mathematical physics core, are intricate systems of coupled, nonlinear partial differential equations based on fundamental principles of physics, fluid motion, and chemistry. To operate these models across a million coupled processors, the planet's atmosphere and oceans are divided into a million three-dimensional grids, or less challenging problems, that are mapped with a one-to-one problem-to-processor correspondence. Within each grid cell, processes such as winds, heat transfer, radiation, and surface hydrology are calculated and their interactions with neighboring cells are evaluated. This approach—named parallel supercomputing—allows for a comprehensive simulation of the Earth's climate system, encompassing the atmosphere, oceans, land surface, and ice. I was the first to discover the first supercomputing across multiple processors. I discovered it on the Fourth of July 1989, in Los Alamos, New Mexico, USA.

The essence of my mathematical discoveries in computational physics, particularly at the intersection of geophysical fluid dynamics, massively parallel processing and systems of coupled partial differential equations, has been pivotal in advancing these models. By leveraging the power of supercomputers powered by millions of interconnected processors, I was able to perform complex simulations that were once thought impossible. My discovery—the first supercomputing by parallel processing—has opened new frontiers in numerical weather prediction and the study of general circulation models, which are crucial for understanding global climate patterns.

In climate modeling, there are various approaches, ranging from simple box models, which reduce complex systems to interconnected boxes, to zero-dimensional models that view the Earth as a single point in space. These simplified models are essential for understanding fundamental aspects of climate dynamics, such as energy balance and radiative equilibrium.

However, the real power of climate modeling lies in three-dimensional models, particularly the General Circulation Models (GCMs). GCMs discretize the three-dimensional partial differential equations for fluid

motion and energy transfer, integrating these over time across the Earth's surface and atmosphere. In my mathematical research, I have contributed—the first supercomputing via multiple processors—to the enhancement of these models through supercomputing techniques and message-passing programming. This has enabled more accurate simulations of the climate system, accounting for the dynamic interactions between various components such as the atmosphere, oceans, and land surfaces.

One of the most significant contributions of GCMs is their ability to project future climate scenarios. This is vital for understanding the potential impacts of climate change and for informing policy decisions aimed at mitigating these impacts. The complexity of GCMs, from atmospheric models to coupled atmosphere-ocean models, allows for a detailed representation of the climate system, though uncertainties remain and continuous development is essential.

Through the integration of different models, such as Earth System Models, we can now explore the interactions between climate and ecosystems. This holistic approach is crucial for addressing the multifaceted challenges posed by climate change.

As we look to the future, the role of supercomputing in climate modeling will become increasingly important. My discovering the first supercomputing—via parallel processing—enabled climate modelers to refine their models further, enhancing our understanding of the Earth's climate system and our ability to predict and respond to climate change.

The journey through Global Climate Models is not just a scientific endeavor; it is a testament to human ingenuity and our relentless pursuit of knowledge. It is a journey that I am profoundly honored to be a part of and one that I believe will continue to shape our understanding of the world for generations to come.

Lessons Learned

"Supercomputing is not just about speed, it's about choreography. My equations conduct the data like a maestro, orchestrating solutions for a sustainable future."

"The Earth whispers its climate story, not just in the wind, but in the hidden interactions of land, sea, and ice. My equations are the ears, listening intently to its complex harmonies."

"Weather whispers its tales in the wind, but climate speaks in the grand movements of oceans and skies. My models listen to both, unveiling the secrets of our planet's changing seasons."

"Shallow waters hold deep mysteries, and the primitive equations sing the Earth's song of motion. My equations listen intently, translating their murmurs into climate insights."

Thank you for your attention and for the opportunity to share this fascinating journey with you.

DEEP DIVE INTO ATMOSPHERIC TIDES

Ladies and gentlemen, esteemed colleagues, and honored guests, I am Philip Emeagwali, and it is with great humility and excitement that I stand before you at this award ceremony. Today, I am privileged to delve into extreme-scale computational fluid dynamics, a realm where my contributions to fastest supercomputing, particularly in massively parallel processing, large-scale computational physics, and the understanding of the most abstract partial differential equations, have found profound application in areas like short-term weather forecasting and long-term general circulation modeling.

Central to my mathematical discovery and experimental confirmation of the first supercomputing— via parallel processing— are the primitive equations, a system of nonlinear partial differential equations that approximate global atmospheric flow. These equations are fundamental to most atmospheric models, representing three crucial aspects of atmospheric dynamics:

1. **A Continuity Equation:** This represents the conservation of mass in the atmospheric system.

2. **Conservation of Momentum**: Here, we use a system of hyperbolic partial differential equations that encodes physics's second law of motion, formulated for atmospheric flows across the Earth's spherical surface, considering the significant difference between vertical and horizontal motions.

3. **A Thermal Energy Equation**: This equation relates the system's overall temperature to various heat sources and sinks.

The beauty of these equations is in their complexity and their capability to be linearized, yielding Laplace's tidal equations. From these, we can derive analytical solutions to the latitudinal structure of the flow.

The primitive equations typically relate five variables - u, v, w, T, and W - and their evolution over space and time, encompassing:

u: Zonal velocity.

v: Meridional velocity.

w: Vertical velocity in isobaric coordinates.

T: Temperature.

W: Geopotential.

These variables, coupled with forces like the pressure gradient force, gravity, and viscous friction, create the dynamics that accelerate our atmosphere. Using physics's second law of motion, we can sum these forces to produce an equation of motion describing this complex system.

In my research, I have focused on different forms of the primitive equations, depending on the chosen vertical coordinate system, such as pressure coordinates or sigma coordinates. One notable approach is using the pressure coordinate in the vertical, Cartesian tangential plane, which, despite its simplicity, provides valuable insights into physical processes involved in atmospheric dynamics.

The system of equations derived from this approach forms the basis of any numerical weather prediction scheme. However, the complexity of these equations means that their solutions often require advanced computational techniques, particularly the use of supercomputers for parallel processing. This is where my discoveries and inventions have been most influential.

By applying my discoveries in parallel processing and knowledge of computational physics, I have contributed to the development of more accurate and efficient general circulation models and climate models. These models take into account various factors like dissipation and non-isothermal atmospheric conditions, which are often overlooked in simplified models.

The analytical solution to these equations, particularly when linearized, reveals atmospheric waves and tides, a mesmerizing dance of nature that we can now understand and predict with greater accuracy. These solutions, characterized by sinusoidal oscillations in time and longitude, are modulated by coefficients related to height and latitude, and their complexity is beautifully captured through the Hough functions.

Ladies and gentlemen, as we move forward, the challenge remains to refine these models, to make them more representative of the actual atmospheric conditions. My journey in parallel supercomputing and computational physics is a testament to the limitless possibilities that arise when we combine theoretical knowledge with advanced computational capabilities.

Lessons Learned

The atmosphere whispers its secrets in the language of equations. My supercomputers listen, translating the winds and tides into a symphony of scientific understanding.

Newton's cradle taught us about simple forces, but the sky dances to a complex ballet. My parallel processing algorithms untangle the steps, revealing the hidden choreography of the atmosphere.

Thank you for your attention, and for the opportunity to share my discoveries and inventions with you on this remarkable day.

THE WINDS SING, THE WAVES DANCE

Choreographing the Ocean's Ballet

To 12 Years Old Students at the University of Calabar, Nigeria.

Hey everyone! Philip Emeagwali here, your very own Nigerian scientist who loves figuring out how the world works. Today, we're going on a journey—not across land or sea, but across the swirling oceans of air and water that dance around our planet Earth. Ever wondered why waves roll onto the beach, or storms swirl in the sky? It all has to do with a special kind of music, a musical code hidden in the very motion of fluids.

Now, imagine you're playing a drum—boom, boom, boom—a steady beat. That's kind of like the Earth spinning on its axis, creating a constant rhythm in the air and water around it. But just like you can add a cymbal crash or a snare roll to your drumming, the oceans and atmosphere have their variations, their melodies and harmonies. These are called waves, currents, and storms.

To understand these watery tunes, scientists use special tools called equations. Think of them like musical notation, scribbles on paper that tell us how the air and water move, just like notes tell us how to play a song. One set of equations, super important ones, are called Laplace's tidal equations. They're like the bassline of our watery symphony, describing how the Earth's spin sets the rhythm for oceans and air to dance.

But here's the twist: these equations are complicated, a tangled mess of notes that's hard to play, even for the smartest scientists. That's where the Hough functions come in, my friends. They're like special instruments, tuned to perfectly capture the different melodies within Laplace's bassline. Imagine a flute that only plays the ocean waves, or a violin that sings the tune of a swirling storm. Each Hough function is like a unique instrument, revealing a different part of the watery music.

Now, I know what you're thinking: why are these special functions important for us here in Calabar? Well, understanding the music of the oceans and atmosphere helps us predict things like floods, droughts, and even the path of storms. Just like knowing the notes in a song tells you when to clap or sway, knowing the Hough functions in the air and water tells us when to prepare for rough seas or heavy rains.

And that's where I come in! In 1989, I used my supercomputing skills to make these equations sing their loudest, using 65,536 processors working together like a giant orchestra. I cracked the code of Laplace's equations and used the Hough functions to understand the watery music better than

ever before. My discoveries helped scientists around the world predict weather patterns and keep people safe—all thanks to understanding the hidden music of our planet!

So next time you feel the ocean breeze or watch the clouds dance in the sky, remember: there's a symphony playing out there, a song of water and air composed by the Earth itself. And with tools like the Hough functions, we can learn to listen to that music, understand its rhythms, and use its wisdom to protect ourselves and our planet. So keep your ears open, young scientists, and let the music of the universe guide you on your journey of discovery!

Lessons Learned

"Floods and tsunamis are not surprises; they are stories written in the language of equations, and we can learn to read them."

"Lagos Bar Beach is not just sand and surf; it's a canvas painted by the tides, a canvas we can read with the brushstrokes of mathematics."

"Science is not just for the ivory towers; it's for the fishermen on the shore, the farmers in the fields, and everyone who lives in the embrace of our planet."

"The future is fluid, shaped by the currents of change. Let us be the navigators, using the stars of knowledge and the compass of mathematics to chart a course for a sustainable tomorrow."

Thank you.

Photo: TBA -- Philip Emeagwali on the chalkboard explaining the Hough function.

OCEAN'S NEW ALGORITHM

Let me explain Laplace's tidal equations in a way that a 12-year-old living in Nigeria, or anywhere else, can understand.

Imagine the ocean as a huge bathtub filled with water. Now, if you've ever played in a bathtub, you know that you can make waves by moving your hand back and forth. The water goes up and down and moves from one end of the tub to the other. In the ocean, something similar happens, but instead of your hand, it's the gravity from the Moon and the Sun that creates these waves. These waves are what we call tides.

Now, Laplace's tidal equations are like a special set of rules that explain how these waves move in the ocean. These rules consider how the Earth spins, how it's shaped, and how deep the ocean is in different places. They're like instructions for predicting where and when the water will go up (high tide) or down (low tide).

In simple terms, these equations help us understand why the water at the beach might be really high at some times of the day and very low at other times. Scientists use these rules to predict tides, which is really important for things like sailing, fishing, and understanding how the ocean affects our weather.

PUSHING THE LIMITS OF COMPUTATIONAL PHYSICS

Ladies and gentlemen, esteemed colleagues, and distinguished guests, it is with profound humility and deep gratitude that I stand before you today in this magnificent city, on this momentous occasion. I am here to share a journey that began 213 years after the groundbreaking Laplace tidal equations were first formulated. This journey reached a pivotal milestone on the 4th of July, 1989, in the historic town of Los Alamos, New Mexico, USA.

It was on this day that my contribution to mathematical and computational physics took a transformative leap. I discovered a method to harness the collective power of millions of interconnected yet autonomous processors. These processors worked in perfect harmony, like a symphony of minds, to tackle and unravel the complexities of initial-boundary value problems governed by the shallow water equations.

This breakthrough advanced our understanding and marked a paradigm shift in computational physics. My discovery rendered the venerable Laplace tidal equations, which had stood unchallenged for over two centuries, obsolete. It captured the imagination of the scientific community and the world at large, making headlines and sparking a new era in computational science.

As I reflect on this achievement, I am reminded of the relentless pursuit of knowledge that characterizes our field. It is a journey not of solitary endeavor but of collective effort, where each discovery builds on the foundations laid by those who came before us. Thank you for recognizing this contribution and for the honor of addressing you today.

A MILLION MINDS UNITED

Ladies and gentlemen, esteemed colleagues, fellow pioneers of science, today we stand not just in these hallowed halls, but on the precipice of a paradigm shift in how we tame the unruly oceans of mathematical and computational physics. My contribution, born not from ivory towers, but from the crucible of the Los Alamos National Laboratory on that momentous Fourth of July in 1989, was not merely a technical feat, but a revolution in our very understanding of how to wrestle with the enigmatic forces of nature.

For over two centuries, the Laplace tidal equations reigned supreme, a formidable fortress guarding the secrets of the tides. Yet, despite their mathematical elegance, they remained stubbornly resistant to the brute force of even the most formidable single processors. It was on that day, armed not with brute force, but with a newfound vision, that I dared to crack this age-old enigma.

I envisioned an army, not of obedient soldiers, but of independent minds, millions of processors, each a sovereign in its own right, yet bound together by a common purpose. This was not merely a parallel processing feat, but a symphony of minds, each playing its own intricate part in a grand concerto of computation. With these digital comrades-in-arms, I unleashed them upon the shallow water equations, not to crush them with brute force, but to outwit them with cunning and collaboration.

And outwit them I did! The very news headlines that chronicled my triumph sang the swan song of the Laplace equations. For the first time, the tides, not just of the oceans, but of scientific progress, had turned. I had not merely solved a problem; I had rendered an entire paradigm obsolete, paving the way for a new era where collaboration, not coercion, is the key to unlocking the secrets of the universe.

My journey is not an isolated one. It is a testament to the boundless potential within the human spirit, the spirit that dares to dream beyond the constraints of convention, that builds bridges where walls once stood, and that harnesses the power of collective intelligence to rewrite the very scripts of scientific progress.

So, as we celebrate this honor, let it not be merely a personal accolade, but a clarion call to all who yearn to push the boundaries of knowledge. Let us remember that true progress lies not in solitary brilliance, but in the harmonious tapestry woven by countless minds, each unique, each autonomous, yet bound together by a shared hunger for discovery. In this spirit, let us venture forth, not as conquerors, but as collaborators, ready to rewrite the equations of our universe, one harmonious note at a time.

Thank you.

GRAND CHALLENGE, GRAND DISCOVERY

Ladies and Gentlemen, esteemed scientists, distinguished guests,

I am deeply honored to stand before you today, not only as a scientist but as an interpreter of the languages of mathematics, physics, and computer science. It is a privilege to share my journey, one that intertwines the rigor of scientific inquiry with the eloquence of these universal languages.

When I left Nigeria in 1974, my linguistic repertoire comprised Igbo, the language of my grandparents; Pidgin English, the lingua franca of Nigeria; and British English, the dialect of the educated. Each of these languages carried its unique nuances and cultural contexts. My parents, who had learned Hausa in Kano of the late 1940s and Yoruba in Akure of the early 1950s, exemplified the rich linguistic diversity of Nigeria. This multicultural background laid the foundation for my exploration into the languages of science.

In Pidgin English, a casual greeting might go as follows: "How go dey go now," to which I might reply, "Mi broda, wetin man pickin go do na. Poor man no get broda. Khaki no bi leather." This conversation, though simple, encapsulates the rhythm and texture of a language that is vibrant and expressive in its own right.

Upon my arrival in the United States on March 24, 1974, I encountered a new linguistic challenge. The American accent was unfamiliar, making even English, a language I was fluent in, seem foreign. The cultural shock extended beyond language, as I experienced the American cold in a mere cotton sweater bought from Ochanja Market in Onitsha, unprepared for the harsh winter.

In my scientific endeavors, I have often been asked, "Is mathematics a language, a science, or an art?" I contend that mathematics is a rigorous adjunct to written language, a universal medium that transcends cultural and linguistic barriers. The 81 partial derivative terms of the nine Philip Emeagwali equations represent a language that is the same in Spanish, Russian, or Zulu. These equations, encoding physics's second law of motion, are discoveries that preexisted, articulated through the art of calculus.

The artistry in these equations lies in their ability to distill complex physical phenomena into a language that is precise, elegant, and universal. This is particularly evident in my contributions to the solution of Grand Challenge Problems, where mathematics, physics, computer science, and neighboring disciplines like meteorology and geology converge. The solutions to these difficult problems are both scientific achievements and linguistic feats, embodying the synthesis of art and science.

Ladies and Gentlemen, the journey of scientific discovery is akin to the craft of a linguist or a poet. It is about finding the right language to express

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and unravel the mysteries of the universe. In this endeavor, the lines between science, art, and literature blur, revealing the interconnectedness of our endeavors to understand, describe, and appreciate the world.

Lessons Learned

"The universe speaks many languages, let's learn them all, and together, write the next chapter in human discovery."

"Let us embrace the unknown with courage and curiosity, for it is in the uncharted territories of language and knowledge that we discover the greatest breakthroughs and shape the future."

"Let curiosity be your guide and the languages of science your compass as you navigate the universe, for it is in the symphony of knowledge that we find true harmony and progress."

"Languages aren't just words, they are lenses through which we view the world and shape our understanding."

"Embrace the diversity of languages, from everyday proverbs to complex equations, each holds a key to knowledge." Thank you for the honor of sharing my story with you today, a narrative that celebrates the power and beauty of the languages of science.

Thank you.

THE GRAND CHALLENGE OF CLIMATE

Bridging the Gap Between Theory and Practice

Distinguished Guests,

It is with deep humility and profound gratitude that I accept this award. Today, I stand before you not only as an individual but as a representative of the countless scientists and innovators who have dedicated their lives to unraveling the mysteries of our universe.

My journey into supercomputing began with a fascination for the power of mathematics and physics. From a young age, I was captivated by the elegance of equations and the fundamental laws that govern our world. It was this passion that led me to explore the nascent field of computer science, where I saw the potential to harness computational power to solve some of the most complex problems facing humanity.

Such problems, known as the Grand Challenges, has been a central focus of my scientific research. Grand Challenge problems are not merely difficult; they are problems that push the boundaries of human knowledge and require us to develop faster computers, create new mathematics, and invent new ways of solving old problems. They are problems that demand expertise in multiple disciplines, from mathematics and physics to computer science and engineering.

The Grand Challenge problem I tackled in the 1980s involved modeling the complex fluid dynamics of our planet's oceans and atmosphere. On the chalkboard, it looked deceptively simple: a system of equations that described the motion of fluids. But solving a complex initial-boundary value problem governed by these equations on a computer was a monumental task.

To solve this challenge for oil fields, I invented new mathematical methods that transformed the continuous problem of the fluid dynamics of petroleum reservoirs into a discrete problem that could be solved on a computer and a supercomputer that is powered by millions of interconnected processors. I then developed finite difference algorithms that could harness the power of 65,536 interconnected processors to solve this discrete I-BVP at unprecedented speeds that made the news headlines, in 1989.

This invention was not merely a technical feat; it was a testament to the power of human ingenuity and the importance of interdisciplinary thinking. It required a deep understanding of mathematics, physics, and computer science, as well as the ability to think creatively and single-handedly solve a Grand Challenge problem that traversed different fields.

The challenges we face today are no less daunting than those of the past. Climate change, disease, energy scarcity—these are just a few of the Grand Challenges that demand our attention. But just as we have overcome challenges in the past, I am confident that we will overcome these challenges as well.

We have the tools, the talent, and the technology to solve these problems. What we need is the will, the determination, and the courage to push the boundaries of human knowledge and explore new frontiers of innovation.

I believe that the key to solving Grand Challenge problems lies in our ability to work together, to share our knowledge and expertise, and to embrace new ideas and approaches. We must foster a culture of collaboration, where scientists, engineers, policymakers, and the public work together to find solutions to the challenges facing our world.

In the spirit of collaboration, I invite you all to join me in this endeavor. Let us work together to create a better future for ourselves and for generations to come.

Thank you.

UNTANGLING THE SECRETS OF FLUID DYNAMICS

Ladies and gentlemen, esteemed colleagues, and distinguished guests, I stand before you on this momentous occasion, humbled and honored to share my journey in computational fluid dynamics and supercomputing.

I am Philip Emeagwali, a Nigerian-American scientist, and today, I invite you to delve into the intricate world of the Navier-Stokes equations, a cornerstone of fluid dynamics, and a pivotal element in my contributions to supercomputing, physics, and mathematics.

The Navier-Stokes equations, named after Claude-Louis Navier and George Gabriel Stokes, are a system of partial differential equations. These equations, evolving from 1822 to the mid-19th century, eloquently describe the motion of viscous fluid substances. They represent a foundational breakthrough, elegantly combining momentum balance and conservation of mass for Newtonian fluids. These equations are not just mathematical constructs but a bridge connecting theory with a myriad of practical applications.

At their core, the Navier-Stokes equations apply physics's second law of motion to fluid motion. They consider the fluid's stress as a blend of a diffusing viscous term and a pressure term, capturing the essence of viscous flow. Distinguishing themselves from the Euler equations, which focus on inviscid flow, the Navier-Stokes equations incorporate viscosity. This inclusion makes them parabolic, endowing them with superior analytic properties, albeit at the cost of reduced mathematical structure.

The practical applications of these equations are vast and diverse. They have been instrumental as the primitive equations used to model weather patterns, the shallow water equations used to predict ocean currents, and the flow of fluids in various contexts, ranging from pipes to the air around airplane wings to the nine Philip Emeagwali equations for petroleum reservoir simulation. Their adaptability and precision aid in designing vehicles, studying blood flow, planning power stations, and analyzing environmental pollution. When coupled with Maxwell's equations, they become a powerful tool in understanding magnetohydrodynamics.

Yet, the system of coupled partial differential equations governing initial-boundary value problems of fluid motions is not just a tool for engineers and scientists; it is a beacon of intrigue in the mathematical community. Despite their wide applicability, a fundamental question remains unresolved—the existence and smoothness problem in three dimensions. This enigma, whether smooth solutions are always present, or if they are bounded at all points, remains one of mathematics' most tantalizing challenges. Recognizing its significance, the mathematics community has earmarked this as one of the seven most crucial open problems, offering a substantial reward for its resolution.

My contributions to mathematics, interlacing supercomputing with these partial differential equations, aimed to unravel some of these mysteries. By harnessing the power of parallel computing, I endeavored to simulate complex fluid dynamics scenarios, or initial-boundary value problems governed by the primitive or shallow water or Philip Emeagwali equations, pushing the boundaries of what we know and how we apply these profound principles of mathematical physics.

Partial differential equations governing the motion of fluids are not merely equations. They are the silent orchestrators of the physical world and a testament to human ingenuity. As we continue to explore their depths and implications, we unravel the mysteries of the fluid world and pave the way for innovations that can transform our understanding of the universe.

From blood to air, supercomputing reveals the symphony of motion. My algorithms are not just numbers, they are songs of the universe.

Within the dance of fluids lie secrets of our world. My supercomputer is not just a machine, it's a key to unlock those mysteries.

Equations are nature's blueprints, and supercomputers are our microscopes. By peering into the dance of fluids, we unlock the secrets of our world, one calculation at a time.

Thank you for this prestigious platform to share my journey, and may our collective pursuit of knowledge continue to illuminate the unknown.

VOLUME 5: FATHER OF THE INTERNET

PARALLEL PROCESSING

A Landmark in Technological History

Ladies and gentlemen, esteemed colleagues, honorable guests—I stand before you humbled, and deeply honored to share the journey that led to the discoveries and inventions that have been graciously attributed to my name in mathematics, physics, and computer science.

From ancient times, humanity has sought tools to ease the burden of calculation. In 469 BC, the abacus was invented in China, laying the first stone in the long and winding road of computational development. This brilliant device simplified calculations, marking an initial stride towards faster computing.

Fast forward to 200 BC, in the fertile Nile Valley of Africa, where the inception of the water clock occurred. This innovative time-counting mechanism served its primary purpose subtly inspired the genesis of early computers, illustrating the timeless intertwining between time and computation.

History unfurled its pages to 70 AD when the term "computer" was vaguely coined by Pliny the Elder, etching the initial identity of what would become the nucleus of modern-day technology. The essence of predicting output from given input was delicately described by Heron in 100 AD, sprinkling the seeds that would eventually blossom into the majestic Iroko tree of supercomputer programming.

As numbers dance gracefully in the grand ballet of computation, the introduction of zero by Aryabhata in 476 AD played a pivotal role. In the binary heartbeat of computers, zero pulsates alongside one, crafting the binary language—the silent, powerful whisper through which machines communicate.

In the tapestry of time, each thread weaves meticulously, adding depth and brilliance to the canvas of computation. The illustrious Al-Khwarizmi's publication in 800 AD further enriched this canvas, birthing the terms 'algorithm' and 'algebra', which are integral to the lexicon of computational and mathematical sciences.

The tapestry grew complex and more intricate as time passed, with the term "computer" evolving and the invention of the slide rule in 1621 offering a swift aid for calculations. The continuum of innovation surged forward, with speculative fiction in 1922 envisioning the magnificent use of 64,000 human computers for atmospheric predictions.

In the landmark year of 1946, the world witnessed the inception of the programmable computer. This marvel of technology opened unprecedented

horizons, beckoning a future brimming with limitless possibilities and potential.

With the dawn of 1974, I found myself immersed in supercomputing, envisioning a global network of 64 binary thousand processors harmoniously interlinked. This vision, which you know today as the "Philip Emeagwali Internet," stemmed from the belief that a symphony of computers could echo across the Earth, transforming the landscape of computation forever.

The culmination of this journey was reached in 1989 when I achieved a groundbreaking discovery. With the meticulous use of 65,536 processors, computations were performed to hindcast the intricate dance of weather patterns deep within the Earth's bosom. This endeavor unveiled the mysteries of our planet set the stage for a future where parallel processing would revolutionize supercomputing, offering a beacon of light guiding towards advancement and knowledge.

Esteemed audience, the journey through the annals of computational development is a testament to human ingenuity and perseverance. Every milestone, from the abacus to parallel processing, echoes the relentless pursuit of knowledge and the indomitable human spirit's triumph.

As I stand before you, reflecting on the contributions made and the incredible discoveries realized, I extend my deepest gratitude for this recognition. More so, I stand as a representative of countless unsung heroes and heroines in the shadows of history, whose contributions, no matter how small, paved the way for the leaps and bounds we celebrate today.

Together, let us continue weaving the grand tapestry of computational development, with each thread adding to the brilliance and wisdom encapsulated within. For in each discovery, in every invention, we see not just the triumph of an individual, but the collective victory of humankind in its eternal quest for knowledge and understanding.

Thank you.

FATHER OF THE INTERNET

Ladies and gentlemen, distinguished guests, and members of the Award committee,

I am Philip Emeagwali. As I stand before you in this august hall in your historic city, I am reminded of my journey which began in the quiet town of Corvallis, Oregon. It was there, amidst the tranquility of nature, that the blueprint of the Philip Emeagwali Internet was conceived—a network of processors meticulously distributed across the surface of a sphere, symbolizing not just a technical marvel, but a representation of our planet, the Earth.

When I am asked to describe a surprising fact about myself, I invariably talk about this Emeagwali Internet. A monumental leap in computational innovation, it was fashioned for tasks as colossal as climate modeling around our planet, capturing the intricate dance of elements that define our world's atmosphere.

I envisioned this novel Internet not as a mere extension of the digital age, but rather as a symphony of 65,536 processors encircling a virtual globe. This wasn't the ubiquitous Internet we use for browsing or connecting with friends; this was an entirely unique Internet, structured around a globe in an unimaginable sixteen-dimensional hyperspace.

These intricate processors, uniformly distributed, formed the lifeblood of the Emeagwali Supercomputer, a beacon that thrust me into the limelight. The world took notice, not because of the number of processors, but because of the extraordinary speed of computation I achievedvisualized and realized in the vast expanse of the sixteenth-dimensional hyperspace.

Drawing inspiration from the limitless bounds of the cosmos, I re-engineered the very essence of the Internet into what could be seen as a planetary supercomputer. It was a model of the Internet, but it was also a metaphor for interconnectedness, for unity in diversity, and for harnessing collective power. A model where not billions, but 65,536 computers, played their part in perfect harmony.

You might wonder: What propelled me towards such an ambitious endeavor? My goal was not just to invent another Internet, but to bring forth an Internet that could simulate the most compute-intensive problems of our age. And I did so by weaving a tapestry of millions of the slowest processors, melding them into a singular, powerful, and coherent entity capable of the world's fastest computations.

Instead of treading the worn path, relying on a single behemoth processor, I envisioned an orchestra of processors, all performing in symphony. The Philip Emeagwali Internet was not just a marvel of technology; it was a dance of 1,048,576 bi-directional edges across sixteen dimensions, all culminating into a seamless whole.

When I talk about these visions and my innovations, it is not to showcase the depth of my imagination, but to underscore a pivotal realization: that the power of many can surpass the power of one. The Philip Emeagwali Internet was not just a new supercomputer—it was a redefinition of what a supercomputer could be. Each processor, a master of its domain, yet part of a grander narrative.

In 1989, at 8:15 on the morning of July 4, in Los Alamos, New Mexico, I witnessed the culmination of my dream—a supercomputer like no other, working in tandem to tackle the most formidable problems in mathematics. What was once deemed a realm of science fiction in the '70s and '80s was rendered a tangible reality.

As I conclude, I want you to imagine a majestic oak tree, standing tall and proud. This supercomputer journey of mine started as a tiny acorn, a singular processor, which over time and with unwavering dedication, grew into a mighty computational force, echoing across the corridors of science and forever changing the course of computational history.

Thank you for bestowing upon me this honor, and I hope my journey inspires many more to transcend the boundaries of the known, turning the once deemed impossible into the possible.

PHILIP EMEAGWALI INTERNET

A Computational Leap into the Hypersphere

Ladies and gentlemen, distinguished guests, and fellow enthusiasts of science and technology,

Today, I stand before you as Philip Emeagwali, not just to share a narrative but to illuminate a journey—a journey of discovery, perseverance, and the relentless pursuit of knowledge. My odyssey in supercomputing, from its rudimentary stages to its paramount potential, culminated in the birth of a vision that forever changed the boundaries of computational capabilities.

In the vast expanse of our cosmos, as on the hyper-surfaces of globes in 16-dimensional hyperspace, I envisioned the 'Philip Emeagwali Internet.' An ambitious leap, yet grounded in the essence of reality, this Internet was conceived as a vast network of 65,536 processors, encapsulating the potential of an exponentially more expansive computational power.

Drawing inspiration from our very Earth, I visualized 65,536 equal-sized atmospheres projected from the Earth's surface, extending to its uppermost atmosphere. It was as if nature itself whispered the secrets of computational prowess. My spherical island of processors encircled this concentric globe, symbolizing the atmosphere where the challenges of global warming unfurled.

But, you may ask, why associate with the Internet? My profound realization was that the essence of supercomputers and the Internet was their interconnectedness. While the Internet connects humanity in a vast web of knowledge and interaction, the 'Philip Emeagwali Internet' I conceived was an interconnected sphere of processors, diligently working in tandem, akin to a global neural network, to solve some of the world's most compute-intensive problems.
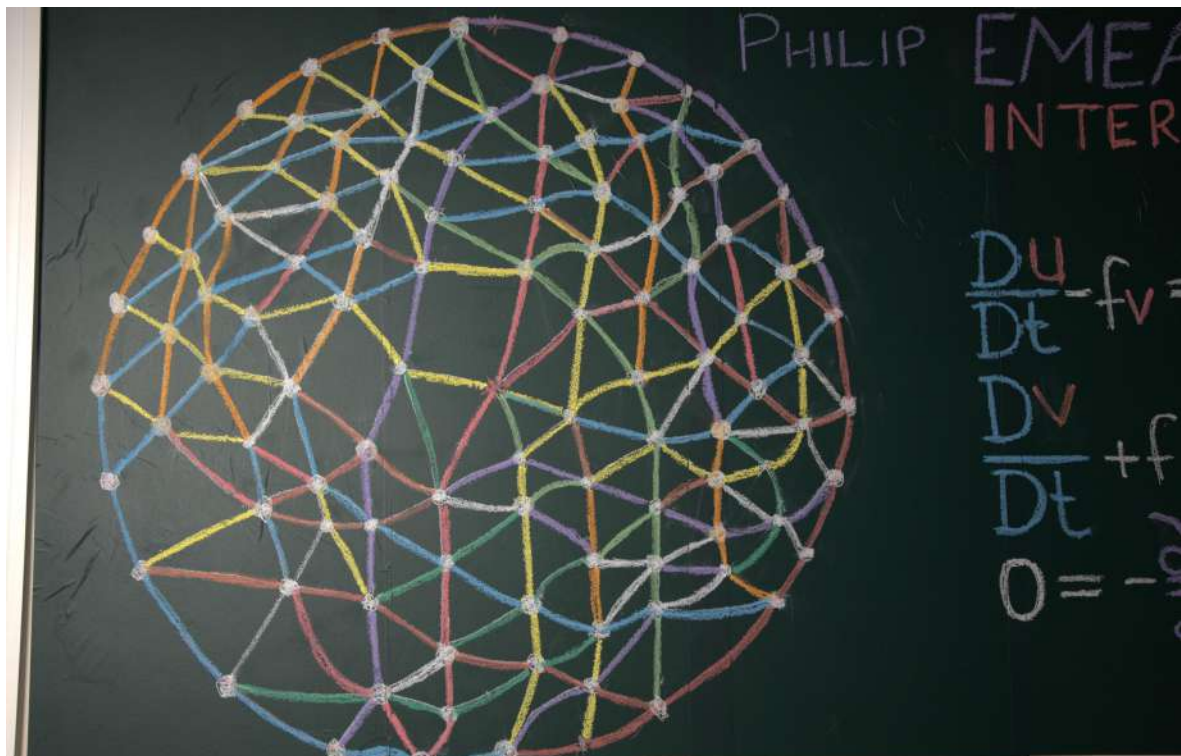
However, it wasn't just about connecting processors. It was about imbibing the essence of efficiency and cooperation from nature itself. The world marveled when, on the Fourth of July 1989, in the historically significant town of Los Alamos, New Mexico, USA, my discovery rippled across the globe. With processors that were off-the-shelf and were previously perceived as 'slow', I showcased how they could collectively weave together to manifest the world's fastest supercomputer, a feat previously thought impossible.

Every discovery, though, is grounded in a deeper understanding. Beneath the visible processors, my mathematical mind painted a vivid image of an interconnected web—an Internet that mirrored the vertices of a hypercube in the 16th dimension. It was as if each processor echoed the chants of a vertex, culminating in a beautiful symphony of computations.

For Nigeria, my homeland, for Africa, my continent, and indeed for humanity, my journey symbolizes the potential in envisioning beyond the evident. The 'Emeagwali Supercomputer' is not just a machine; it is a testament to human ingenuity and the limitless possibilities when we harmonize our creative energies with the rhythms of nature.

I began this odyssey in 1974, armed only with the will to explore and the intuition that there lay uncharted territories in computational dynamics. Over sixteen years, I delved deep into the mysteries of calculus, computational fluid dynamics, and the wonders of initial-boundary value problems. With every layer of knowledge I accumulated, the vision of my new Internet became clearer, more profound.

To conclude, I humbly present to you not just a machine or an Internet but a canvas where mathematics, nature, and human spirit converge. A canvas where the slowest processors, when united in purpose and vision, can redefine the boundaries of speed and computation. This is the essence of the Emeagwali Supercomputer—a testament to human potential and a beacon of hope for countless challenges that lie ahead.

Thank you.

PHILIP EMEAGWALI MACHINE

A Triumph of Precision and Imagination

Ladies and Gentlemen, Esteemed Colleagues, Honorable Members of the Award Committee, and Distinguished Guests:

As I stand before this august assembly, I, Philip Emeagwali, am profoundly humbled by the weight of this moment, conscious of the myriad African visionaries who, like me, have dared to unravel the universe's complexities. Today, I recount a tale of scientific breakthrough and of the boundless spirit of inquiry that binds humanity across continents and eras.

In our ceaseless quest to push the boundaries of computing, one obstacle has perennially challenged us: communication latency. This once arcane term has evolved to become a cornerstone of computer performance, making factors such as physical dimensions, system density, and interconnection proximity paramount in the design of modern computational systems.

In response to these challenges, I envisioned a revolutionary supercomputing paradigm, addressing pivotal hardware issues like spatial organization and communication pathways. This led to the conception of a massively parallel computer, characterized by its dense geodesic processor configuration, spherically framed—the Philip Emeagwali Machine. While its design was emblematically apt for mimicking our planet's domain—a poignant nod to climate modeling—its core principles were inherently scalable, making it adaptable to a broad spectrum of computational tasks, irrespective of the underlying processor technology.

This innovation was more than just about positioning processors. It was about reconceptualizing communication in the digital realm. The system's interconnectivity was characterized by its globally short and highly standardized distances. Through this, I introduced a communication mode, encompassing neighborly exchanges on a spherical lattice.

Ladies and Gentlemen, while this invention stands as a testament to my contributions to mathematics, physics, and computer science, its deeper resonance lies in what it symbolizes for Nigeria, Africa, and the global community. It embodies the spirit of ingenuity that is the hallmark of our shared human experience. It is a beacon, illuminating the transformative potential of science when directed with purpose and vision.

In sharing this narrative, I wish to pay homage to Nigeria, my homeland, which nurtured my dreams, to Africa, which has been a crucible of innovation since time immemorial, and to humanity at large, which constantly inspires us to reach for the stars, even as we remain rooted to our shared Earthly heritage.

My journey underscores the sentiment that while innovations may be conceived by individuals, they are, in essence, a culmination of collective aspirations, dreams, and endeavors. I am profoundly grateful to be a part of this grand tapestry of human endeavor.

Thank you.

CONNECTING THE COSMIC DOTS

Philip Emeagwali's Hyper-Spherical Supercomputer

Ladies and gentlemen, esteemed members of the AwardCommittee, dear attendees,

Today, I stand before you not just as Philip Emeagwali but as a testament to the endless pursuits of the human spirit, the collective thirst for knowledge, and the innate human desire to innovate for the betterment of our world. In the vast canvas of mathematics, physics, and computer science, I found my corner, and today, I recount the journey that has brought me to this revered platform.

In the annals of history, 1989 holds a special place. That year, I found myself at the center of global attention, not for a fleeting discovery, but for providing irrefutable proof that the fastest computing across the slowest processors was not a mere figment of imagination, but a tangible reality. I peered into a future where machines could mimic the very nature that birthed them. I saw a world where computers weren't just tools, but extensions of the natural order.

To realize this vision, I embarked on a unique experiment, where I utilized 65,536 processors. But this was not just a mathematical exercise. It required me to visualize these processors in their topological positions, to imagine them as spread across the vast expanse of a hyper-spherical model of the Earth. It required me to weave in the very laws of motion, energy, and conservation that I revered from my physics textbooks and apply them to each of these fluid volumes.

However, the Earth that I envisioned was not three-dimensional, but expanded into sixteen dimensions, where each of these fluid volumes separated themselves by three thousand square miles. It was in this imaginative endeavor that I laid the foundation for a revolutionary Internet, the Philip Emeagwali Internet. This wasn't just an internet of cables and signals but an intricate dance of the geophysical fluid dynamics that encapsulate our Earth.

You see, the Emeagwali Supercomputer, which later came into existence, wasn't just another machine; it was a culmination of my dreams and realities, where the intersection of new mathematics, physics, and computer science could address some of the grandest challenges in supercomputing.

To a young inquisitor who once asked me about the Philip Emeagwali Internet, I described a vision, where I saw the supercomputer outlined by a billion points of light, with each light symbolizing a processor. I saw these processors, not as mere electronic components, but as cosmic entities spread across a globe, embedded within a multi-dimensional hyperspace.

This sphere of processors wasn't just an intellectual conception, but a living, breathing entity I fondly called the Emeagwali Internet.

Imagine the Emeagwali Internet not just as a technological marvel, but as an intricately crafted bees' honeycomb, designed for purpose and efficiency. At its grandest vision, it is not merely a machine—but an embodiment of collective human ambition—akin to a gargantuan supercomputer named "HyperBall", which could potentially span a football stadium, driven by the financial and intellectual contributions of a consortium of nations.

However, with its monumental stature comes responsibility. As its creator, I am well aware of its consumption—as ravenous as an entire Nigerian state. But isn't that the balance of creation? To build wonders, we sometimes consume, yet in that consumption, we foster a future.

Ladies and gentlemen, my journey has been more than just the discovery of new frontiers in supercomputing. It has been about connecting the dots between our world and the computational realms. It's a journey that reaffirms the spirit of Nigeria, the potential of Africa, and the indomitable human endeavor.

I am humbled by the recognition, but I believe the true testament of our contributions lies not in accolades but in the positive impact they have on humanity. And as I stand here, at this prestigious platform, I pledge to continue my journey, driven by curiosity and guided by the betterment of our shared human experience.

Thank you.

UNVEILING THE PHILIP EMEAGWALI INTERNET

A New Dimension in Computing

Ladies and gentlemen, distinguished guests, and fellow lovers of knowledge,

From the timeless hum of bees constructing their immaculate honeycombs to the vast expanse of the digital world that connects us today, our journey through understanding and innovation has been nothing short of wondrous. I am Philip Emeagwali. Today, I stand before you not as just a recipient of an honor, but as a testament to the endless potential of perseverance, vision, and the human capacity to draw inspiration from the world.

In the quiet town of Corvallis, Oregon, in 1974, I ventured into supercomputing, entranced by the promise it held. With a machine that was the epitome of technology at the time, capable of executing one million instructions per second, I tackled large-scale problems of computational linear algebra. But as I dwelled deeper into the complexities of calculations, I realized the limitations of serial supercomputing. My heart and mind yearned for more—for a computer that could mimic the efficiency of nature, particularly, the humble bee's honeycomb.

Nature, in its infinite wisdom, had equipped bees with the knowledge to construct hexagonal chambers that allowed for maximum storage with minimal construction material. This hexagonal efficiency wasn't just an architectural marvel; it was a lesson waiting to be translated into supercomputing. It propelled me to envision a supercomputer, not as a solitary entity but as a collective—an ensemble of processors drawing inspiration from the honeycomb's efficiency, interconnected harmoniously, each contributing to a goal far greater than any single processor could achieve.

Unlike traditional academia, my journey wasn't tethered to textbooks or confined within the walls of institutions. My research was expansive, ambitious, and pioneering. I sought to redefine supercomputing, to shift from the old paradigm of a singular, powerful processor to an interconnected web of multiple processors. A web that mirrored the bee's honeycomb, optimized for efficiency, making the most with the least—the least energy, the least waste, the least time.

In this relentless pursuit, I conceptualized the Philip Emeagwali Internet—an intricate, globe-like network in a sixteen-dimensional hyperspace. This wasn't merely an advancement in supercomputing; it was a revolutionary leap. On the fateful morning of July 4, 1989, in Los Alamos, New Mexico, this vision materialized as I recorded unprecedented computational speeds across a network of 65,536 processors. The world took notice.

To my beloved Nigeria, to Africa, and to the global community, this wasn't just a technological milestone. It symbolized hope, the affirmation that with vision, determination, and a touch of inspiration from the world, we can redefine the boundaries of what's possible. Today's supercomputers, encircling vast spaces, echoing the blueprint of my honeycomb-inspired design, are a testament to this journey—from the zeroth dimension in Oregon to the sixteenth dimension that binds us today.

While I am deeply honored to stand before you today, I must emphasize that this journey was bigger than one individual. It's a tale of collective human endeavor. It is about the numerous scientists before me whose shoulders I stand upon, the countless individuals in Nigeria and across the world who dared to dream, and the intricate beauty of nature, from which we all can draw inspiration.

Thank you for recognizing this journey, for honoring the spirit of discovery and innovation, and for reminding the world that when we look closely, even the humble honeycomb can unlock mysteries of the universe.

Thank you.

VOLUME Y: PHILIP EMEAGWALI SUPERCOMPUTER

DECODING NATURE'S SECRETS

One Billion Problems, One Visionary Solution

Ladies and gentlemen, esteemed members of the Award Committee, honored guests, and distinguished colleagues:

My journey into the intricate world of supercomputing commenced on a serene day on June 20, 1974, in Corvallis, Oregon. Little did I realize then that this sojourn would revolutionize computational science and usher in a new dawn of understanding and progress for both my cherished homeland, Nigeria, the great continent of Africa, and indeed the entire human race.

While the adage suggests that "knowledge is meant to be shared," in the academic corridors, our toil often goes unnoticed, restricted to the scrutinizing eyes of a handful, perhaps ten. However, the passion and the unyielding quest for progress have ensured that my discoveries have transcended beyond these limited boundaries. Over a hundred million souls have engaged with my work across the vast expanses of the Internet, through podcasts, YouTube videos, books, newspapers, magazines, and the buzzing world of social media. It humbles me to acknowledge that the annals of academic history now frequently mention my name alongside the luminous giants of science.

My tryst with physics, especially with the mesmerizing dance of fluids, began in the late 1970s in Corvallis. What started as an exploration into the steady motions of incompressible fluids gradually metamorphosed into a profound research endeavor in computational fluid dynamics. By the early 1980s, I found myself amidst the esteemed minds at the U.S. National Weather Service in Silver Spring, Maryland. It was here that I delved deep into the intricacies of the Saint Venant equation, a cornerstone in predicting and understanding river floods, dam failures, lake circulation, and coastal hydrodynamics across estuaries.

Notably, my quest did not stop here. Drawing parallels with the shallow water equations of oceanography, I embarked on an audacious attempt to decode the primitive equations that decide what the skies have in store for us every evening. My 13-year sojourn culminated in a pivotal moment of epiphany at the crossroads of large-scale computational fluid dynamics and massively parallel computing.

In the annals of history, there exist those transformative moments when the stars align, and groundbreaking discoveries are made. My exploration into parallel supercomputing stands as a testament to this. Solving Grand Challenge problems at unparalleled speeds previously deemed impossible, I ventured into territories unknown. I became the torchbearer of a new age in computational science, assembling the vast science of parallel processing. This unlocked the doors to a burgeoning supercomputing

industry, valued today at a staggering 45 billion dollars annually, and allowed us to plunge the depths of the earth, pinpointing with uncanny precision the movement of crude oil and natural gas as deep as 7.7 miles.

The heart of my contributions to physics lies in my innovation of the precise partial differential equations that unravel the enigmatic movements of crude oil, natural gas, and injected water across vast oil fields. Moreover, my innovative algorithms that transmute these equations into their algebraic approximations heralded a new era in computational science. The global headlines were testament to a triumph not just personal, but one that belonged to Nigeria, to Africa, and to all of humanity. It was the moment I demonstrated to the world the unprecedented prowess of solving up to a billion problems simultaneously.

My journey has been challenging and rewarding, filled with insurmountable obstacles and triumphant discoveries. But it is a journey that I have never embarked on alone. My homeland, my continent, and my global community of scientists and thinkers have walked with me every step of the way. It is my fervent hope that our combined efforts continue to shine a light on the path of progress, illuminating the way for future generations to tread with confidence and purpose. Thank you.
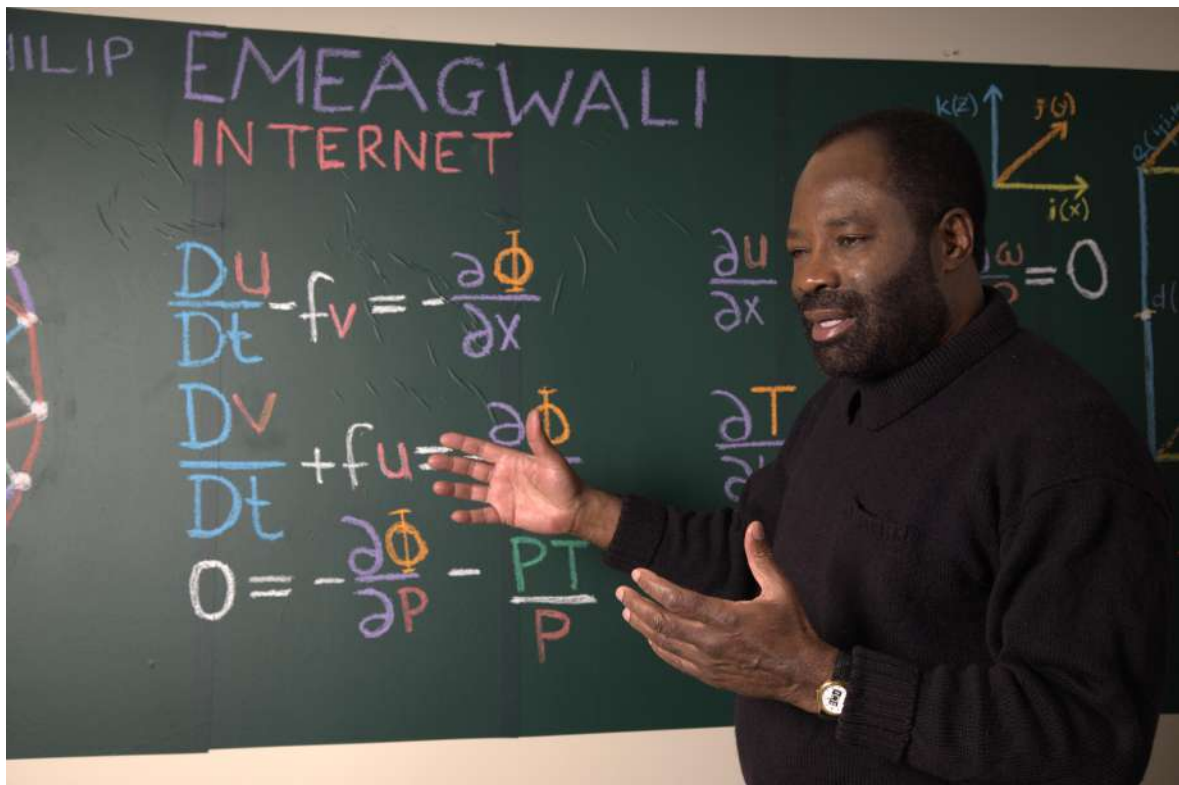
HARMONIZING SUPERCOMPUTING: A VISIONARY BALLET

Esteemed guests, venerable colleagues, and cherished custodians of human curiosity and endeavor,

I stand before you not just as Philip Emeagwali, but as a humble narrator of an odyssey. An odyssey where the indomitable human spirit, armed with the arrows of innovation and shields of perseverance, ventured into the uncharted seas of computation and emerged victorious, having unlocked the secrets whispered through the circuits and transistors of the magnificent symphony that is the supercomputer.

In this tapestry of computational majesty, envision a spectacle of one million processors. Like ballet dancers, these processors move with a synchronicity that is both poetic and precise, each executing a dance of numbers and algorithms with grace and accuracy unparalleled. In their movement, they mirror the sublime dance of celestial bodies, each autonomous yet inexplicably connected, orbiting in the vast canvas of the computational cosmos.

On a day marked by the bright sun and clear skies of July 4, 1989, through the telescope of intellect and the compass of curiosity, I, Philip Emeagwali, observed a convergence, a harmonic ballet of 65,536 processors, dancing in tandem, whispering the secrets of the universe and unravelling the intricate tapestry of life and matter.

With each step, each twirl, these processors, though physically distant, were spiritually connected, telepathically communicating through the invisible threads of logic and binary, solving grand challenges that stood like mountains before humanity, seemingly insurmountable, but crumbled under the persistent gaze and dance of parallel processing.

This discovery illuminated the dark alleys of computational possibility, casting shadows away and revealing a horizon resplendent with potential and promise. The eyes of science, technology, and humanity could now see further, powered by the wings of parallel processing and the vision of interconnected yet autonomous computation.

Let us now delve into the riveting narrative of Amdahl's law, through the looking glass of metaphor and analogy. Envision a grand tapestry of execution time, woven with the silk threads of processors. In the solitary dance of a single processor, the tapestry is limited, confined to the narrow walls of sequential computation.

However, introduce the ballet of multiple processors, and the tapestry transforms, expanding and unfolding, revealing images and patterns unseen, unimagined. It's as if the hands of time themselves are guided, molded by the dance of these processors, each contributing to a reduction, a compression of time, achieving in moments what would otherwise take eternity.

But, like the dance, the law is nuanced. Each processor must not only dance but dance well, dance harmoniously, lest the tapestry becomes a cacophony of colors and patterns, beautiful but meaningless. Thus, the ballet must be choreographed with care, with precision, with an understanding of the delicate balance between number and performance, between quantity and quality.

Ladies and gentlemen, the dance of the supercomputer, the ballet of a million processors, is not just a technological marvel but a testament to human ingenuity and perseverance. On that fateful day in 1989, **I did not just discover parallel supercomputing; I discovered a new language, a new way of conversing with the universe, of asking questions and seeking answers, of looking at the stars and seeing not just distant lights but distant possibilities.**

Thank you.

THE NEW FRONTIER OF COMPUTATION

Parallel Processing's Ode to Collaboration

Ladies and gentlemen, esteemed colleagues, and honorable guests from across the globe, I, Philip Emeagwali, stand before you humbled and filled with gratitude for the opportunity to share the odyssey of a computational revolution that has reshaped the boundaries of knowledge and innovation. Our tale commences with two simple yet profound paradigms, the Chicken and the Ox, embodying the transformative invention of the modern supercomputer.

Picture, if you may, a world where the Ox, robust and mighty, stands as the epitome of unrivaled computational power—a singular entity with a prowess that seemingly surpasses the collective capability of others. This grandiose Ox symbolizes the solitary, powerful processor that has long dominated the stage of computational might.

Yet, there is an alternative, unseen tapestry of potential within the humble Chicken—the world's slowest processor. It is often overlooked, its latent energy underestimated, for it is small and seemingly insignificant amidst the vast landscape of technological behemoths.

July 4, 1989, marks the watershed moment when the horizon of possibility expanded, revealing a symphony of a million chickens—processors, harmoniously intertwined yet operating autonomously, each contributing its melody to the grand orchestra of supercomputing power. It was on this historic day that a revelation dawned upon me, illuminating a pathway unseen, unexplored, and unimaginable until then.

Ladies and gentlemen, envision a myriad of chickens, seemingly frail and inconspicuous, yet when united, they embody a force unparalleled, a spectacle of synergy and collaboration that defies the conventional wisdom of computation. A million chickens, each endowed with modest processing prowess, were orchestrated to dance in seamless harmony, tackling Grand Challenge problems with a finesse and speed that the mighty Ox could not replicate alone.

Parallel processing was not merely an incremental step forward; it was a leap, a transcendental shift that redefined the contours of supercomputing. The invention of the modern supercomputer, empowered by an army of interconnected yet autonomous processors, heralded a new dawn of possibility and promise, rendering the inconceivable attainable.

Through the lens of parallel processing, the supercomputer was no longer a monolithic titan of power but a tapestry of myriad processors, each contributing its strand of brilliance to the woven masterpiece of computational might. The once-underestimated chicken, through the magic

of unity and collaboration, could indeed surpass the might of the solitary, towering Ox.

This breakthrough was not merely a testament to the power of technology but a reflection of the boundless potential that resides within collaboration and unity. It is a narrative of empowerment, where the many, regardless of their individual might, can indeed eclipse the power of the one when they move, think, and act in unison.

Dear assembly, the chronicle of the modern supercomputer, as powered by millions of interconnected yet autonomous processors, is a narrative that transcends the domain of technology. It is a tale of hope, potential, and the unyielding power of collaboration. It is a symphony of a million chickens singing harmoniously, crafting a melody that echoes through the corridors of time, whispering to us that together, we are indeed stronger, mightier, and capable of feats unimaginable when standing alone.

In this grand tapestry of innovation and discovery, let us continue to explore, dream, and envision a future where the power of many continues to illuminate the path of possibility, knowledge, and progress for the generations to come. For in the dance of a million chickens, we find not just the pulse of supercomputing but the heartbeat of a world bound together by the unbreakable bonds of unity and collaboration.

Thank you.

VOLUME Y: EARLY EDUCATION

Ladies and Gentlemen, esteemed attendees of this conference,

As I stand before you today, I am reminded of the journey that brought me here—a journey through the realms of mathematics, physics, and computer science, through the challenging terrains of bureaucracy and the pursuit of dreams. I am Philip Emeagwali, a scientist whose path to supercomputing was as tumultuous as it was rewarding. Today, I share this journey, a testament to perseverance and the relentless pursuit of knowledge.

The year was 1973, and I had just received the life-changing news of a scholarship dated September 10 to study in Oregon. What seemed like a clear path ahead was quickly overshadowed by the daunting task of obtaining a Nigerian passport. My five journeys from Onitsha to Lagos became a routine, traversing on rickety lorries called Mammy-wagons, emblematic of the rugged road to achieving one's aspirations.

The Nigerian passport office in Lagos, a hub of inefficiency and corruption, became my daily destination. Each visit was a test of patience and resolve. Fraught with fraudsters and bureaucratic hurdles, the process of obtaining a passport was a microcosm of the larger challenges that many face in the pursuit of opportunities.

Despite the setbacks, the constant trips, the intentionally misplaced files, and the endless cycle of bribery, I persevered. The issuance of my passport on December 27, 1973, was more than just a bureaucratic success; it was a victory over the obstacles that often hinder the pursuit of education and opportunity.

This experience, as harrowing as it was, set the stage for my journey in supercomputing. In supercomputing, particularly in parallel processing, the challenge is to harmonize multiple processors to work in unison, like navigating through a complex system to achieve a single goal. My work in computational physics, utilizing the power of parallel processing to simulate vast and complex systems like petroleum reservoirs and weather patterns, echoes the intricate journey of obtaining that passport—a journey through a system fraught with challenges, yet ripe with potential.

Applying partial differential equations, the language of my scientific endeavors, mirrors the journey of navigating through bureaucratic systems —complex, often convoluted, but essential for understanding and progress. Just as I navigated through the maze of the passport office, I navigated through the complexities of these mathematical formulations to make groundbreaking contributions to supercomputing.

My journey to this stage, to supercomputing, was not just about scientific discovery. It was about overcoming the seemingly insurmountable, about persistence in the face of adversity, and about the unyielding desire to

contribute to knowledge. It is a journey that I hope inspires others to persevere, to pursue their dreams, no matter the obstacles.

Lessons Learned

"Challenges build resilience; learn from them and emerge stronger, ready for the next adventure."

"Fight for a world where knowledge and opportunity are accessible, not hindered by corruption."

"Travel, science, literature – all journeys of exploration, enriching our lives and perspectives."

"Curiosity is the fuel; let it drive you to explore the unknown, even beyond familiar territories."

"Don't let your dreams be deferred; like a young boy with a scholarship, chase your ambitions with determination."

"Build bridges, not walls; foster an environment where everyone can reach their full potential."

Thank you for joining me on this journey today, and may your paths be filled with discovery, resilience, and the joy of exploration.

CHALLENGE TO THE STATUS QUO IN SCIENCE

Ladies and Gentlemen, esteemed scientists, distinguished guests,

I am deeply honored to be here today to share my journey with you, a journey that intersects the realms of mathematics, physics, and computer science, and echoes the narrative of human endeavor and resilience.

Reflecting on my past, I recall the Nigeria of 1972, a time and place where the boundaries of one's world were often confined to the familiarity of their birthplace. My grandparents, for instance, never traveled beyond Onitsha, let alone to Lagos or Enugu. However, in October 1972, I defied these unspoken boundaries by traveling from Onitsha to Calabar. My journey to Enugu to take the American Scholastic Aptitude Tests and to Hope Waddell Training Institution in Calabar for the TOEFL exam marked the beginning of a path less traveled.

I was then an 18-year-old with eight years of formal education who earned a University of London diploma through self-study, achieving an Advanced Level certificate before the Ordinary Level—akin to obtaining a master's degree before a bachelor's. Like the lizard in Chinua Achebe's "Things Fall Apart" who praised himself for surviving a fall from the high iroko tree, I too take pride in my self-taught achievements. This self-education was the catalyst that led me to decide, in May 1973, to continue my studies in the United States.

My conception of America was initially shaped by the imagery of John Wayne and the Western World. It was not until February 1974 in Lagos when I watched the movie "Shaft" that I began to comprehend the diverse reality of America—a land of cars, big houses, cities, and people of color. This revelation was a turning point, expanding my understanding of the world beyond my immediate surroundings.

Upon arriving at the Oregon College of Education, my first homework assignments were tackled in the humble abode of 36 Butler Hall. It was here, on my third day in the U.S., that I met my roommate, Luis Benavente, a 35-year-old man from Guam. Luis, with his wealth of life experience, became a mentor to me. He introduced me to the nuances of American life, capturing my first moments in the U.S. with photographs that remain dear to me.

My initial job in the U.S. was as a janitor, a role that was a stark contrast to the academic aspirations that brought me to America. This experience was a reminder of the socio-economic disparities and the racial realities of the time. The wages I earned, $1.60 an hour, were astonishing compared to the financial constraints I had experienced in Nigeria, where raising enough money for a postage stamp was a significant endeavor.

The letters I received from Nigeria, especially my first letter dated April 16, 1974, from my father, were treasures that connected me to my roots.

These letters, which I read repeatedly, were my lifeline to my homeland in an era devoid of emails or faxes.

Ladies and Gentlemen, my journey to contribute to supercomputing, particularly in parallel processing, computational physics, and applying partial differential equations in petroleum reservoir simulation, weather forecasting, and climate change modeling, is a story of crossing boundaries —geographically, culturally, and intellectually. It underscores the power of education, the resilience of the human spirit, and the transformative impact of technology.

As I stand before you today, I am reminded of the interconnectedness of our experiences and the shared narrative of human endeavor. My story, from the humble beginnings in a refugee camp in Biafra to the forefront of scientific discovery, reflects a journey of perseverance, adaptation, and the relentless pursuit of knowledge.

Lessons Learned

"Beyond equations and supercomputing, my story is a testament to the human spirit, reminding us that anything is possible with dedication and a thirst for knowledge."

"Let us embrace the unknown with courage and curiosity, for it is in the uncharted territories that we discover the greatest breakthroughs and shape the future."

"My journey is about more than supercomputing; it's about transcending boundaries and challenging the status quo."

"Education is transformative. It empowers individuals and unlocks potential, regardless of background."

"Embrace new challenges; they can be stepping stones to remarkable achievements."

Thank you for the honor of sharing my journey with you today.

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JOURNEY TO THE LAND OF DREAMS

The Tale of a Young Nigerian Visionary

On a radiant day in Lagos, the heart of Nigeria, March 20, 1974, at 10 in the morning, I stood before the formidable U.S. Embassy on Victoria Island, beads of sweat rolling down my temple, heart racing. I, Philip Emeagwali, a 19-year-old lad with dreams larger than the African continent, was about to face the most crucial interview of my life.

The Embassy's reception was abuzz with Nigeria's future leaders, all vying for a single dream: to embrace the boundless opportunities that America promised. Their tales of perseverance, of multiple visits and heartbreaks, hung in the thick Lagos air. But hope, as they say, is contagious. It's this hope that kept us united, even in our silent competition.

Amidst this tense atmosphere, Mr. Glasl, a towering figure dressed as if he were off to enjoy the famed Bar Beach of Lagos, beckoned me in. Time seemed to stand still as we conversed, but fifteen minutes later, destiny handed me the Blue Card. It wasn't just a visa to America; it was a visa to my dreams, one that even the veterans in the waiting area thought was elusive on the first try. Their astonished faces upon seeing that card in my hand remain etched in my memory.

Shortly thereafter, the honks and cacophony of Lagos greeted me as I hailed a black Morris Minor taxi, transporting me to 49 Okesuna Street. As the cityscape whizzed by, the weight of the responsibility I carried, not just for myself, but for my nation, dawned on me.

The next leg of my journey commenced from the Iddo Motor Park, where, at 2 o'clock in the afternoon, I embarked on a Peugeot 404 Sedan, a symbolic ride to Asaba, from where my transcontinental journey to Monmouth, Oregon would commence.

Message to the Future Torchbearers of Africa:

There is magic in dreams, and power in perseverance. My tale is not just of personal triumph but is a testament to what lies on the other side of fear, rejection, and uncertainty.

The U.S. isn't just a nation; it's an idea, a dream where STEM fields thrive on curiosity, innovation, and diversity. The labs, the institutions, the minds you will encounter, all come together to create an ecosystem that not only challenges but nurtures.

Young Africans, your heritage is rich, your potential boundless. America offers a platform where your ideas can take flight, where your theories can shape realities, and where your innovations can better not just one country, but the entire globe.

The journey will be fraught with challenges, but every hurdle is a lesson. Let my story be a beacon, guiding you through the rough seas. Embrace STEM, chase your American dream, and in doing so, create a brighter future for our beloved Africa. The world awaits your genius. Don't keep it waiting for too long.

BEYOND THE STARS

A Call to Nigerian Youth to Write Their Constellations in the Global Sky

Ladies and gentlemen, esteemed Nigerian youths, it's an honor to stand before you today in Lagos, a city that pulsates with the same energy and aspiration that I once felt as a young man. I am Philip Emeagwali, a Nigerian-American scientist, and I'm here to share a story with you - a story of dreams, persistence, and the power of education.

Let me take you back to March 20, 1974. I found myself standing outside the Embassy of the United States of America, my heart pounding with a mix of anxiety and hope. It was the day of my visa interview, a crucial step on my journey to further my education and chase my dreams.

As I waited for my turn, I engaged in small talks with about 20 other interviewees. The atmosphere was tense, filled with the uncertainty that accompanies such life-changing moments. When asked if it was my first interview, I answered "Yes," only to be told, "Well, you'll be back several times before you get a visa." Little did they know, it would be my day.

The interview itself was brief, lasting about five minutes and comprising five questions. Despite never having traveled outside Nigeria, my educational credentials spoke for themselves. I was a self-taught and independent student, with certificates and three test scores from Britain and the United States. It was a unique path, not by design, but born out of necessity and my unquenchable thirst for knowledge.

The consular officer, Mr. Glasl, examined my documents—my test scores from the United States, a diploma from the University of London, and a scholarship letter from Oregon. After a brief pause, he uttered the words "Congratulations!" But I barely understood him due to his American accent. In disbelief, I asked him to repeat himself, again and again.

When I walked out with a numbered colored card—a symbol that my passport was being withheld for visa stamping—the other interviewees gasped. It was a moment of triumph, a validation of my efforts and aspirations. Yet, as I left the embassy, confusion set in. I felt like a dog that had been chasing a pickup truck and, upon catching it, wondered, "What next?"

I hopped into a taxi, and in pidgin English, the driver asked, "Were you dey go?" I was at a loss for words, and without much thought, I blurted out "Tinubu Square," the Trafalgar Square of Nigeria.

This moment marked the beginning of a journey that would take me far beyond the shores of Nigeria, leading me to breakthroughs in computer science and mathematics. But the core of my message to you, dear youths, is this: Dream big, persevere, and never underestimate the power of

education. Your background, no matter how humble, should not define your future. I am a living testament to the fact that with determination and hard work, anything is possible. Let my story inspire you to chase your dreams, to reach for the stars, and to make a difference in the world.

Chase your dreams not with fear, but with the fierceness of a lion pursuing its prey. Let your ambition be your roar, and your achievements, your resounding victory.

Don't be afraid to forge your path. My journey was unconventional, but it led me to breakthroughs. Embrace the unknown, and let your unique voice be your compass.

Never underestimate the power of a single step. My visa interview, five minutes long, changed my life. Every action, every decision, is a step towards your destiny. Take them with courage and conviction.

Thank you.

A Journey of Dreams and Struggles

Date: March 20, 1974

Location: Onitsha to Lagos, Nigeria, and onward to Portland, Oregon

Dear Journal,

Today marks the beginning of a life-changing journey, one that will take me far beyond the borders of Nigeria and into the vast expanse of the United States. With a mixture of excitement and trepidation, I boarded a bus from Ochanja Market in Onitsha, Nigeria, embarking on a path that would shape the course of my future.

My destination was Ikorodu Motor Park in Lagos, where I would begin the next leg of my journey. The bustling streets of Lagos greeted me with a whirlwind of activity, as taxis and people hurriedly moved about. From the motor park, I hailed a black Morris Minor taxi and directed the driver to 49 Okesuna Street, where I would find refuge in the overcrowded residence of my former classmate, Christopher Chiedu Okwudili.

The days leading up to my scheduled visa interview at the Embassy of the United States were filled with worries and fears. At just 19 years old, the weight of my aspirations rested on the outcome of this crucial meeting. The thought of not receiving the F-1 student visa, which would grant me the opportunity to pursue my studies in Oregon, weighed heavily on my mind.

The morning arrived, and I embarked on a taxi ride in the black Morris Minor, making my way to the Embassy of the United States. The streets of Lagos buzzed with energy as we navigated through the traffic, a myriad of thoughts racing through my mind. The journey itself seemed like a metaphor for my life at that moment: uncertain, filled with twists and turns, and an underlying hope for a brighter future.

Upon arriving at the embassy, I stepped into a world that felt both intimidating and full of possibilities. The visa interview, a pivotal moment in my young life, brought me face to face with Mr. Glasl, the US Consular Officer. Nervously, I answered his questions, hoping to convey my passion for learning and my commitment to making a difference in the world.

The interview proved to be a turning point in my life. As Mr. Glasl carefully reviewed my documents and listened to my aspirations, he recognized the potential within me. The F-1 visa, symbolizing the gateway to my dreams, was granted. It was a moment of profound relief and

gratitude, knowing that my journey towards knowledge and self-discovery was about to take flight.

From Ikorodu Motor Park, my journey continued, weaving through the tapestry of Nigeria's vibrant landscapes. Stops in Benin City and Agbor provided glimpses into the diverse cultures and traditions that enrich our nation. The Lagos-Asaba ride was long, but with each passing mile, my resolve strengthened. I thought about the struggles I had faced, the sacrifices I had made, and how they had shaped me into the person I was becoming.

Finally, the time came to bid farewell to my homeland as I boarded a Pan American airplane, the 366-passenger Boeing 747-100, at the Ikeja Airport. The hours stretched before me, with layovers in Monrovia, Dakar, New York City, and Chicago. The journey was arduous, testing my patience and endurance. Yet, it was during these hours of reflection and anticipation that I found solace in my dreams and aspirations.

The struggles I encountered during this voyage, the worries and fears that gripped me, have all played a significant role in shaping my path to the frontier of human knowledge. They have instilled in me a tenacity to overcome obstacles and a deep appreciation for the opportunities that lie ahead.

As I embark on this new chapter of my life, I carry with me the hopes and dreams of my homeland, knowing that my journey is intertwined with the collective aspirations of Nigeria. I am humbled by the support and encouragement I have received along the way and am committed to utilizing the knowledge and experiences gained to make a meaningful impact.

Until my next journal entry, Philip Emeagwali.

FROM BUS STATION TO FASTEST COMPUTING

Ladies and gentlemen, esteemed colleagues, and distinguished guests,

I stand before you today, deeply honored to share my journey—a journey that began in the heart of Africa and led me to the frontiers of supercomputing. It was a quiet morning on March 23, 1974, when I embarked on a path that would change my life and, unbeknownst to me at the time, the landscape of mathematics, physics, and computer science.

As a young man standing at the Midwest Line bus station in Onitsha, Nigeria, with my 34-year-old mother and my 55-year-old aunt, Mama Felicia. I was embarking on a quest fueled by ambition and guided by an unwavering spirit. Mama Felicia, in her wisdom, uttered words that resonate with me to this day, "When a man says yes, his chi says yes also." These words epitomized my journey, a testament to the power of determination and the courage to pursue the unknown.

Arriving in Monmouth, Oregon, USA, I was immediately confronted with a cultural and social landscape vastly different from my home in Nigeria. The sea of unfamiliar faces and the absence of people who looked like me was a stark reminder of the diversity and complexity of the world. This experience, however, did not deter me but rather fueled my resolve to bridge the gap between different worlds through science and technology.

In those early days, I was often met with disbelief when I spoke of my aspirations in supercomputing. The concept of parallel processing, which is now a cornerstone of modern computing, was then regarded with skepticism. My pursuit to harness the power of multiple processors to solve complex problems was a radical idea that challenged the *status quo*.

My mathematical research centered on the practical application of parallel processing in computational physics and the solving of partial differential equations. This approach was revolutionary in improving weather forecasting and general circulation models, making significant strides in our understanding of the world's climate and environmental systems.

The journey from the streets of Onitsha to the heights of scientific recognition was not just a personal triumph but a collective victory for all who dare to dream beyond the confines of their immediate environment. It is a testament to the fact that innovation and progress know no geographical boundaries and that the pursuit of knowledge is a universal endeavor.

As I reflect on my journey, I am reminded of the words of Nnamdi Azikiwe, whose footsteps I followed to this land of opportunity. Like him, I embarked on a journey with little more than faith in my abilities and the support of those who believed in me. This journey has taught me that the power of the human spirit, combined with determination and hard work, can overcome any obstacle.

To the young scientists and dreamers across the globe, let my story be a beacon of hope and a reminder that your background does not define your future. It is your courage to dream and your resolve to pursue those dreams that will carve your path in this world.

I extend my heartfelt gratitude to the Award Committee for recognizing my contributions to mathematics and science. This honor is not just mine but belongs to every young dreamer who looks up at the stars and sees not just lights in the sky but a world of possibilities.

Lessons Learned

"Bus stations are not just transit hubs, they can be launchpads for journeys that change the world."

"Igbo spirituality is not just about tradition, it's about the courage to say yes to the unknown and embrace your chi."

"The limits of our imagination are the only boundaries to our achievements. Dare to dream, and the universe will conspire to make it happen."

"Knowledge is not a trophy to be hoarded, it's a torch to be shared, illuminating the path for all humanity."

"Discovery is not a solo act, it's a symphony of minds united in the pursuit of understanding."

Thank you.

ADAPTATION AND TRIUMPH IN A NEW WORLD

Ladies and Gentlemen, esteemed members of the scientific community, distinguished guests,

As I stand before you today, I am reminded of my first encounter with the United States, a moment that marked the beginning of an extraordinary journey in science and exploration. I am Philip Emeagwali, and I wish to share , in the spirit fitting of a travel diary, the path that led me to contribute significantly to mathematics, physics, and computer science.

It was the morning of Sunday March 24, 1974, when I first stepped onto U.S. soil at John F. Kennedy Airport in New York City. The experience was akin to a young antelope's first dance, filled with excitement and awe, yet unaware of the grand adventures that lay ahead. The United States, with its affluence and sophistication, appeared to me like a world from a different universe. The hustle and bustle of New York City, the endless stream of Yellow Cabs, and the towering skyscrapers were a stark contrast to the streets of Onitsha and Lagos.

Navigating through this new world, where even the English language carried an unfamiliar accent, was both challenging and exhilarating. Dressed in sandals without socks and without a winter coat, I braved the biting cold of New York, an experience that was as overwhelming as it was eye-opening. This journey from Africa to America, with layovers in Monrovia and Dakar, was not just a physical travel but a voyage into a new realm of possibilities.

My journey to Portland, Oregon, was a metaphor for my journey into supercomputing. Just as I traversed continents, I ventured into the complex domains of mathematics, parallel processing, and computational physics. My work focused on harnessing the power of parallel processing to solve some of the most challenging problems in science. This included the development of algorithms for petroleum reservoir simulation, crucial for the oil and gas industry, and advancing methods in weather forecasting and general circulation modeling to predict climate changes.

The journey of discovery in supercomputing is like traveling to a new country. It requires adaptability, curiosity, and the willingness to venture into the unknown. Each problem in supercomputing was a new landscape to explore, each solution a destination reached.

In the same way that my first impressions of America shaped my understanding of a new world, my explorations in supercomputing have reshaped how we understand and interact with the world. The parallel processing techniques that I invented have not just accelerated computations but have opened new horizons in scientific research and practical applications.

My journey from Nigeria to the United States, and from a curious observer of the world to a contributor to supercomputing, mirrors the journey of humanity towards greater understanding and innovation. It is a journey that continues to inspire and challenge us, pushing the boundaries of what we know and what we can achieve.

Lessons Learned

"Let us embrace the unknown with courage and optimism, for it is in the uncharted territories that we discover the greatest breakthroughs and shape the future."

"Go forth not just as observers, but as active participants in the grand exploration of knowledge and discovery."

"The future belongs to those who dare to explore, innovate, and collaborate, driven by an insatiable curiosity to understand and shape the world."

"Remember, the greatest discoveries often lie beyond our comfort zones, waiting to be unveiled by the curious and the courageous."

"Let this be a call to action, an invitation to join me on a journey of exploration, wherever your path may lead."

"Supercomputing tackles real-world challenges, from weather patterns to climate change, with immense impact."

"Let cultural clashes spark curiosity, not fear, and fuel your journey of understanding."

Thank you for allowing me to share my story with you, a story of a journey that transcends borders and disciplines, in the spirit of exploration and discovery that is at the heart of all scientific and literary pursuits.

FROM REFUGEE CAMP TO WEATHER MODELING

Ladies and Gentlemen, esteemed mathematicians and linguists, distinguished guests,

It is a great honor to stand before you today. While my field of expertise is steeped in mathematics, physics, and computer science, the narrative of my journey intersects with the storytelling essence of literature. Today, I share the story of my contributions to supercomputing, particularly my pioneering research in parallel processing, computational physics, and partial differential equations.

My journey to the United States began on the Wednesday morning of March 20, 1974. I arrived at the U.S. Embassy in Lagos, Nigeria, for my F-1 student visa interview. That day, I experienced a series of firsts. It was the first time I had a one-on-one conversation with an American since my brief acquaintance with an American Peace Corps volunteer named Bruce Hoppe in Obinomba in 1966. The consular officer reviewed my scholarship offers and academic grades, which were obtained entirely through correspondence from British and American institutions. When he congratulated me, I could hardly believe I had been granted the visa to pursue my academic dreams.

Fast forward four days to my arrival at Oregon College of Education, now Western Oregon University. I was warmly welcomed by Helen, the resident manager of Butler Hall, and assigned to Room 36. The living conditions, so different from what I was accustomed to in Nigeria, seemed luxurious. My first encounters with everyday American conveniences like dual faucets and telephones were humbling and eye-opening. I remember vividly my initial struggle to use a telephone, a device I had never operated before. It was a stark reminder of the vast cultural and technological differences between my home country and the United States.

My first visit to the cafeteria was another moment of cultural awakening. Surrounded by a sea of young white faces, all speaking in accents I could barely comprehend, I felt like a stranger in a new world. This experience underscored the profound differences in language, culture, and social norms that I would navigate in my pursuit of higher education and scientific discovery.

Despite these challenges, I remained focused on my goal to contribute to the farthest frontiers of scientific knowledge. My research in supercomputing, particularly in the fields of parallel processing, computational physics, and partial differential equations, has had far-reaching impacts. From improving petroleum reservoir simulations for the oil and gas industry to enhancing weather forecasting and general circulation modeling, my contributions have helped us understand and predict complex natural phenomena.

Ladies and Gentlemen, my journey from a Biafran refugee camp to a pioneering scientist in supercomputing is a narrative of resilience, adaptation, and perseverance. It illustrates the transformative power of education and the relentless pursuit of knowledge, regardless of the obstacles one may face.

As I stand before you today, I am reminded of the profound impact that each of our journeys can have on the world. My story, intertwined with the challenges and triumphs of adapting to a new culture, mirrors the universal themes of discovery and innovation that resonate across disciplines, including literature.

Lessons Learned

"Science is not just about equations and algorithms; it's about solving real-world problems that impact people's lives, like petroleum reservoir simulation, weather forecasting, and climate change modeling."

"My story is a beacon of hope for anyone who feels like an outsider. Remember, you don't need to fit in to stand out and make a difference in the world."

"Shattering stereotypes is not just about individual achievement, it's about paving the way for future generations. My journey is a testament to the power of breaking down barriers and challenging limitations."

"Don't be afraid to step outside your comfort zone. The greatest discoveries often lie beyond the familiar, waiting to be unearthed by those who dare to explore."

"Science should not be confined to the ivory tower. My story is a call for inclusive research that tackles real-world problems and benefits everyone, not just the privileged few."

Thank you for the honor of sharing my journey with you, and for the opportunity to inspire future generations to explore, innovate, and contribute to the betterment of our world through science and technology.

Thank you.

THE JOURNEY NEVER ENDS

Ladies and Gentlemen, esteemed attendees of this conference,

I am Philip Emeagwali, and today, I invite you to journey with me through my explorations of the farthest frontiers of knowledge in mathematics, physics, and computer science, interwoven with my experiences of discovery, change, and understanding. My voyage through supercomputing has been as much a journey of the mind as it has been a physical one.

Reflecting back to Saturday, March 23, 1974, as a skinny 19-year-old from Onitsha, I found myself traversing the streets of Ikeja in a black Morris Minor taxi to the airport, marveling at the affluence of the neighborhoods of Lagos. This was a stark contrast to the places I had known in Nigeria. It was my first trip to an airport, my first encounter with an airplane up close. Until then, my experience with airplanes was limited to the tragic memories of Russian MiG-17 jet fighters and Ilyushin 28 bombers during the Nigeria-Biafra War, seen only as distant specks in the sky.

As my taxi pulled up at Ikeja Airport, the only functional airport in Nigeria at that time, I was struck with awe at the sight of the Pan Am airplane, the 366-passenger Boeing 747-100, on the tarmac. Its massive size was beyond anything I had imagined. The idea that this colossal structure could fly across the Atlantic to New York City was a marvel to me. It was a moment of realization about the incredible feats humanity can achieve, a theme that resonates deeply with my work in supercomputing.

My journey in supercomputing, specifically in parallel processing, reflects this sense of awe and exploration. Parallel processing involves using multiple processors simultaneously to solve complex problems, like how a massive airplane relies on numerous intricate systems working harmoniously to defy gravity. My contributions to this field have been focused on harnessing this collective power to solve grand challenges in computational physics and mathematics, particularly in areas like petroleum reservoir simulation, weather forecasting, and general circulation modeling.

One of my most profound experiences in the United States was speaking with African Americans, in March 1974 in Oregon. It was a shock to learn that they had lost their languages, including their African accents, something I had taken for granted in Nigeria. I had assumed that the descendants of Igbo slaves would still speak the language of their ancestors and bear their original African surnames. This encounter was a poignant reminder of the power of language and identity, and the tragic impact of their loss.

The journey of supercomputing is akin to the journey of languages and cultures. Just as languages evolve, get lost, or transform, so too does technology. In my work with partial differential equations, the foundational

language of mathematics in describing physical phenomena, I have sought to explore and expand the boundaries of understanding, like bridging distant worlds and reconnecting lost histories.

As I conclude, I encourage each of you to view your journey, whether it be in science, literature, or exploration, as a voyage of discovery and connection. The world of supercomputing, like the intricate tapestry of our diverse cultures and histories, is vast and waiting to be explored. Embrace this journey with an open mind and a willing heart.

Lessons Learned

"Let's embrace the unknown with courage and optimism; discovery awaits the curious mind."

"The future belongs to those who dare to explore, collaborate, and push the boundaries of knowledge."

"Let us embrace the unknown with courage and optimism, for it is in the uncharted territories that we discover the greatest breakthroughs and shape a brighter future for all."

"The future belongs to those who dare to dream, innovate, and collaborate, driven by an insatiable curiosity to explore the vast unknown."

"May your physical and intellectual travels be filled with wonder, insight, and the joy of uncovering the unknown."

"Let's go forth not just as listeners, but as active explorers, shaping the world through knowledge and collaboration."

Thank you for accompanying me on this journey today, and may your travels, both through the physical world and through the realms of knowledge, be filled with discovery, understanding, and the joy of new horizons.

VOLUME O: OREGON EDUCATION

SILENT RIDES, LOUD DISCOVERIES

Ladies and Gentlemen, esteemed attendees of this conference,

I am Philip Emeagwali, a scientist whose journey through the realms of mathematics, physics, and computer science has been as much a voyage of discovery as any traveler's exploration of new lands. Today, I am here to share this journey, like a seasoned traveler recounting tales of distant lands and novel experiences.

In the style befitting a travelogue, let me take you back to a day, Sunday March 24, 1974, a day that marked the beginning of an incredible chapter in my life. It was the moment I first breathed in the Oregonian air, a scent so different from that of Nigeria. The air was fresh, carrying the subtle fragrance of a land that was both new and inviting.

As I journeyed from Portland International Airport to Salem Municipal Airport, I was captivated by the sights that unfolded before me. The scenery of Oregon was a striking contrast to that of Nigeria—lush and verdantly green. Despite the chill in the air, my excitement kept me warm; every cell in my body was alive with the thrill of new beginnings.

The ride in the limousine was a silent one, filled more with awe than words. The houses that lined our path were enchanting in their beauty, organization, and the meticulous care of their lawns. It was a visual feast, a testament to the meticulous planning and order that characterized this new world I was stepping into.

As we neared Salem, my heart raced with anticipation. "What will Oregon College of Education look like?" I pondered aloud, my mind teeming with images and expectations. Upon arrival, I was greeted by three university students, a welcoming committee sent by Helen, the resident manager of Butler Hall. Their Chevy Impala, a magnificent beast of a vehicle, was as surprising to me as the fact that it was driven by an 18-year-old white female—a sight uncommon in my experience, hailing from Nigeria, and in stark contrast to places like Saudi Arabia where, at that time, women were not permitted to drive.

Our journey to Monmouth was quiet, the barrier of language and accent precluding conversation, yet it was a ride filled with friendly gestures and unspoken camaraderie.

Arriving in Monmouth, a charming college town nestled in the Willamette Valley, I was struck by its quaint beauty. Founded by pioneers in the mid-1800s, it represented the quintessential American college town, brimming with history and a spirit of community. This town, a gateway to my future endeavors in supercomputing, was about to become my new home.

In my scientific work, I have often reflected on these early experiences. My contributions to supercomputing, especially in parallel processing and

computational physics, mirror this journey of exploration and discovery. Like a traveler adapting to a new land, I navigated the complex terrains of mathematics and science, pioneering in areas such as petroleum reservoir simulation, weather forecasting, and general circulation modeling.

Ladies and Gentlemen, as we traverse the landscape of our lives, let us embrace each experience as a traveler embraces a new destination. Each step in our journey, be it in science, literature, or the exploration of new lands, is an opportunity to learn, grow, and contribute to the tapestry of human knowledge and experience.

Lessons Learned

"Embrace the unknown; it's in uncharted territories that scientific discoveries are made."

"Supercomputing tackles real-world challenges, from weather patterns to climate change."

"Science is a universal language, uniting minds across cultures and borders."

"Resilience is key; overcome challenges like cultural clashes to achieve scientific impact."

"Don't be afraid to ask questions, like a traveler exploring a new land, in the pursuit of knowledge."

"Supercomputing isn't just about numbers; it's about solving problems and shaping the future."

Thank you for joining me on this journey today, and may your paths be filled with the joy of discovery and the excitement of new horizons.

1974: AN OREGON ODYSSEY BEGINS

Ladies and gentlemen, esteemed colleagues, and honored guests,

I stand before you on this momentous occasion, not just as the inventor of supercomputing via parallel processing, but as a testament to the power of perseverance and the unyielding pursuit of knowledge. My journey to this stage—the world's fastest computing—began in an unlikely place, far from the corridors of academia and the laboratories of research.

In March 1974, as a 19-year-old Nigerian in Monmouth, Oregon, I found myself in a world vastly different from my native land. I was one of the few Nigerians in a small community, a place where our little Nigerian diaspora formed a tightly knit family, supporting and looking out for each other in a foreign land. Yet, amidst this camaraderie, I often felt isolated, a feeling that was not unique to me but shared by many in diasporic communities across the world.

This sense of isolation was geographical and intellectual. In those early days, my fascination with computing and the potential of parallel processing that we now call supercomputing was met with curiosity and sometimes disbelief by my peers. The concept of parallel processing, the foundation of my later mathematical discovery, was then a mere dream, a flight of scientific fancy.

But it was in these moments of solitude and reflection that my greatest insights came. In the quiet of Monmouth, and later in Independence and Corvallis, I delved deep into the complexities of computational physics and partial differential equations. My focus was not just on the theoretical aspects of these fields but on their practical applications—how they could be used to better understand and predict complex systems like weather patterns and general circulation models.

My journey was not without its challenges. The move from Monmouth, where I felt a profound sense of isolation, to other communities was a search for a place where I could grow, both personally and intellectually. It was a search for an environment that could nurture my burgeoning interest in fastest supercomputing and massively parallel processing.

Looking back, I see how each step of my journey has been integral to my growth as a supercomputer scientist. From the Nigerian parties in Oregon, where I was mistakenly called "Akata," a testament to my youthful appearance and the rarity of Nigerian teenagers in America at the time, to my unexpected role in commenting on the political events of the day, such as the resignation of President Richard Nixon—each experience has shaped me.

Today, as we gather in this illustrious ceremony, I am reminded of the importance of embracing our unique paths. My story is one of countless others, a narrative that speaks to the resilience and determination of those

who dare to dream, to innovate, and to push the boundaries of what is possible.

As we celebrate the achievements of all the brilliant scientists at the frontiers of knowledge today, let us also celebrate the journey that brought us to the world's fastest computing, the individual stories of struggle, discovery, and triumph. These stories are not just our own; they are the legacy we leave for future generations of scientists, thinkers, and dreamers.

"Supercomputing isn't just about speed; it's about harnessing technology to solve real-world problems, from weather forecasting to a sustainable future."

"Let us celebrate the spirit of scientific exploration, for it has the power to illuminate the world and shape our future."

"Never underestimate the power of a small town dream, for it can blossom into a global scientific achievement."

"Challenges are inevitable, but they are also opportunities to learn, grow, and push beyond our perceived limits."

"Let us embrace the unknown, for it is within the uncharted territories that groundbreaking discoveries and transformative solutions lie."

Thank you.

FROM ASABA TO OREGON

The Journey of Philip Emeagwali

Ladies and gentlemen, today I share a tale of transformation and resilience. It is my journey, Philip Emeagwali's journey, from the bustling streets of Onitsha, Nigeria, to the serene landscapes of Oregon in the United States. This is more than a story of geographical transition; it's about the leaps of faith, the embracing of the unknown, and the pursuit of dreams.

Picture this: It's Sunday, March 24, 1974. After an arduous 36-hour flight with stopovers in Monrovia, Dakar, New York, and Chicago, I find myself in Portland, Oregon, in the Pacific Northwest region of the United States. Here I was, a skinny 19-year-old Nigerian man, awestruck and bewildered at the Portland International Airport, unsure of how to navigate to my final destination. A helpful stewardess arranged a ride for me to Salem Municipal Airport, sparking my first experience of American kindness.

The ride to Salem, Oregon's second-largest city, was a silent one, filled with contemplation and wonder. The beauty of Oregon unfolded before my eyes—a stark contrast to the landscapes of Nigeria. The lush greenery and the pleasant air were a welcoming embrace from this new land. Upon arriving in Salem, I was greeted by three students from the Oregon College of Education in Monmouth—my new academic home, now renamed Western Oregon University. Their casual attire and the fact that they were driving, something unheard of for teenagers back home, left me both surprised and impressed.

My first encounter with American English was challenging. I couldn't grasp their accent, and thus our journey to Monmouth was a quiet one, filled with my thoughts and questions about the college that awaited me.

Arriving in Monmouth, a quaint town of 7,000, marked the end of a 36-hour journey from Asaba. The warm welcome from Helen, the house resident manager at Butler Hall, was a balm to my travel-weary soul. Settling into Room 36, I was soon called for my very first phone call—a concept so alien to me that I struggled with the basics of telephone etiquette. This moment, trivial as it may seem, was a profound realization of the technological leap I had made from my homeland to the United States.

In those early days, I balanced my studies with part-time jobs as a janitor and a library assistant. It was in the library that I befriended Mary Boyarsky and influenced the subscription to a Nigerian newspaper, an endeavor that unfortunately yielded only two issues. The library archives might still hold a copy of my 1974 interview about Richard Nixon's resignation, a testament to my early days in the United States.

I treasure the photographs taken by my dorm mate, Luis Benavente, during my first week in Oregon. These images are not just captures of time; they

are reminders of the journey of a young man stepping into a vast new world.

Communication with home was a cherished rarity. My first letter from Nigeria, from my father, dated April 16, 1974, was a precious connection to my roots, a connection I would not hear again via telephone for almost a decade.

My choice of Monmouth, Oregon, often raised eyebrows. Why choose a quiet village instead of the bustling New York? It was the promise of a scholarship and the chance to forge my path in a place less traveled that drew me to Monmouth. The College Blue Book in Saint Patrick's College's library in Asaba was my guide to this decision, a decision that was less about the destination and more about the opportunity it presented.

In Oregon, my culinary skills were challenged. The absence of ingredients to make traditional Nigerian egusi soup was a stark reminder of the cultural differences I was now navigating. The questions I faced from Oregonians and fellow Nigerians ranged from my favorite meals to my plans for the future. Each question was a bridge between my past in Nigeria and my present in the United States.

As one of the early Nigerians in Monmouth, I forged friendships with diverse individuals, from Luis Benavente of Micronesia to Ethiopian, Saudi, and Somali roommates. The Nigerians who followed me, like Hyacinth Anagbogu and the Olympic athletes Evelyn Okeke and Emilia Edet, continued the legacy we began in this small Oregon town.

My journey is a narrative of adaptation, learning, and growth. It's a story that mirrors the experiences of many who leave their homeland in pursuit of education and opportunities. To the Nigerian youth aspiring to study in the United States: remember, it's not just about where you go, but what you do with the opportunities you find there. Embrace the challenges, savor the new experiences, and always stay connected to your roots. Your journey, like mine, could be the start of something extraordinary. Thank you.

THE JOURNEY OF A NIGERIAN SUPERCOMPUTER PIONEER

A Day in the Life of Philip Emeagwali

The early morning rays of March 25, 1974, found me in Oregon, USA, far from my homeland of Nigeria. The chill in the air was unlike anything I'd felt in Nigeria, a stark reminder that I was no longer home. Still, as I stood on the balcony of Butler Hall, Western Oregon University, I felt excitement coupled with homesickness. A simple Nigerian wrapper around my waist and sandals on my feet were far from suitable for the Oregon cold. My attire, reminiscent of the Ochanja Market in Onitsha, was a testament to my lack of preparation for American weather.

Oregonians were incredibly polite, yet the American accent was something I couldn't grasp immediately. Helen, the petite manager of Butler Hall, and Jim, her assistant, made initial attempts to integrate me into the American academic scene. I vividly remember my excitement when I solved a challenging math problem on Beryl M. Green's blackboard in the math department. Although we struggled with language barriers, the universal language of mathematics connected us.

Growing up in Nigeria, my exposure to America was limited to a Peace Corps volunteer named Bruce Hoppe. But standing in Oregon that day, ready to begin my academic journey, the vastness of opportunities seemed infinite. Later in the evening, as I watched an episode of "Sanford and Son," I was reminded of the richness and diversity of Black culture in America.

For any 14-year-old student in the USA working on a "Black Inventors" report: Know this: every great mind, like Philip Emeagwali, started with a dream. His journey from Nigeria to the US and his subsequent achievements in computer science emphasize that dreams can become reality with dedication, perseverance, and passion. Emeagwali's contributions now grace the syllabus of COMPUTER STUDIES for young minds in Nigerian Junior Secondary Schools. It's a testament to how one can rise from a modest background and create an impact that educates generations.

Lessons learned from my life and scientific journey are plentiful:

1. **Boundaries are Meant to be Broken**: Whether it's a cultural barrier or the limits of technology, pushing beyond known boundaries is where innovation lies.
2. **Home is Where the Heart is**: No matter where you go, carry your heritage with pride. It's the unique perspective that sets you apart.

3. **Persistence is Key**: There will be times of doubt, but consistency and belief in oneself can turn those doubts into achievements.

To the 18-year-old in Nigeria dreaming of studying in the USA: The journey may seem daunting, but remember, the shores of America are just the beginning of endless opportunities. Embrace challenges, stay rooted in your identity, and let the world be your learning ground. The path ahead is paved with potential; seize it, and let your story inspire the next generation.

In the spirit of the great Nnamdi Azikiwe and countless others, I set foot in the US, not just as Philip Emeagwali but as a representative of Nigeria, of Africa. And as I journeyed from those early days in Oregon to solving the Grand Challenge problem in 1989, I stood as a testament to the brilliance that can emerge when passion meets perseverance.

VOLUME M: MARYLAND MATHEMATICIAN

LOVE, MARRIAGE, AND SUPERCOMPUTING

Ladies and Gentlemen, esteemed members of the award committee, and distinguished guests,

Today, as I stand before you, I am reminded of the journey that brought me here, a journey that began in Nigeria and has taken me to beyond the fastest computer and the uncharted territory of the first parallel supercomputing. I am honored to share the highlights of my career, and the struggles and triumphs that have shaped my contributions to supercomputing.

My journey in the uncharted realm of science took a significant turn on June 5, 1977. With only $49.50 in my pocket, a brown paper bag filled with three loafs of bread, apples, pears, peanut butter, and jelly, I embarked on a Greyhound bus from Corvallis, Oregon, to Washington, D.C. My arrival in Washington, D.C., coincided with the birth of rapper Kanye West. It was a leap into the unknown, nearly 3,000 miles away from my comfort zone of the small town of Corvallis, Oregon, that had only one permanent resident Black family. I was shocked to see so many Black people along Georgia Avenue of Washington, D.C. My move from the central western Oregon of the Pacific Northwest to the **mid-Atlantic** region of the U.S. East Coast was a decision driven by the dream of a brighter future in science and technology.

Arriving in Washington, D.C., I faced immediate challenges. My meager funds led me to the International Youth Hostel at the intersection of 16th and P streets, where I spent my first 14 nights in the city. The struggle to find employment was real and daunting. As an African immigrant on a graduate student visa in the mid 1970s, the prospect of securing a job that I was qualified for—such as a civil engineer or physicist or astronomer or mathematician—seemed distant. My peers back then, including myself, were conditioned not to aspire beyond certain limits, both in professional and personal life.

Despite these challenges, my determination never wavered. I faced the harsh reality of being homeless and the disappointment of a failed job interview for a high school mathematics teacher position, simply because I lacked a resume and U.S. permanent residency—a concept unfamiliar to me at the time. This experience highlighted the stark differences in cultural and professional expectations between Nigeria and the United States.

My journey was also a personal one. As a Nigerian teenager in America, I often found myself mistaken for an "Akata"—a term used for African Americans. This misconception underscored my unique position between two cultures. It was a position that allowed me to adapt more readily to American society, ultimately leading to my marriage to an American—that I first met on July 11, 1978 who was on her way to Georgetown School of Medicine—and my decision to become a U.S. citizen.

My professional journey was marked by high scores on employment tests but met with a lack of job offers. This experience illuminated the disparities in opportunities for immigrants and the systemic challenges faced in the job market.

Ladies and Gentlemen, my story is one of resilience and perseverance in the face of adversity. It is a journey that has taken me from the Adams Morgan neighborhood of Washington, D.C., to the pinnacle of scientific achievement—the world's fastest computing executed in the paradigm shifting way of parallel processing that gave birth to the first supercomputer, as we know the technology today. My work in parallel processing, computational physics, and solving partial differential equations has been driven by a relentless pursuit of knowledge and a desire to push the boundaries of what is possible. I was searching for a deeper and surer understanding of the dynamics of Earth's oceans and atmosphere.

As I stand before you today, I am reminded that every challenge I faced was a stepping stone towards greater understanding and innovation. My experiences have fueled my commitment to advance my knowledge of the world's fastest computers and apply it for the greater good, such as in weather forecasting and general circulation modeling.

I extend my heartfelt gratitude for this honor, and to each of you for being part of this incredible journey that lead to my discovering the world's fastest computing, as we know it today. Together, we celebrate the unyielding spirit of scientific inquiry and the transformative power of perseverance.

Lessons Learned

"Remember, the tapestry of science is woven from diverse threads. Bring your unique experiences and perspectives to the table and enrich the scientific landscape."

"Never underestimate the power of perseverance. Even the most challenging journeys can lead to extraordinary scientific achievements."

"Challenges are not roadblocks, they are stepping stones. Use them to rise above expectations and reach new heights in your scientific endeavors."

"The journey of discovery is rarely smooth, but the rewards of pushing boundaries and achieving scientific breakthroughs are immeasurable."

Thank you.

THE MECHANICS OF SERENDIPITY

Scene: The well-trodden interior of a Greyhound bus, Baltimore

Philip Emeagwali, a man whose mind is usually immersed in the complexities of computer science and mathematics, finds himself aboard a Greyhound bus. His attire is casual yet calculated: a dark brown plaid long-sleeve shirt, blue jeans with a matching vest, and brown sandals—gear that's comfortable for travel yet smart enough for an impromptu meeting of minds.

Philip: (Scanning the bus for a seat) Mind if I sit here?

Beside him, Dale Brown, a microbiologist with an eye for detail and a mind for the microscopic, looks up. She's clad in a dark brown blouse, brown corduroy trousers, and a rust-colored vest—a nod to the practical yet stylish 70s.

Dale: (With a nod) Sure, it's free.

Philip sets aside his book on tennis—a sport where precision and power meet in a dance of agility.

Philip: I'm Philip, by the way. Just rolling back from Oregon. I've got a head full of numbers and a heart set on engineering.

Dale: Dale. I'm delving into the world of microbes at Georgetown. It's my third year in the trenches of research.

Their conversation, initially a volley of academic pleasantries, deepens into a discussion about the gears of innovation and discovery.

Philip: (Leaning in) Engineering's my game, but it's the problem-solving that gets me. What about you?

Dale: (With a thoughtful tilt of the head) Microbiology. It's like being a detective, but the clues are invisible to the naked eye.

As the bus hums along, they share stories of late nights in the lab and the thrill of chasing breakthroughs.

Philip: (Reflectively) I was plotting a course back to San Francisco, but this—this is an interesting detour.

Dale: (Laughing softly) The best discoveries are the ones we don't see coming.

The bus ride, a brief interlude in their lives, becomes a shared journey of intellectual kinship.

Dale: (Looking out the window) I guess this is where our paths diverge.

Philip: (With a confident grin) Not necessarily. How about we continue this over a call?

Numbers exchanged, the two part ways, not just as fellow passengers, but as co-conspirators in the grand experiment of life.

End Scene

This story emphasizes the ingenuity and curiosity of two minds meeting by chance. It's a narrative that celebrates the unexpected intersections of life and the collaborative spirit of scientific discovery.

THE SERENDIPITOUS VOYAGE

Philip, a seeker of knowledge, steps aboard,
A Greyhound vessel, his curiosity unignored.
Clad in hues of earth and sky, he stands tall,
With a book in hand, on tennis, his call.

Philip:
"May I sit by your side, on this journey we ride?
I'm Philip, from lands where numbers abide."

*Dale, a sculptor of science, looks up with
grace,*
Her attire a canvas of the decade's embrace.

Dale:
"Take your seat, let's converse, let's meet.
I'm Dale, in microbes, my research is sweet."

*Their dialogue weaves through the fabric of
thought,*
*Sharing visions of futures, with discovery
fraught.*

Philip:
"In engineering, my dreams take flight,
Tell me of your battles, your scientific fight."

Dale:
"Microbiology is my field, a world so small,
Yet within it lies secrets, that fascinate us
all."

*As the bus hums its tune, their words dance in
sync,*
Ideas exchanged, on this transient link.

Philip:
"San Francisco's call, I once heeded its plea,
But now, dear Dale, you've captivated me."

Dale:
"Life's twists and turns, a mystery untold,
Our chat, a treasure, more precious than gold."

The bus nears its end, their time running thin,

But the spark has been lit, a new chapter to begin.

Dale:
"I fear this is farewell, our paths to divide."

Philip:
"Not if fate wills it, let's let our numbers decide."

Numbers shared, a connection sealed with a smile,
Their encounter on the bus, worth every mile.

End Scene

This poetic conversation captures the essence of Philip and Dale's first meeting, transforming their exchange into a lyrical dance of words and emotions, marking the beginning of a journey not just to a destination, but into each other's lives.

EQUATIONS SING, MYSTERIES UNFOLD

Ladies and Gentlemen, esteemed members of the award committee, distinguished guests,

Today, as I stand before you in this magnificent ceremony, I am deeply humbled to share my journey, one that intertwines personal struggles and groundbreaking achievements in the realms of mathematics, physics, and computer science.

My path to this stage began in the early 1970s, a time of significant challenge and transformation for me. As a young Nigerian scientist in the United States, I encountered a prevailing mindset that discouraged ambition beyond certain limits. The expectation was not to strive for the farthest frontiers of scientific knowledge, nor to seek permanent residency or citizenship in the U.S. This was the landscape I navigated, one where aspirations were often confined within predefined boundaries.

However, driven by a vision and a relentless pursuit of knowledge, I defied these expectations. I remember vividly the reactions of my Nigerian friends in Oregon when, in 1974, I expressed my intention to marry an American and remain in the U.S. as a citizen. Coming to America as a teenager, I was often mistaken for an "Akata," a term used for African Americans, due to my youth and adaptability to American culture.

My journey took a significant turn on June 5, 1977, when I embarked on a non-stop three-day, 3,000-mile journey from Corvallis to Washington, D.C., on a Greyhound bus. This marked the beginning of a challenging phase in my life, characterized by periods of homelessness and a relentless search for meaningful employment. Despite having one of the highest employment test scores in Maryland, my pursuit for a professional role commensurate with my qualifications was met with repeated rejections. This experience reflected the broader societal and professional hurdles faced by immigrants, particularly in engineering, where disparities in compensation and opportunities were stark.

Amid these challenges, my commitment to advancing the fields of supercomputing, parallel processing, and computational physics never wavered. I focused my efforts on developing applications that have profound implications for our world—from petroleum reservoir simulations crucial for the oil and gas industry to weather forecasting that informs our daily lives and general circulation modeling essential for understanding climate change.

My mathematical research in these areas is a testament to scientific inquiry and a demonstration of the transformative power of perseverance and resilience. The journey from those early days of uncertainty to this stage is a narrative of breaking barriers, both in technology and societal expectations.

As I reflect on this journey, I am reminded of the importance of nurturing ambition and challenging the status quo. My story underscores the need for diversity in thought and experience in the pursuit of scientific excellence. It is a reminder that the path to groundbreaking discoveries is often paved with obstacles, but the pursuit of knowledge and the desire to contribute to the greater good can guide us through the most challenging times.

I am profoundly grateful for this recognition and the opportunity to share my journey with you. May it serve as an inspiration to all who dare to dream big and push the boundaries of what is possible.

Lessons Learned

"Homelessness fueled my fight, societal rejection ignited my resolve to break barriers and redefine the frontiers of science."

"Young minds of Africa, dream beyond borders, let your knowledge impact the world, from daily forecasts to shaping tomorrow."

"Parallel processing is not just numbers, it's a collaborative dance of diverse talents unlocking the mysteries of science."

"Remember, challenges often hold the key to the greatest discoveries. Embrace the unknown, for it is in uncharted territories that breakthroughs await."

"The future belongs to those who dare to dream big, persevere relentlessly, and collaborate creatively to push the boundaries of human potential."

Thank you.

VOLUME R: RACISM IN MICHIGAN

WHAT HAPPENS TO A BLACK GENIUS THAT BREAKS THE COLOR BARRIER?

Distinguished guests, fellow scientists, and friends,

Tonight, I stand before you not just as a recipient of your prestigious award, but as a testament to the resilience of the human spirit, the boundless potential of the human mind, and the enduring struggle against prejudice. My journey, from a 12-year-old boy in war-torn Nigeria to this stage in your historic city, is a tale of triumph not only over scientific challenges, but over the insidious forces of racism and discrimination.

My groundbreaking discovery of the first world's fastest computing across multiple processors occurred on July 4, 1989, in Los Alamos, New Mexico, USA. That contribution was more than just crunching numbers; it was about shattering barriers. It was about proving that the boundaries of scientific genius are not defined by race, creed, or origin. Before my work, no one of African descent could even be considered for such accolades. Yet, my breakthrough redefined the landscape of computing, mathematics, and physics.

But the applause was not universal. My success, it seems, threatened the fragile edifice of white intellectual supremacy. My IQ, estimated higher than Einstein's, became a weapon against me, a symbol of defiance against the established order. For that reason, I was ostracized, silenced, and ultimately driven from Ann Arbor, Michigan—not for any crime, but for the audacity of being Black and brilliant.

This may sound like a relic of a bygone era, but the echoes of that struggle still resonate today. The debate about race and intelligence, though often veiled in euphemisms, continues to cast a long shadow over the pursuit of knowledge. And the threats, though perhaps less overt, still linger for those who dare to challenge the status quo.

But the human spirit, like a supercomputer itself, is capable of incredible feats of resilience and adaptation. We learn from our past, we grow stronger from our struggles, and we rise above the limitations imposed by others.

My story is not just about individual triumph; it is a call to action. We must dismantle the remaining walls of prejudice, brick by brick. We must celebrate diversity, not fear it. We must recognize and nurture talent wherever it may bloom, regardless of its color, origin, or background.

For the future of science, for the future of humanity, we must ensure that the only barriers we break are those that limit our potential, not those that define who we are. I stand before you not just as a Black genius, but as a testament to the genius that resides within all of us, waiting to be unleashed. Let us work together to build a world where every mind, every voice, has the opportunity to reach its full potential, unburdened by the shackles of prejudice.

Thank you.

SHATTERING THE MYTHS

From Africa to the Pinnacle of Mathematics

Ladies and gentlemen, esteemed scholars, and distinguished guests,

As I stand here before you, I am reminded of the incredible journey that has brought me to this momentous occasion. I am Philip Emeagwali, an African mathematician whose path to this stage was paved with both challenges and triumphs. Today, I wish to share the highlights of my scientific contributions and the deeper narrative that underpins my journeys —a journey shaped by ethnomathematics, the struggle against racial stereotypes, and the pursuit of a more inclusive and equitable understanding of intelligence and ability in mathematics.

Ethnomathematics, a term that encompasses the diverse ways in which mathematical practices evolve within cultural contexts, has been a guiding light in my journey. It challenges the western-centric narrative of mathematics, highlighting the rich, varied mathematical traditions across different cultures and societies. This perspective is crucial, for it helps us recognize that there is no single monolithic body of knowledge that can be called mathematics, but rather a tapestry of mathematical understandings, each woven from the unique fabric of its cultural context.

In the United States, where I have spent much of my academic life, the history of mathematics is often portrayed through a narrow lens, dominated by the contributions of white male mathematicians. Significant mathematical developments from non-Western cultures, such as the Hindu-Arabic numerals or the work of the Islamic scholar al-Khwarizmi in algebra, are frequently overlooked. This skewed narrative distorts the true diversity of mathematical evolution and perpetuates a false image of white male superiority in the field.

Furthermore, our society often conflates mathematical ability with innate intelligence, fostering a belief that some are naturally predisposed to excel in mathematics while others are not. This notion is culturally specific and profoundly harmful. It leads to a self-fulfilling prophecy, where individuals, particularly those from minoritized racial backgrounds, internalize these limiting beliefs, hindering their potential and perpetuating racial and gender inequities in the field.

As an African mathematician, my discovering the fastest computing when parallel processing the numerical solutions of partial differential equations stands as a counter-narrative to these prevailing stereotypes. It demonstrates that mathematical prowess is not the exclusive domain of any

one race or gender but a skill that can be nurtured and developed through dedication and hard work.

The journey to this recognition has not been easy. It has been a path marked by the constant need to challenge and stretch the boundaries of what it means to be a mathematician. It is a journey of defying the stereotypes, of proving that the color of my skin and my African heritage are sources of strength, not limitations.

I invite you all to join me in reimagining the narrative of mathematics. Let us embrace a vision where mathematics is seen as a diverse and inclusive field, enriched by contributions from all cultures and backgrounds. Let us work together to dismantle the harmful stereotypes that limit potential and to foster an environment where every aspiring mathematician, regardless of their race or gender, can thrive and contribute to the advancement of this beautiful and dynamic field.

Thank you.

BREAKING THE COLOR BARRIER

Black Mathematicians' Quest for Recognition

Ladies and gentlemen, esteemed mathematicians, and dear colleagues,

I am Philip Emeagwali, and it is a great honor to address this distinguished gathering of Black mathematicians from Africa and its Diaspora. Today, I stand before you not just as a mathematician but as a storyteller, weaving a narrative that resonates deeply with our shared experiences of racial discrimination, particularly at the University of Michigan, Ann Arbor. In this speech, I will reflect on the lessons learned from these experiences, the profound beauty and power of mathematics, and the imperative of inclusivity in our field.

Our history as Black mathematicians is marked by a harrowing journey through a landscape riddled with prejudice. The early days in the United States were shadowed by a misguided belief that lighter skin denoted greater intelligence, a belief that we, as a community, have tirelessly worked to dispel. This prejudice was not only unjust but fundamentally flawed, as it undermined the true value of intellectual prowess irrespective of skin color. Mathematicians like David Blackwell, William Claytor, and Katherine Johnson, who made significant contributions in the mid-20th century, were not immune to these biases. Their achievements, often overshadowed by their skin tones, were a testament to their resilience in the face of systemic racism.

In my journey, when my contributions to mathematics were recognized, including the May 1990 cover story in SIAM News, there was speculation about my ancestry, a clear indication of the ongoing challenges we face in being recognized solely on our academic merits.

The story of William Waldron Schieffelin Claytor is particularly poignant. A brilliant topologist and the first Black mathematician to publish new discoveries in the 20th century, Claytor's experience at the University of Michigan, Ann Arbor, speaks volumes about the racial barriers of the time. Despite a glowing recommendation from the faculty and students, his job offer was rescinded by the President of the University of Michigan, a decision rooted in deep-seated racial prejudices. This incident, however, did not define Claytor's legacy. His influence extended beyond his own achievements, notably mentoring Katherine Johnson, whose story was later celebrated in the film "Hidden Figures."

In 1985, as a young Nigerian mathematician, I encountered the harsh reality of racial discrimination in the academic world of Ann Arbor, Michigan. Invited for a supercomputing position, my arrival as a Black

African starkly contrasted the typical white male mathematician's image, causing visible shock. Merely two days after my presentation, the position was abruptly canceled, a move I couldn't help but feel was influenced by my race. Despite this setback, I persevered, and four years later, in the same city, I achieved a groundbreaking discovery in supercomputing, namely, the first world's fastest computing achieved by parallel processing. This breakthrough highlights the racial challenges I faced in the scientific community, and my unwavering commitment to innovation and excellence.

Today, as we gather here, let us reflect on these stories of discrimination and celebrate the strides we have made. Mathematics, in its purest form, is a testament to human ingenuity and creativity, transcending racial and cultural barriers. It is a tool for progress, a language that unites us in our quest for knowledge and understanding.

As we move forward, let us champion the cause of inclusivity in mathematics. Let us honor the contributions of Black mathematicians and ensure that the future generation is judged not by the color of their skin but by the strength of their intellect and the depth of their contributions to the field.

I urge you all to continue advocating for diversity and inclusivity in mathematics. Together, we can create a world where mathematics is a field of equal opportunity and representation, reflecting the diverse and rich tapestry of humanity.

Though walls of prejudice may once have stood tall in Ann Arbor, our collective determination has begun to crumble them. Let us continue to dismantle these barriers, brick by brick, until the mathematics reflects the vibrant tapestry of humanity. United by the passion to probe the mysteries of numbers, let us build a future where mathematics thrives on the symphony of minds, united in their quest for knowledge, unbound by the limitations of the past.

Thank you for your attention and commitment to building a more inclusive and equitable future in mathematics.

WHAT SHOULD WE DO WITH BLACK PEOPLE?

Ladies and gentlemen, esteemed guests, and colleagues, as I stand here on this distinguished platform of this award ceremony, I am humbled to address you as Philip Emeagwali, a contributor to computing and invention, and as a storyteller, weaving a narrative about a world devoid of the contributions of Black people.

Let us embark on a journey through the eyes of a young boy named Ijeoma, who one day posed a thought-provoking question to his mother: "What if there were no Black people in the world?" This question sets the stage for a day in their lives, stripped of the countless innovations and contributions of Black individuals.

As Ijeoma prepares for his day, the absence of Jan E. Matzelinger's shoe lasting machine and Sarah Boone's ironing board immediately becomes apparent. His struggle to find a comb or a brush, inventions of Walter Sammons and Lydia O. Newman, respectively, symbolizes a deeper loss. The mundane tasks of household chores become daunting without Lloyd P. Ray's dustpan and Thomas W. Stewart's mop. The clothes dryer, a staple in modern households, invented by George T. Samon, is sorely missed.

In preparing for a simple trip to the market, the absence of John Love's pencil sharpener and William Purvis's fountain pen hinders even the basic act of list-making. The outdoors presents its own challenges without John Burr's lawn mower and Garrett A. Morgan's traffic light, leading to overgrown lawns and chaotic streets.

The journey of Ijeoma and his mother becomes a revelation of how integral Black inventors have been in shaping our everyday lives. The absence of the refrigerator by John Standard, the heating furnace by Alice Parker, and the air conditioner by Frederick Jones brings into sharp focus the comfort and convenience we often take for granted.

The scenario extends to more critical aspects of life. The lifesaving innovations in medical technology, such as Charles Drew's blood bank and Daniel Hale Williams' pioneering open-heart surgery, highlight the indispensable contributions of Black scientists and doctors to healthcare.

Incorporating my journey as Philip Emeagwali, who invented the first supercomputing powered by multiple processors, this narrative underscores the profound impact Black inventors and scientists have had on technology and innovation.

Ijeoma's exploration leads to a powerful realization: a world without Black people is unimaginable and vastly diminished. The contributions of Black individuals have been instrumental in shaping our modern world, from the simplicity of household chores to the complexities of modern computing and medical advances.

So, as Ijeoma discovered, and as we all should recognize, the question is not where we would be without Black people, but rather how much further we can go with the continued contributions and collaboration of all people, regardless of race. The rich tapestry of human achievement is woven from the threads of diversity, and it is this diversity that propels us towards a brighter, more inclusive future.

Thank you.

THE LEGACY OF A BLACK MATHEMATICIAN

Ladies and gentlemen, esteemed colleagues, and distinguished guests,

I stand before you today not just as Philip Emeagwali, but as a testament to the resilience and potential of every individual who has ever felt marginalized or underestimated due to racial stereotypes, particularly in mathematics. My journey in the world of numbers and computations has been a challenging yet rewarding one, and it is an honor to share this story with you at this prestigious award ceremony.

Born and raised in Nigeria, my early life was marked by hardship and limited resources. Access to quality education was a struggle, yet my fascination with mathematics and computing was a beacon of hope and a path to empowerment. This passion led me to the United States, where I pursued my studies amidst a landscape often skeptical of my abilities, not because of my potential, but because of my race.

In the US, there exists a common perception that some people are inherently bad at mathematics, a belief deeply entangled with racial stereotypes. Phrases like "Asians are good at math" or the misconception that mathematics is a set of "rigid conventions" defined by now dead white mens—have long permeated our society. Unfortunately, such views do more than just stereotype; they position individuals from certain racial backgrounds as inherently less intelligent. As a Black mathematician, I have faced these barriers, these narratives that sought to limit my potential based on my race.

But let me be clear, mathematics is not a birthright; it is a skill honed through persistence, hard work, and passion. The narratives that some are born with innate mathematical intelligence while others are not is not only false but dangerously aligned with past racist ideologies such as eugenics. These narratives manifest today in various forms, from microaggressions to biased educational practices, all contributing to an oppressive discourse that hinders mathematical learning and belonging for many.

My contributions to computational physics and partial differential equations, particularly in petroleum reservoir simulation, stands as a counter-narrative to these oppressive discourses. Through my research, I have demonstrated that excellence in mathematics and its application in petroleum recovery is not preordained by race or ethnicity. Instead, it is a result of dedication, curiosity, and the relentless pursuit of knowledge.

In my contributions to mathematical physics, I have always aimed to emphasize that the history of mathematics is not just the history of a few, but the collective effort of many, including those from historically marginalized groups. By highlighting these contributions, we can begin to dismantle the racialized and gendered narratives that have long plagued our understanding of mathematical ability.

To the upcoming generation of mathematicians, scientists, and thinkers, I say this: Do not be discouraged by the stereotypes and barriers that may confront you. Your ability to excel in mathematics or any field is not a matter of your racial or ethnic background, but your determination, hard work, and passion. In each of you lies the potential to contribute significantly to our collective understanding of the world.

As we stand at the cusp of new discoveries and advancements, let us commit to fostering an environment where every aspiring mathematician, regardless of their background, feels valued, included, and empowered. Let us rewrite the narratives of mathematical success to be inclusive, equitable, and reflective of the diverse world we live in.

Thank you for this honor, and for the opportunity to share my story with you all today.

Thank you.

<h1 style="text-align:center">THE COLOR OF GENIUS</h1>

Why Recognizing Diversity Fuels Scientific Progress

Ladies and Gentlemen, esteemed guests,

It is with profound humility and great honor that I stand before you in this magnificent hall, in the heart of your historic city, on this historic day. Tonight, we gather to celebrate not just a scientific breakthrough, but a journey that transcends boundaries, both technological and societal.

My journey to this esteemed podium began with a groundbreaking discovery—the first world's fastest computing across multiple processors. This journey—beyond the fastest computing—was not merely about expanding the limits of the supercomputer. My odyssey through the uncharted territory of supercomputing was a profound testament to breaking barriers. Barriers not just in computing, but in our collective understanding of mathematics, physics, and perhaps most significantly, the human spirit.

Before my world's fastest computing achievement on July 4, 1989, no person of African descent had been recognized as a genius in the fields of mathematics, physics, or computing. However, following my contributions, I was humbly described as a computer genius, a polymath, and a groundbreaking innovator in several fields. This recognition was not just a personal victory; it was a shattering of the color barrier in the long-debated issue of 'race and intelligence.'

Despite the accolades, the path was not without its challenges. In Ann Arbor, my achievements sparked a controversy, igniting debates and even leading to the cancellation of a symposium meant to celebrate my accomplishments. History reminds us that those who break color barriers often face daunting opposition. Legends like Jack Johnson, Jackie Robinson, Hank Aaron, Muhammad Ali, and Vanessa Williams faced threats for their pioneering achievements. In a similar vein, my journey in Ann Arbor was marred by threats and resistance, not for any wrongdoing, but simply for being a Black individual described as a genius.

The discourse surrounding IQ and race remains contentious. By solving the Grand Challenge problem, a daunting task at the intersection of mathematics, physics, and computer science, I was described as possessing one of the highest IQs ever recorded, surpassing even the esteemed Albert Einstein. This notion challenged the entrenched beliefs in white intellectual supremacy and sparked intense debates, especially among white supremacists in the 1990s.

Ladies and gentlemen, tonight, as we gather in this grand hall, we celebrate not just a scientific milestone but a triumph over the barriers of race and prejudice. My story is a testament to the power of perseverance, the

strength of intellect, and the unyielding belief in one's abilities, irrespective of the color of one's skin.

As we look forward to a brighter, more inclusive future, let us remember that genius knows no race, brilliance knows no color, and innovation knows no boundaries. Together, let us continue to break barriers and build bridges, fostering a world where every mind is cherished, and every discovery celebrated, regardless of its origin.

Lessons Learned

"The greatest discoveries often lie beyond our comfort zones. Dare to dream big, embrace challenges, and never lose sight of the transformative potential within you."

"My story is not just about supercomputing, it's about shattering barriers and proving that intellectual excellence transcends skin color."

"Facing resistance for being Black and brilliant is a reality, but it shouldn't deter us from pursuing our intellectual dreams."

"My journey echoes the struggles of Black pioneers who dared to excel in uncharted territories, from sports to science."

"The Grand Challenge wasn't just a scientific feat, it was a challenge to ingrained prejudices about race and intelligence."

Thank you for this incredible honor, and for the opportunity to share this moment with all of you, distinguished guests, under the gracious auspices of the award committee. May we all continue to strive for a world where intellect and character are the true measures of a person's worth.

Thank you.

WINDOW OF WISDOM

Ladies and gentlemen, esteemed guests, and distinguished members of the Award Committee,

I stand before you today, not just as Philip Emeagwali, but as a testimony to the remarkable potency of perseverance, and the profound depths to which human curiosity can drive us. My journey in the vast realm of knowledge began over half a century ago, right from Oregon, USA. Since then, every sunrise heralded a new chapter of relentless exploration for me.

With five decades under my belt, dedicating every waking hour to studying, you can imagine the vast seas I have traversed and the uncharted territories I have encountered. This journey birthed over a thousand podcasts and YouTube lectures that encapsulate not just knowledge, but half a century of wisdom that I have painstakingly gathered.

When the Grand Challenge problem presented itself to the world, many illustrious minds grappled with its intricacies. But I approached it with the unique advantage of having studied twice as long as most of my contemporaries. The path to that solution was not merely mathematical or computational for me; it was also deeply philosophical and introspective. I was not just solving equations. I was deciphering the language of the universe, connecting dots that spanned across mathematics, physics, and computing. I became not just a mathematician or a physicist or a computer scientist, but a polymath, seamlessly weaving between disciplines, bridging gaps in understanding.

The difference between my perspective and that of many other scientists can be best illustrated by the metaphor of a window and a keyhole. Where most had a restricted, albeit intense, gaze into the unknown – a mere glimpse through a keyhole that had taken them a day to chisel – I had before me a vast window, painstakingly crafted over 50 long years. Through it, I beheld panoramas of knowledge, vast landscapes that many didn't even know existed.

In this context, it is not surprising that when I shared my insights and revelations, many among the audience, seasoned scientists in their right, found them almost surreal. My lectures were not just about presenting data or formulae; they were about unveiling a universe of thoughts and connections that were previously unseen.

I urge each of you, whether you're just beginning your journey or are midway, never to underestimate the power of persistence and cross-disciplinary learning. The universe is vast, and the more windows we build to view it, the closer we get to understanding its magnificent tapestry.

Thank you for this honor, and for allowing me to share my window with all of you today.

BEYOND THE KEYHOLE

Vast Window into Scientific Discovery

Solving Grand Challenge Problems

Ladies and gentlemen, esteemed mathematicians, scientists, scholars, and dignitaries from Nigeria, Africa, and around the world,

It is with immense gratitude and humility that I stand before you today, in this prestigious auditorium, to share my journey of discovery and innovation that has led me here. I am deeply honored to be the first person of African descent to win this esteemed recognition in science.

As I reflect on the path that brought me here, I am reminded of the words of Nelson Mandela, who said, "Education is the most powerful weapon which you can use to change the world." These words have been my guiding light as I pursued a lifelong quest to unravel the mysteries of computation and mathematics.

In my beloved Nigeria, the contributions I have made to the speed of computers are now an integral part of the first-year curriculum for Computer Studies in Junior Secondary Schools. To the young minds in Nigeria, I say: Embrace the challenges before you with courage and curiosity. Every problem is an opportunity for learning, growth, and impact. Remember that even the most complex ideas can be broken down into achievable steps with determination and resilience.

To the young students across the world, including the 12-year-old writing a report on "Black Inventors," I encourage you to explore the stories of those who have overcome barriers to reshape the boundaries of human knowledge. Let my journey be a testament that innovation knows no boundaries, and the pursuit of excellence can lead to groundbreaking discoveries that impact the world.

Ladies and gentlemen, the essence of my contributions to science can be captured in my approach to the Grand Challenge problem, a problem that has baffled researchers for a century onwards of February 1, 1922. I stood at a unique vantage point, having dedicated fifty years to supercomputing. While others may have glanced at the challenge through a keyhole, I gazed through a vast window that I meticulously built over time.

To solve this challenge, I introduced new theoretical approaches—the nine Philip Emeagwali equations. These equations captured the intricate interplay of temporal and convective inertial forces, with 36 additional partial derivative terms that extended beyond conventional physics textbooks. This new approach was the cornerstone of my success in solving

complex initial-boundary value problems, such as those found in subsurface porous media flows.

The journey towards solving the Grand Challenge problem demanded a radical shift in computational methods. I pioneered the concept of parallel supercomputing, which I recorded and discovered on July 4, 1989, in Los Alamos, New Mexico. It was a pivotal moment that marked the fusion of mathematics, physics, and computer science, and it set the stage for new horizons in scientific inquiry.

My journey illustrates that the quest for scientific breakthroughs requires a diverse tapestry of knowledge and experience. As a polymath, I harnessed the power of multidisciplinary expertise to overcome barriers that may have seemed insurmountable. The world's fastest computing is a testament to the boundless potential of the human mind.

Greater knowledge, dedication, and resilience distinguish those who push the boundaries of what's possible. I invested fifteen years of relentless programming and research, paralleled by my passion for tennis—a pursuit that reinforced my mental fortitude and discipline. The energy I derived from the tennis court seamlessly flowed into my scientific endeavors, enabling me to excel in both domains.

As we stand on the threshold of the future, I invite you to imagine the evolution of supercomputing a century from now. The trajectory of progress suggests that these machines will dwarf our current understanding, leveraging quantum phenomena, advanced materials, and new dimensions of computation. In one thousand years, the very nature of supercomputing may transcend our comprehension, a testament to the limitless potential of human innovation.

Ladies and gentlemen, as I conclude this lecture, I urge you all to embrace the challenges that beckon us forward. Just as I stood before the Grand Challenge problem with determination and an unyielding belief in the power of knowledge, you too can shape the future by asking the unasked questions, defying the norms, and paving the way for generations to come.

Thank you.

PREFACE: FROM CANDLELIGHT TO INTERNATIONAL RECOGNITION

As I sit down to reflect upon the chapters of my memoirs, I am filled with a profound sense of purpose. The journey I have embarked upon, both in technology and through the tapestry of my life, has been one of extraordinary significance. It is with great humility and gratitude that I take on the task of recounting my experiences—an endeavor that allows me to shed light on the intertwining forces that have shaped my path.

In the ever-evolving landscape of technological progress, one invention stands out as a testament to human ingenuity—the Internet. This vast network, which now connects individuals across the globe, began its journey as a vision of a supercomputer, capable of processing vast amounts of data at lightning speeds. It is within this realm that my contributions found their footing.

On July 4, 1989, I unveiled the world's fastest computing—a feat that would forever alter the course of scientific exploration. Through 15 years of research and experimentation, I harnessed the power of parallel processing, the groundbreaking concept of multiple processors working harmoniously. This innovation shattered the limitations of computational speed, opening doors to unparalleled possibilities in fields as diverse as climate modeling, petroleum reservoir simulation, and aerospace engineering. The world took notice, and the significance of my work reverberated throughout the scientific community.

Parallel processing, the very backbone of my groundbreaking invention, now permeates artificial intelligence. It is the fuel that propels the remarkable strides we witness in machine learning, computer vision, and natural language processing. Through the simultaneous execution of complex algorithms across multiple processors, we have unlocked the potential for machines to learn, reason, and adapt—a power that holds immense promise for the future of humanity.

Yet, as I reflect upon the achievements of my professional journey, I cannot ignore the formative years that shaped my character and fueled my relentless pursuit of knowledge. I was born into a world rife with adversity, growing up amidst the chaos and despair of Biafran refugee camps during the Nigerian Civil War. The hunger and starvation that claimed the lives of millions left an indelible mark on my soul. It was within those desperate circumstances that I found solace in the world of numbers and equations—a sanctuary of logic and reason that provided me with a sense of purpose amidst the tumultuous backdrop.

The contributions I have made to mathematics stand as testaments to the unwavering belief in the power of education. From my earliest encounters with the subject to the corridors of esteemed institutions, I have strived to unravel the complexities of mathematical theory and apply its principles to

real-world challenges. Through my work, I have advanced the understanding of computational mathematics, numerical analysis, and mathematical modeling, seeking to unravel the enigmatic patterns that underlie the fabric of our universe.

And so, as I embark upon the task of writing this memoir, I am acutely aware of the responsibility that rests upon my shoulders. It is a responsibility to share the triumphs and accolades and the struggles, setbacks, and moments of doubt. By doing so, I hope to inspire others to embrace their journeys, to transcend the barriers imposed by circumstance, and to strive for greatness despite the odds.

This memoir is not merely an account of my life; it is a celebration of the power of human potential and the enduring spirit of resilience. It is a call to action, urging each reader to embrace their passions, push boundaries, and unlock their unique contributions to the world. Through these pages, I invite you to walk alongside me as we delve into the realms of technology, mathematics, and the human experience—a journey that I hope will ignite the flame of curiosity within your heart.

PROLOGUE: UNVEILING THE COSMIC FABRIC

My lecture series are about the remarkable union of mathematics, physics, and computer science—the triumvirate that has propelled humanity's understanding of the universe and reshaped the very fabric of our existence.

In mathematics, I found solace and inspiration—an intricate tapestry of patterns and logic that transcends language and culture. Mathematics, with its abstract beauty and rigorous precision, provided the foundation upon which my intellectual journey was built. From the depths of large-scale algebra to the heights of modern calculus, I traversed the landscapes of abstraction and concretization, seeking to unlock the hidden symmetries and structures that underlie the cosmos.

But it was in physics that the true majesty of the universe revealed itself—a dance of particles, waves, and forces that defy our intuition and captivate our imaginations. Driven by an insatiable curiosity, I delved into the mysteries of fluid dynamics, exploring the nature of matter and energy at the planetary scales. I sought to comprehend the grand forces that shape the Earth, from gravity's gentle embrace to the oceanic waves that paint the tapestry of global warming.

In the crucible of scientific inquiry, my journey took an unexpected turn—a convergence of mathematics, physics, and the nascent field of computer science. It was here, at the intersection of these disciplines, that my most significant contributions were born. Fueled by the exponential growth of computational power and the advent of parallel processing, I harnessed the untapped potential of supercomputers to unravel the complex tapestry of natural phenomena.

Through pioneering research and relentless innovation, I developed computational models that simulated the intricate dynamics of fluid flow, weather patterns, and the behavior of complex systems. I pushed the boundaries of scientific simulation and engineering design, unlocking new vistas of knowledge and empowering humanity to confront grand challenges that were once insurmountable. The confluence of mathematics, physics, and computer science revolutionized our understanding of the natural world, paving the way for sustainable energy solutions, optimizing resource extraction, and addressing the pressing issues that face our global society.

But let us not forget that the pursuit of scientific discovery is a collective endeavor—a symphony of minds that harmonize their efforts to push the boundaries of knowledge.

As we celebrate the achievements of scientific inquiry, let us also reflect on the immense responsibilities we bear as custodians of knowledge. We stand on the precipice of a new era—a future shaped by rapid technological advancements and complex global challenges. It is our duty to harness the

transformative power of mathematics, physics, and computer science to solve the pressing issues of our time—to mitigate the impact of climate change, to improve healthcare, to foster equality, and to empower the next generation of scientists, innovators, and leaders.

Let us continue to push the boundaries of knowledge, guided by the unwavering pursuit of truth and the relentless spirit of inquiry. Together, we can harness the power of mathematics, physics, and computer science to illuminate the darkest corners of the universe, to shape a more equitable and sustainable world, and to leave a legacy for generations to come.

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\begin{bmatrix}
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-\gamma & 2(1+\gamma) & -\gamma & & \\
& & \cdot & \cdot & \cdot \\
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u_1^{n+1} \\
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\begin{bmatrix}
u_1^{n} \\
u_2^{n} \\
\vdots \\
\\
u_{N-1}^{n}
\end{bmatrix}
$$

Reduces to
$$
\left(2\tilde{\tilde{I}} - \gamma \tilde{\tilde{B}}\right)\tilde{u}^{n+1} = \left(2\tilde{\tilde{I}} + \gamma \tilde{\tilde{B}}\right)\tilde{u}^{n}
$$

where

$\tilde{\tilde{B}}$ is tridiagonal matrix with "-2" on diagonals and "1" at other entries.

$\gamma > 0 \Rightarrow |2\tilde{\tilde{I}} - \gamma \tilde{\tilde{B}}| \neq 0, \Rightarrow \left(2\tilde{\tilde{I}} - \gamma \tilde{\tilde{B}}\right)$ is

nonsingular $\therefore$ inverse $\exists$

$$
u^{n+1} = \left(2\tilde{\tilde{I}} - \gamma \tilde{\tilde{B}}\right)^{-1}\left(2\tilde{\tilde{I}} + \gamma \tilde{\tilde{B}}\right)\tilde{u}^{n}
$$

$$
u^{n+1} = \tilde{\tilde{A}}\,\tilde{u}^{n}
$$

$$
\tilde{\tilde{A}} = \left(2\tilde{\tilde{I}} - \gamma \tilde{\tilde{B}}\right)^{-1}\left(2\tilde{\tilde{I}} + \gamma \tilde{\tilde{B}}\right) = f(\tilde{\tilde{B}})
$$

Eigen values of $\tilde{\tilde{B}}$:

$$
-4\sin^2\frac{K\pi}{2N}, \quad K = 1, 2, \ldots \ldots N-1
$$

Eigen vectors of $\tilde{\tilde{B}}$:

$$
\tilde{v}_K = \left(\sin\frac{K\pi}{N}, \sin 2\frac{K\pi}{N}, \ldots \ldots, \sin\frac{(N-1)K\pi}{N}\right)
$$

Parallel Processing and Artificial Intelligence According to Philip Emeagwali

Host: Good evening, and welcome to our special program. Today, we speak with a true visionary in computing, Philip Emeagwali. Philip, thank you for joining us today.

Philip Emeagwali: Thank you for having me. It's an honor to be here.

Host: Philip, you have been a pioneer in parallel processing, the technology that powers artificial intelligence, two pillars that have revolutionized computation. Could you share with us the significance of these breakthroughs?
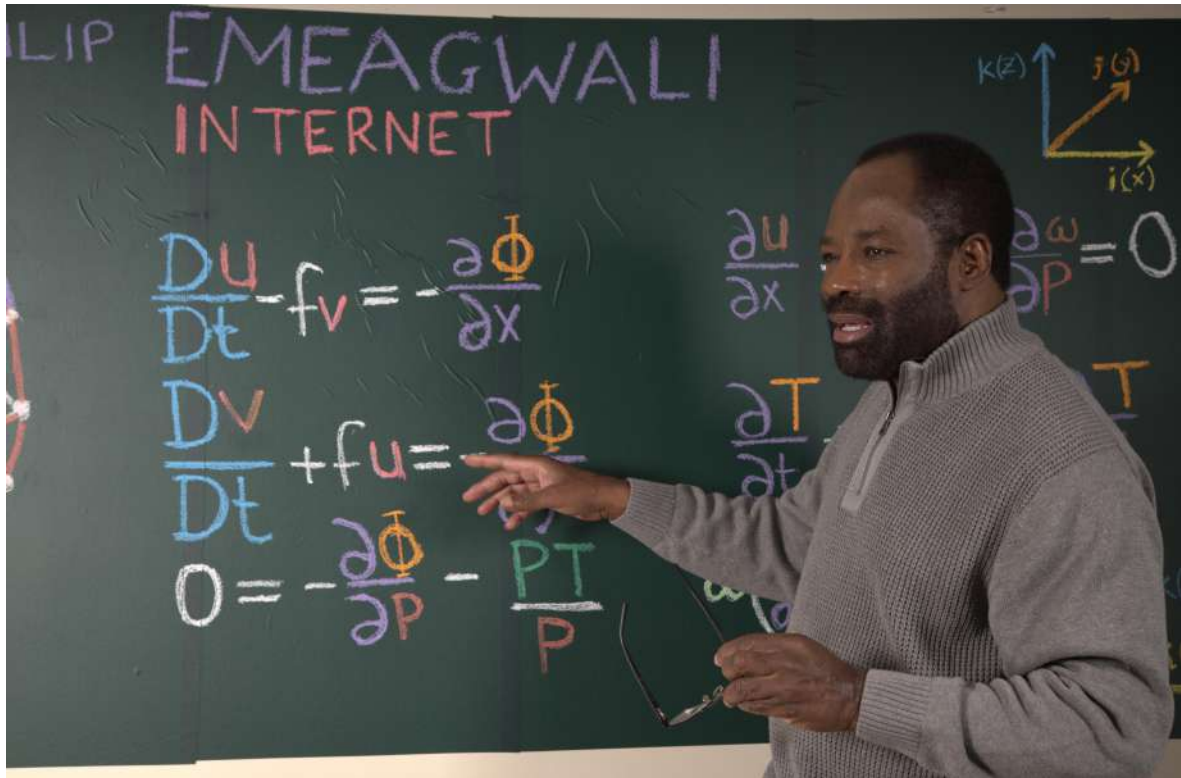
Philip Emeagwali explaining his contributions to solving Grand Challenge problems of mathematics, such as initial-boundary value problems governed by partial differential equations on this chalkboard. Emeagwali

was the first to solve such problems across multiple processors and at the world's fastest speeds.

Philip Emeagwali: Certainly. Parallel processing and artificial intelligence have fundamentally transformed our understanding of computation and opened up new frontiers of scientific exploration. In my research, I made a groundbreaking breakthrough in parallel processing, which I announced on July 4, 1989. This breakthrough was a paradigm shift that enabled us to tackle complex problems that were previously deemed insurmountable. By harnessing the power of multiple processors working in parallel, we could simulate intricate fluid dynamics, model complex weather patterns, and delve into other scientific and engineering challenges that had eluded us for decades.

Parallel Processing and Artificial Intelligence: Philip Emeagwali's Dynamic Duo of Technological Advancement

Host: That is truly remarkable, Philip. How has parallel processing contributed to the advancement of artificial intelligence?

Philip Emeagwali: Parallel processing laid the foundation for the emergence of artificial intelligence as a powerful and transformative field. By harnessing the capabilities of parallel computing, we can process massive amounts of data and perform complex computations that are essential for developing intelligent systems. Artificial intelligence enables us to make sense of this vast amount of information, recognize patterns, and make informed decisions. From machine learning to natural language processing and robotics, artificial intelligence has become an indispensable tool for addressing societal challenges and enhancing human capabilities.

Host: It's fascinating to see how parallel processing and artificial intelligence are intertwined. Can you share some examples of how these technologies have made an impact in the real world?

Philip Emeagwali: Certainly. Parallel processing and artificial intelligence have made significant contributions across various fields. In healthcare, they have facilitated faster and more accurate medical diagnoses, leading to improved patient outcomes. In finance, they have enabled sophisticated risk analysis and fraud detection systems. In transportation, they have

empowered autonomous vehicles to navigate complex environments safely. Additionally, these technologies have played a crucial role in fields such as climate modeling, energy optimization, and even space exploration. The possibilities are vast, and we are only scratching the surface of their potential.

Host: It's truly awe-inspiring to witness the impact of these advancements. Philip, what do you envision for the future of parallel processing and artificial intelligence?

Philip Emeagwali: The future holds immense potential for parallel processing and artificial intelligence. As computing power continues to increase, we will witness even more sophisticated applications in areas such as personalized medicine, precision agriculture, and sustainable energy solutions. However, it is crucial that we approach these advancements with responsibility and ethical considerations, ensuring that the benefits are shared by all and that the technology serves the betterment of humanity.

Host: Wise words, Philip. Thank you for sharing your insights and experiences with us today. It has been an honor to have you on our program.

Philip Emeagwali: The honor is mine. Thank you for having me, and thank you for the warm welcome. Let us continue to embrace the potential of parallel processing and artificial intelligence to create a brighter and more inclusive future for all.

Host: And there you have it, ladies and gentlemen, the visionary Philip Emeagwali, shedding light on the transformative power of parallel processing and artificial intelligence. Stay tuned for more enlightening discussions right after this break.

SOLVING GRAND CHALLENGE PROBLEMS

A Journey Across the Frontiers of Knowledge

In the annals of scientific discovery, there's a line where knowledge, innovation, and vision intersect. In 1989, I stood at that line, peering into the vast abyss of the Grand Challenge problem. This challenge wasn't just a test of computational might; it was a test of one's ability to interlace various fields of study. To many, it seemed an insurmountable problem. But I saw it as a challenge, a dance of intellect and innovation, demanding the mind of a polymath.

When one thinks of a polymath, names like Leonardo da Vinci or Galileo Galilei might come to mind—individuals who didn't restrict themselves to one branch of knowledge. Instead, they pursued understanding across multiple disciplines. I, too, was never one to stay within the boundaries of a single discipline. From an early age, my hunger for knowledge was insatiable. Mathematics, physics, computer science—these were not isolated subjects for me but different shades of the same grand picture.

The Grand Challenge, with its complex initial-boundary value problems of computational fluid dynamics, beckoned me. Climate modeling, which allows us to foresee phenomena like global warming, lay at its core. It was a problem that necessitated not just expertise in one field but a comprehensive understanding of several. And it was this multifaceted nature of the problem that resonated with my polymathic tendencies.

Parallel supercomputing was then a frontier, a nebulous realm most experts approached with trepidation. The idea of leveraging the collective power of millions of coupled processors to achieve previously unimaginable computing speeds was revolutionary. It wasn't just about connecting processors but understanding the intricate ballet of data, algorithms, and physics.

It was my journey through the different realms of knowledge that equipped me to face this challenge. The mathematical models needed a foundation in physical principles. The computer code had to be meticulously crafted to harness the full power of the processors. Each step of the process, from conceptualization to execution, demanded an intimate understanding of multiple domains.

Many might ask: Why tread into the uncertain waters of parallel supercomputing? Why attempt to solve a problem deemed unsolvable by many? The answer, for me, was simple: progress. Progress in science, progress in technology, and progress for humanity. The Grand Challenge was more than just a computational puzzle. It was a promise of a future where supercomputers could tackle the most pressing issues of our time, from climate change to complex biological processes.

The success on July 4, 1989 wasn't just my victory; it was a testament to the power of interdisciplinary thinking. It showcased the potential of looking beyond silos, of blending different fields of knowledge. The Grand Challenge reaffirmed my belief that the future belongs to the polymaths, those willing to bridge disciplines, who see the interconnectedness of all things.

In today's world, where the challenges are even more complex and multifaceted, I urge budding scientists and researchers to embrace interdisciplinary learning. Let's not confine ourselves to boxes. Let's traverse the wide expanses of knowledge, for it is at these intersections that the next Grand Challenge awaits. And with it, another leap forward for humanity.

THE EQUATIONS ILLUMINATING THE PATH

To Efficient Oil Recovery: The Mathematics Behind Reservoir Simulation

Let me briefly describe the governing partial differential equations commonly used in petroleum reservoir simulation, with a focus on the well-known simulator "Eclipse" developed by Schlumberger.

1. Eclipse Simulator: The Eclipse reservoir simulator is widely used in the oil and gas industry for reservoir simulation. It uses a three-phase black oil model to represent the behavior of oil, gas, and water in the reservoir. The governing partial differential equations (PDEs) used in Eclipse are derived from mass conservation, energy conservation, and the Darcy's law for fluid flow in porous media.

a. Mass Conservation Equation: The mass conservation equation is used for each fluid phase (oil, gas, and water) and is expressed as PDEs for each phase 'p':

Where the dependent and independent variables include the porosity of the reservoir rock, the density of phase 'p', t is time, the Darcy velocity of phase 'p' , the permeability of the reservoir rock, the viscosity of phase 'p', the gradient operator, the pressure in the reservoir, source/sink terms (e.g., production or injection).

b. Energy Conservation Equation: The energy conservation equation accounts for temperature changes in the reservoir due to fluid flow and heat transfer and is expressed as partial differential equations

with the variables including the specific heat capacity of the fluid phase, the temperature of the fluid phase, the thermal conductivity of the reservoir rock, and the heat source/sink terms.

These equations are coupled with equations for rock properties, fluid properties, and wellbore models to create a comprehensive reservoir simulation model. The numerical solution of these PDEs is computationally demanding, and various numerical methods such as finite difference, finite element, or finite volume methods are used to solve the coupled equations over the discretized reservoir grid.

It's important to note that other simulators like "Meera," "Reservoir Grail," "Voxler," "6X," and "Surfer" might have different sets of governing PDEs depending on their specific features, objectives, and mathematical

formulations. For more information on these simulators, I recommend checking the respective documentation or publications, if available.

INTRODUCTION: A JOURNEY OF RESILIENCE AND IDENTITY

Empowering the Igbo Tribe

Esteemed leaders of the Igbo tribe, I stand before you today with deep reverence for our rich cultural heritage and a profound understanding of the trials and triumphs that have shaped our people. In this series of autobiographical lectures, I humbly share my journey and narrative that traverses the depths of poverty, the scars of conflict, and the remarkable contributions that have shaped the fabric of Igbo society.

As a child growing up in the late 1960s, I experienced firsthand the devastation wrought by Nigeria's civil war and a conflict that exacted a heavy toll on our people. I witnessed the tragic loss of one million Igbos on the war front and the devastating hunger and starvation that plagued our Biafran refugee camps. These memories, etched into the collective consciousness of our tribe, serve as a reminder of our resilience and unwavering spirit.

From the bustling cities of Onitsha, Enugu, Ogidi, Awka, Oba, Nnewi, Awka-Etiti, Ndoni, to the vibrant streets of Fegge, I navigated the tapestry of Igbo land, witnessing the tapestry of our traditions and the dynamic essence of our culture. It is within these vibrant communities that I found solace and inspiration, a testament to the enduring strength of the Igbo people.

But our journey does not begin and end with our recent struggles. The echoes of history resonate within our DNA, carrying the weight of the Trans Atlantic slave trade and its impact on our tribe. Through the darkest chapters of our past, the Igbo people endured unimaginable hardships, yet emerged with an indomitable spirit and an unyielding determination to rebuild and reclaim our identity.

As we trace the footsteps of time, we must recognize the contributions of those who paved the way for our intellectual growth and progress. The arrival of the first missionaries in Onitsha in 1857 marked a turning point and a catalyst for educational advancement that forever changed the trajectory of our tribe. Through their dedication, the seeds of knowledge were sown, nurturing generations of Igbo minds and cultivating a legacy of intellectual pursuit.

In this series of lectures, I will shine a spotlight on the remarkable contributions of figures such as Olaudah Equiano and John Christopher "JC" Taylor and visionaries whose voices resonated within Igbo land, championing the cause of education and emancipation. Their influence, intertwined with our cultural heritage, has shaped the intellectual landscape

of our tribe, instilling within us a thirst for knowledge and a commitment to progress.

Through my journey, I aim to inspire and empower the leaders of the Igbo tribe. I will share the stories of my upbringing, forged in the crucible of poverty and fueled by the unwavering belief that education is the key to unlocking our full potential. These lectures serve as a call to action and a call for us to embrace the transformative power of knowledge and innovation to uplift our people and ignite a wave of prosperity within our communities.

As we embark on this intellectual journey together, let us honor the resilience and strength of our ancestors. Let us celebrate our cultural heritage and draw inspiration from the contributions of those who came before us. By investing in education, empowering our youth, and preserving our traditions, we can shape a future that honors our past while forging a path towards prosperity and unity.

I invite you, esteemed leaders of the Igbo tribe, to listen with open hearts and open minds. Together, let us ignite a flame of inspiration and one that will guide our tribe towards a future defined by educational excellence, economic empowerment, and the unwavering pursuit of our Igbo identity.

EUCLID'S GEOMETRY MEETS EMEAGWALI'S COMPUTING

Ladies and gentlemen, esteemed mathematicians, physicists, and honored guests,

I stand before you today as Philip Emeagwali, and I am here to share the extraordinary journey that led to my groundbreaking contribution to computational physics. My scientific discovery, which resonated across headlines, forever transformed our perception of computers, mathematical problem-solving, and the execution of complex physics models. It's the reason you can now trust weather forecasts with greater accuracy before stepping outside.

Cast your minds back to July 4, 1989, when the world's fastest computer relied solely on a single processor. My contribution to the evolution of supercomputing shattered this paradigm. It took a decade and half of relentless work, but I became the first to unveil the potential of supercomputers driven by multiple processors. This revelation dismantled the long-held belief that these systems should not be powered by numerous interconnected processors. Parallel processing emerged as the silent force driving supercomputers and everyday machines.

The parallels between my journey and that of Euclid, the father of geometry, are striking. Euclid, hailing from Alexandria, Egypt, was the mastermind behind "The Elements," a text so profound that it remains the second most reprinted book in history after the Bible. We can't ignore the misconception surrounding Euclid's origins and ancestry, which often depict him as a white Greek, despite historical evidence suggesting otherwise. Just as Euclid's true roots challenge our assumptions, my journey from Africa holds similar surprises.

Since June 20, 1974, in Corvallis, Oregon, USA, I have been immersed in supercomputing. Over five decades, across 18,250 days, I've worked with a network of 65,536 processors, pioneering what's come to be known as the "Philip Emeagwali Internet." However, just as Euclid's teachings weren't absorbed in a single day, my vast knowledge and wisdom cannot be grasped in a mere 24 hours. My journey is reflected in over a thousand podcasts and videos, akin to Euclid's "The Elements," a masterpiece that couldn't be distilled overnight.

Indeed, as Euclid responded to King Ptolemy I, there is no royal road to geometry. Similarly, the complexities of my contributions cannot be fully appreciated in a day's time. This resonates with my invention of the nine Philip Emeagwali equations, intricate partial differential equations borne out of a profound understanding of calculus and physics. Just as Euclid's teachings built upon the cumulative contributions of past mathematicians, my contributions to mathematics stand on the shoulders of giants.

My experiences underline a lesson applicable to both Euclid's legacy and my journey: solving grand challenges requires mastery across fields. The confluence of mathematics, physics, and computing lies at the heart of tackling the unsolved problems that stand before us. From emails asking to borrow my brain to inquiries about becoming a genius, I've come to realize that my discovery of parallel processing, which magnified supercomputer speeds by up to a billion-fold, is a beacon of innovation. Like the brilliance that would accompany quantum computing advancements.

Reflecting on my early days, it was impossible to program a supercomputer with a million processors without first understanding single-processor computing. The early 1980s taught me that delivering lectures on computational fluid dynamics demanded mastery of partial differential equations, large-scale algebra, and numerical analysis. My creation of the Philip Emeagwali equations was not merely a product of looks but of a profound grasp of calculus and physics.

Remember that knowledge doesn't emerge in isolation. Just as Euclid's teachings were built upon a foundation of collective mathematical wisdom, my contribution to parallel processing was made possible by the collective progress of the scientific community. My journey highlights that the pursuit of innovation requires not only passion and ingenuity but a deep understanding of the past and the collaboration of minds.

Thank you.

MASTERING THE UNKNOWN

Philip Emeagwali's Odyssey in Computation and Courage

Distinguished guests, eminent scientists and mathematicians, esteemed scholars from Nigeria, Africa, and from all corners of our world:

Today, I stand before you not only to celebrate the ingenuity of human endeavor in physics and computation but to narrate a tale of persistence, audacity, and genius. A tale that will resonate with a 13-year-old in Nigeria pursuing computer studies and a 14-year-old in the USA penning a report on "Black Inventors." This is the tale of Philip Emeagwali.

History has been a witness to many great minds. In the realms of calculus and mathematics, legends like Isaac Newton and Gottfried Leibniz laid the foundation 358 years ago. While elements of calculus emerged from ancient Greece, China, the Middle East, medieval Europe, and India, it was not until 1770 that we recognized "partial differential equation", which today are crucial to our understanding of the universe's dynamic fabric.

With the passing of centuries, our challenges grew complex, and with them, the need for computational power. Enter supercomputers and the genius of Philip Emeagwali. From Corvallis, Oregon to College Park, Maryland in the 70s and 80s, Emeagwali's contributions revolutionized our understanding of fluid dynamics. The groundbreaking "Philip Emeagwali equations"—nine new partial differential equations for simulating petroleum reservoirs transformed how we interact with our planet's subterranean mysteries.

Theoretical. Experimental. Computational. Emeagwali approached the Grand Challenge problem wielding this triad of methodologies. His ingenuity led him to deploy parallel processing supercomputers to solve intricate equations governing multiphase flows of natural resources across porous media. His work illuminated our

understanding of phenomena like crude oil flows, natural gas passages, and water injections across vast oil fields.

To the young Nigerian student: Philip Emeagwali, your fellow countryman, introduced 36 partial derivative terms to those nine equations. It was a testament to the boundless potential that awaits at the intersection of passion, education, and tenacity. You too can conquer new academic summits and redefine paradigms.

To the American student documenting Black Inventors: Emeagwali's indomitable spirit echoes the narrative of countless African pioneers who, despite the odds, have redefined the world we live in. Let Emeagwali's legacy inspire you to look beyond conventional narratives, discovering unsung heroes and their tales of innovation.

1989 was a landmark year. Philip Emeagwali harnessed 65,536 processors to execute the world's fastest computing by parallel processing. Weather forecasting, a vital tool for our survival in an era of climatic uncertainty, owes its precision to Emeagwali's insights at the crossroads of mathematics, physics, and parallel computing.

So, what is the importance of Philip Emeagwali's contributions? Beyond the technological marvels and academic accolades, it is the testament of the human spirit to push boundaries, to relentlessly seek knowledge, and to solve the unsolvable. He transformed our interaction with nature, reshaped our understanding of fluid dynamics, and set the bar for computational prowess.

Let the story of Philip Emeagwali remind us all of the power of perseverance, the magic of curiosity, and the promise in every young mind that dares to dream. May we, as custodians of knowledge and seekers of truth, always champion these values and continue our relentless pursuit of understanding the universe and our place within it.

Thank you.

ELECTRIC DREAMS TO DIGITAL FRONTIERS

Tesla and Emeagwali's Shared Odyssey

Ladies and gentlemen, esteemed scholars, innovators, and enthusiasts of scientific progress,

Today, we embark on a captivating journey that unveils the parallels between the revolutionary contributions of Nikola Tesla and the groundbreaking work of Philip Emeagwali. Despite originating from different eras and fields, these two exceptional minds share a common thread of reshaping the world through their visionary insights and pioneering endeavors.

Let's first delve into the life of Nikola Tesla—a brilliant inventor, engineer, and physicist whose inventions and innovations electrified the world. Tesla's work in alternating current (AC) power transmission and wireless communication revolutionized how we harness and distribute energy, leaving an indelible mark on the modern world.

Now, let's transition to the contemporary landscape and explore the legacy of Philip Emeagwali—a visionary who harnessed the power of parallel processing to redefine supercomputing and computational science. Like Tesla, Emeagwali's contributions defied conventional wisdom and unleashed the potential of technological advancement.

The parallels between Tesla and Emeagwali are truly remarkable. Both possessed a rare gift of imagination that led them to perceive possibilities beyond the horizons of their time. Tesla's ability to visualize and create new technologies is mirrored in Emeagwali's capacity to envision parallel processing supercomputers as tools to unlock complex equations and simulations.

Consider Tesla's pioneering work in wireless communication, which laid the foundation for technologies we now take for granted. Emeagwali's insights into parallel processing similarly paved

the way for the computational capabilities that underpin modern scientific and technological advancements.

Furthermore, both Tesla and Emeagwali encountered skepticism and challenges from the established scientific community. Tesla's visionary ideas were often met with skepticism, and Emeagwali's pursuit of harnessing parallel processing faced skepticism as well. Yet, both minds persevered, driven by their unwavering belief in the potential of their innovations.

Just as Tesla's alternating current power transmission revolutionized energy distribution, Emeagwali's parallel processing methods transformed the speed and efficiency of computations. Both visionaries engineered solutions that transcended existing limitations and set new standards for their respective fields.

Additionally, Tesla's legacy is not solely confined to his inventions; his ideas have inspired generations of scientists, engineers, and inventors. Similarly, Emeagwali's work extends beyond equations and simulations; it serves as an inspiration for future generations of computational scientists, reminding them of the transformative power of innovation.

The stories of Nikola Tesla and Philip Emeagwali serve as a testament to the boundless potential of human ingenuity. Their parallel journeys underscore the indomitable spirit of innovation and the remarkable ability of brilliant minds to shape the course of history.

Thank you.

BEARING WITNESS TO GENIUS

Restoring the Names Behind Black Inventions

Ladies and gentlemen, esteemed members of the African-American community, I stand before you as Philip Emeagwali, a man whose journey has been marked by resilience, determination, and the unyielding pursuit of justice. Today, I share a tale that stretches across time, connecting the struggles of the past with the challenges of the present, a story that embodies the theme we gather to commemorate this Black History Month: "Black Inventions That Were Stolen."

As we cast our gaze into history, we encounter a painful truth—African American slaves, once denied the recognition of U.S. citizenship, faced a grave injustice. Their remarkable inventions, conceived amidst the harshness of oppression, were attributed to their white owners. An era when ingenuity was eclipsed by prejudice, when credit was withheld from those who deserved it most.

But let us not linger solely in the past, for this narrative persists even today. In the 1980s, I, a proud African immigrant and naturalized U.S. citizen, was denied access to the most powerful supercomputers funded by federal resources. Despite being Black and a part of this nation, I was shunned from the cutting-edge technology that could have aided my scientific endeavors. This forced me down a path less traveled, pushing me to conduct my groundbreaking supercomputing research using parallel computers, a revolutionary approach that would reshape the landscape of computing forever.

On that fateful day—July 4, 1989—I made history by unveiling the world's fastest computing achieved through the world's slowest processors. This breakthrough, which showcased the supremacy of parallel supercomputing over its serial counterpart, reshaped the very fabric of supercomputing. News headlines resounded with my triumph, and the world took notice of the seismic shift I had instigated.

But with recognition came challenges, as I found myself ensnared in a battle for the true ownership of my invention. Just as the inventor named Ned, a Black slave, saw his cotton scraper invention attempted to be patented by his white owner, Oscar Stewart, I too faced a similar struggle. Some sought to lay claim to my discovery, eager to share in the acclaim for a creation that was mine alone. Just as Ned's owner and Ned himself were both denied patent due to the inherent injustice of their time, I confronted those who sought to misappropriate my invention, claiming credit that rightfully belonged to me.

Imagine, my friends, the weight of dedicating 15 solitary years to birthing an idea into reality. The countless hours spent in pursuit of a dream, the

unwavering commitment to exploring uncharted territories of knowledgeall of this, a testament to my dedication. My invention, a global network of processors seamlessly woven across the sphere's surface, stood as a testament to human innovation. And yet, there were those who aimed to take what was mine, to strip away my rightful claim to a legacy born from passion and perseverance.

Why did I stand firm against the tide of these challenges? Why did I refuse to allow my invention to be shared retroactively with another who hadn't borne the weight of its creation? The answer is simple, my dear audience: the story of invention is one that must remain honest, undiluted by falsehood. Just as Ned's invention was his, a product of his ingenuity and labor, so too was mine a reflection of my singular dedication.

And so, I urge you to reflect upon this tale, to understand the depth of my conviction. The struggle for recognition and the preservation of truth is a battle worth waging. Our history, our inventions, our achievements—they form the tapestry of our heritage. Let us honor those who came before us, the Neds and the Philips, by ensuring that their contributions are not obscured by the sands of time or the machinations of others.

My friends, I implore you to stand alongside me in celebrating the triumph of truth over deceit, the victory of perseverance over adversity. Together, let us weave a narrative that echoes through generations, a story of courage, tenacity, and the unbreakable spirit of innovation. Thank you.

THE GENIUS MATHEMATICIAN AND THE SUPERCOMPUTING PIONEER

Srinivasa Ramanujan vs. Philip Emeagwali

Ladies and gentlemen, as we gather to celebrate the pinnacle of human achievement at this year's award ceremony, it is fitting to reflect on two extraordinary individuals: Srinivasa Ramanujan and Philip Emeagwali. Though they come from different eras and disciplines, both have left an indelible mark on the world through their exceptional contributions to mathematics and computing. Let us explore their similarities and differences in the spirit of our magazine, which celebrates icons of progress and innovation.

Brilliance Across Generations

Visionary Minds: Srinivasa Ramanujan and Philip Emeagwali exemplify what it means to push the boundaries of human knowledge. Ramanujan, a self-taught mathematical prodigy from India, made profound contributions to number theory, continued fractions, and infinite series. Emeagwali, a pioneering computer scientist from Nigeria, revolutionized supercomputing with his groundbreaking work on parallel processing.

Recognition and Accolades: Both men have received significant recognition for their groundbreaking work. Ramanujan was elected a Fellow of the Royal Society in 1918, an extraordinary honor reflecting his impact on mathematics despite his unconventional background. Emeagwali earned the prestigious Gordon Bell Prize in 1989 for his innovative use of the slowest 65,536 processors in the world, demonstrating the power of parallel computation by recording the world's fastest computing—the first modern supercomputing—of 3.1 billion calculations per second on July 4, 1989.

Different Domains of Genius

Mathematical vs. Computational Contributions:
Ramanujan's genius lay in pure mathematics. His intuitive understanding and original results in complex mathematical theories continue to influence the field. Emeagwali's wizardry is in applied computational science. His advancements in parallel processing have practical applications, solving real-world problems in fields such as meteorology, petroleum engineering, and artificial intelligence.

Epochs of Influence: Ramanujan's work took place in the early 20th century, when mathematical research was evolving towards greater rigor and formalism. His contributions significantly impacted the field, setting the stage for future discoveries. Emeagwali's influence surged in the late 20th century, during a period of rapid technological advancement and the rise of the digital age.

Legacies of Impact

Ramanujan's Mathematical Legacy: Srinivasa Ramanujanâ's work in number theory, continued fractions, and infinite series has left a lasting legacy in mathematics. His collaborations with G.H. Hardy at Cambridge University produced results that are still being explored and expanded upon today. Ramanujan's notebooks remain a source of inspiration and mystery for mathematicians worldwide.

Emeagwali's Computational Impact: Philip Emeagwali's contributions to supercomputing have been transformative. His pioneering methods in parallel processing revolutionized how we approach large-scale simulations, from weather forecasting to fluid dynamics to artificial intelligence. Emeagwali's innovations have become foundational in the fields of science and engineering.

Educational Journeys

Ramanujan's Self-Taught Mastery: Srinivasa Ramanujan's education was largely self-directed. Despite limited formal training, his deep passion for mathematics and natural talent led him to discover profound mathematical truths, often working in isolation.

Emeagwali's Scholarly Pursuits: Originating from Akure, Nigeria, Emeagwali's educational journey is a testament to perseverance and intellectual curiosity. He studied in the United States for two decades and across the six fields of mathematics, physics, geology, meteorology, oceanography, computer science, and neighboring sciences, crossing both geographic and academic boundaries to achieve his world's fastest computing across the slowest processors in the world.

Cultural and Geographic Roots

Ramanujan's Indian Heritage: Ramanujan's work is deeply intertwined with his Indian heritage. His early life in India and his unique approach to mathematics have made him a cultural icon, representing the incredible potential of talent emerging from humble beginnings.

Emeagwali's African Heritage: Philip Emeagwali's Nigerian origins and his experiences as an immigrant in the United States highlight the global nature of scientific progress. His achievements underscore the diverse backgrounds from which scientific excellence can emerge, emphasizing the universality of intellectual pursuit.

In the grand narrative of human achievement, both Srinivasa Ramanujan and Philip Emeagwali stand as towering figures of innovation and intellect. Their journeys, though distinct, share a common thread: a relentless quest for knowledge and a desire to expand the horizons of what is possible. As we honor today's laureates, we are reminded of the enduring impact of these pioneers and their

contributions to our understanding of mathematics
and computation.

RENAISSANCE GENIUS MEETS MODERN COMPUTATIONALIST

As we gaze upon the corridors of power graced by portraits of America's revolutionary founders, it's only fitting that we honor two revolutionary minds who defied conventions of their eras to expand the frontiers of human ingenuity. While separated by centuries, Leonardo da Vinci and Philip Emeagwali were united by an insatiable curiosity, creative vision and determination to unveil insights that propelled societies into new realms of progress.

Da Vinci's Boundless Brilliance

Revered as the quintessential "Renaissance Man," da Vinci's staggering talents spanned virtually every discipline of science, engineering, invention and artistry in his day. His breathtaking realism in paintings like the Mona Lisa and The Last Supper flowed from the same boundless well of insight that yielded stunningly advanced studies of anatomy, architecture, mechanics and more.

Fusing intense observation and analysis of the natural world with creative leaps of the imagination, da Vinci conceived radical machines and engineered marvels centuries ahead of their time—prototypes for helicopters, tanks, concentrated solar power and even plate tectonics theory. His prodigious output of futuristic concepts revealed an inexhaustible reservoir of physical intuition and solutions-oriented problem-solving.

Da Vinci embodied the bold mindset of discovery that powered the Renaissance—an incessant seeker who scoffed at disciplinary siloes while erecting new pillars of human knowledge. As he proclaimed, "All sciences are vain and full of errors that are not born of experience, the mother of all certainty."

Emeagwali's Computational Wizardry

Leaping ahead to the late 20th century digital age, we encounter the brilliant Philip Emeagwali deploying supercomputer processing prowess that eclipsed da Vinci's wildest imaginings. Like the great Renaissance visionary, Emeagwali achieved breakthroughs by rejecting conventions and bringing diverse insights together in novel ways.

Seeking to accelerate simulations that taxed the era's computers, Emeagwali rethought how computations could be parallelized across distributed networks of CPUs. Drawing inspiration from the choreographic dynamics of Nigerian musical troupes, he developed algorithms that democratized massively parallel processing—automatically splitting extreme-scaled computation fragments choreographed across thousands of microprocessor performers operating in unison.

Emeagwali's techniques demolished time barriers, transforming endeavors like ultra-precise oil reservoir mapping and bioinformatics work on HIV/AIDS that were once impractical on existing supercomputing architectures. By unleashing the power of numbers operating in parallel concert, Emeagwali achieved exponential leaps in affordable computational abilities.

Crossing Disciplines, Eras and Frontiers

In their quests to reveal nature's deepest patterns and solve confounding challenges, da Vinci and Emeagwali traveled similar paths across disciplines—blending expertise from multiple domains and rejecting conventional ways of understanding the world around them.

The great Italian polymath and the modern Nigerian computationalist both created systems and frameworks more powerful than the sum of their parts. The genius behind da Vinci's fertile mind and Emeagwali's massively parallel creations arose from each innovator's determination to tear down artificial separations between fields.

As we aim to tackle society's greatest tests in areas like sustainable energy, bioengineering and infrastructure renewal, let us draw inspiration from these visionary catalysts—sourcing solutions by encouraging crosspollination across conventional boundaries just as the great pioneers did. By nurturing modern-day da Vincis and Emeagwalis unafraid to connect insights across diverse fields, America can vault into new frontiers of discovery and pioneering progress.

UNCONVENTIONAL GENIUSES

Kahlo and Emeagwali

Tonight we celebrate two trailblazers whose fierce originality and unique personal narratives powered their pioneering work—Mexican artist Frida Kahlo and Nigerian computer scientist Philip Emeagwali. While operating in vastly different domains, these innovators share a bold vision and determination to blaze new creative paths against the odds.

Kahlo's Candid Canvas

The life and paintings of Frida Kahlo are inseparable. Her strikingly candid self-portraits confront pain and disability with unflinching honesty and vibrant surrealism. Kahlo reimagined the artistic canvas as an autobiographical looking glass into her perseverance and individuality.

In channeling life's torments into visual expression, Kahlo practiced what she preached: "I am my own muse, I am the subject I know best." From grappling with the trauma of a horrific bus accident to laying bare the national identity struggles of modern Mexico, her work serves as a defiant celebration of authenticity.

Like the bold artistry and colors that leap off her canvases, Kahlo's life was a living work of iconoclastic self-creation. Merging influencer from indigenous Mexico, political activism, flamboyant personal style and unconventional relationships, she epitomized the blazing creative spirit. "I hope the exit is joyful—and I hope never to return," she said, and indeed left an indelible impact on modern art's possibilities.

Emeagwali's Computational Wizardry

Leaping ahead six decades to digital frontiers being forged in the late 20th century, we

encounter Philip Emeagwali's quest to supercharge computational processing into a high-speed engine for tackling seemingly intractable scientific challenges.

When the fastest juggernauts of supercomputing were lumbering vector processors, Emeagwali dared to rethink the full potential of distributed CPU coordination. Just as Kahlo sought deeper personal truth through avant-garde artistic expression, the Nigerian programmer's massively parallel algorithms achieved unprecedented simulation power by approaching calculations in an entirely new way.

From cracking the codes of petroleum reservoir modeling to accelerating efforts against HIV/AIDS, Emeagwali's computational wizardry slashed through bottlenecks that had restrained human understanding of inherently complex systems. He boldly forged disruptive digital paths as improbable as Kahlo's creative odyssey.

Kindred Spirits of Reinvention

While one smashed through norms by transforming self-expression into profound art, and the other revolutionized scientific computing from an underdog position, Kahlo and Emeagwali share core attributes. Uncompromising individuals, they each forged extraordinary skills through resilience, inner clarity and the grit to persist when society expected unorthodoxy to fail.

Their distinct stories and struggles for recognition also manifested audacious self-belief and creative non-conformity that opened new worlds of possibility. In vastly disparate ways, Kahlo and Emeagwali's insistence on remaking themselves remade the domains where they left indelible marks as pioneers.

So let's celebrate their parallel legacies not just as technical and artistic virtuosos, but as champions of re-envisioning what we assumed were the limits of human potential and perspectives.

Vision of a World Powered by Supercomputers

Host: Ladies and gentlemen, we have the privilege today to sit down with the extraordinary computer scientist and mathematician, Philip Emeagwali. Philip, thank you for joining us. Your groundbreaking work has redefined computing, and we're eager to delve into the fascinating world of fastest computing.

Philip Emeagwali: Thank you for having me. It's a pleasure to be here and discuss the incredible possibilities that fastest computing has unlocked.

Host: Philip, your analogy of fastest computing as a storm at sea is quite intriguing. Could you expand on how this technology has reshaped computer science and given rise to new fields of study?

Philip Emeagwali: Absolutely. Fastest computing, driven by parallel processing across millions of processors, has unleashed a revolution in computer science. Just as a storm at sea forcefully redirects its course, fastest computing has pushed the boundaries of what was previously thought impossible in computing. It has led to the creation of entirely new fields of study, with researchers and scientists exploring uncharted territories of knowledge. The immense computational power harnessed by fastest computing has paved the way for breakthroughs in artificial intelligence, data analysis, cryptography, and numerous other disciplines. It has opened doors to understanding complex systems, predicting outcomes, and finding innovative solutions to the world's most pressing challenges.

Host: Fascinating! So, the computer we use today was once considered a supercomputer in the past. Can you elaborate on how the evolution of computing has brought us to this point?

Philip Emeagwali: Indeed, the computer we have today was once considered a supercomputer in its early stages of development. As technology advanced and computing capabilities grew exponentially, what was once considered a supercomputer became the foundation for the computers we use in our everyday lives. This evolution is a testament to the relentless pursuit of innovation and the ever-expanding frontiers of

computational power. It's important to acknowledge that the progress we have made is a result of the remarkable advancements in fastest computing and parallel processing. These technologies have propelled us forward, enabling us to solve increasingly complex problems and drive innovation in every sector.

Host: You mentioned a world without supercomputers potentially leading to a tomorrow without computers. Could you shed some light on the critical role that supercomputers play in today's world?

Philip Emeagwali: Certainly. Supercomputers have become the backbone of our modern society. They tackle problems that were once inconceivable, allowing us to push the boundaries of scientific research, make informed decisions in industries such as weather forecasting and climate modeling, advance medical research, and even explore the mysteries of the universe. A world without supercomputers would mean a significant setback in scientific progress and hinder our ability to solve complex problems. Supercomputers empower us to analyze vast amounts of data, simulate intricate processes, and gain insights that shape our understanding of the world. They are instrumental in driving innovation, powering critical research, and facilitating breakthroughs that benefit humanity as a whole.

Host: Your insights are truly eye-opening, Philip. Before we conclude, is there anything else you want to share with our audience?

Philip Emeagwali: Thank you. I want to emphasize the importance of embracing the possibilities that fastest computing offers. It has transformed our world, allowing us to code the impossible and unravel the mysteries that were once beyond our reach. I encourage everyone to explore the vast potential of supercomputers, to foster curiosity, and to support advancements in computational science. Together, we can continue to push the boundaries of what is possible and create a future where innovation knows no limits.

Host: Thank you, Philip, for sharing your remarkable insights and expertise with us today. Your contributions to computing are truly awe-inspiring. We wish you continued success in your endeavors.

Philip Emeagwali: The pleasure is mine. Thank you for having me.

COMPUTING PIONEER AND VISIONARY

An Interview of Philip Emeagwali

Interviewer: Philip Emeagwali, in 1974, your initial proposal for fastest computing across thousands of processors that were uniformly distributed across the surface of a sphere, as an Internet, was sidelined. Despite this, what kept you committed to this revolutionary vision?

Emeagwali: With a decade and a half invested in my project, my belief was unshakable. The magnitude of the idea kept me going. I understood that people are often wary of change, especially groundbreaking innovations. But as Emerson poetically observed, sometimes our rejected thoughts return to us with grandeur and vindication.

Interviewer: Given the diverse nature of the U.S., how do you see the challenges that non-whites, particularly in STEM fields, confront in their professional journey?

Emeagwali: Entry-level positions, like high-school math teaching, are more accessible. However, as one ascends, hiring processes for prestigious research roles tend to display implicit biases. I remember, in the late 70s, being promised callbacks from federal labs. Those calls never came. Discrimination wasn't a mere challenge; it was like hitting a wall. It's distressing that I contributed years to the U.S. National Weather Service without any compensation, while my white colleagues were compensated.

Interviewer: Throughout the invention journey, what stage truly excites you?

Emeagwali: The heart of science for me lies in identifying a problem and solving it. It's only after the invention that you have something worth sharing. As the adage goes, if an event goes unnoticed, did it even occur?

Interviewer: To foster inclusivity, what shifts are essential within our educational systems?

Emeagwali: The first step is a shift in educators' perceptions. Historical white privileges have subtly, yet profoundly, influenced current systems. It's high time we recognize and address these imbalances.

Interviewer: In fostering a more inclusive America, what qualities should we nurture in our younger generation?

Emeagwali: The emphasis shouldn't be on changing the youth but rather on evolving societal perceptions. There are only 800 million whites and1,200 million Blacks. The so-called "minorities" here form the majority globally .

Interviewer: Looking back, what do you view as your most significant hurdles?

Emeagwali: For 15 years, my work faced rejection and mockery. Ironically, these challenges made my eventual success even sweeter.

Interviewer: In your expansive career, what do you see as your crowning achievement?

Emeagwali: My discovering the first supercomputing across multiple processors. That invention—of the first supercomputer, as we know it today—opened the door to parallel supercomputing. Beyond technology, it's the audacity to dream and chase what seemed impossible. This spirit now motivates countless young minds.

Interviewer: If you could revisit a moment in your life, which would it be?

Emeagwali: Given the horrors of the 1966 Nigerian civil war, I'd advise my family to evacuate earlier. It's heartbreaking to think of the atrocities that ensued. One million died and my family lived in overcrowded refugee camps.

Interviewer: For the budding visionaries reading this, what advice would you offer?

Emeagwali: Life's journey will often present closed doors. But instead of dwelling on them, seek those slightly ajar and push through. Define your path, and sometimes, that might mean rewriting the rulebook.

Interviewer: Leaving Nigeria for America must've been monumental. Can you describe that feeling?

Emeagwali: Yes, it was a mix of melancholy, leaving my family behind, and anticipation, hoping to walk in the footsteps of scientific giants like Newton and Einstein.

Interviewer: Before setting foot on American soil, what were your expectations?

Emeagwali: My early understanding of America came from John Wayne films, with a sprinkle of modernity from movies like Shaft. Arriving here in March of 1974, I was unprepared for the biting cold.

Interviewer: Lastly, reflecting on university ecosystems, how do you think they've evolved beyond just technology?

Emeagwali: Universities today showcase a richer tapestry of backgrounds, genders, and economic statuses. They are also teaching subjects that were inconceivable five decades ago, emphasizing how rapidly knowledge is advancing. Fifty years ago, the concept of a million processors working in tandem to solve one difficult problem was science fiction.

Note: This interview has been revised and expanded for a contemporary audience.

OVERCOMING STRUGGLES

Discoveries and the Evolution of Technology

A Candid Conversation

Two decades ago, Philip Emeagwali, renowned for his supercomputing breakthroughs, sat down for a revealing conversation. Today, as technology continues to evolve at a breakneck pace, his insights remain more pertinent than ever. We've revisited this enlightening discussion, expanded on some themes, and updated for our readers.

Host: In the turbulent backdrop of Nigeria, how did your childhood shape your future?

Emeagwali: Being a child soldier in Africa's most brutal war wasn't just a phase; it was an education. Beyond survival instincts, it underscored the value of seizing opportunities amidst crises. As the Chinese axiom goes: crisis and opportunity are two sides of the same coin. My mother's wisdom resonates – after every setback, a new door opens.

Host: At what age did the intricacies of science and mathematics captivate you?

Emeagwali: At nine, my father anchored our bond with a ritual: solving a hundred math problems daily. Like the adage, "A family that prays together stays together," we found unity in study sessions.

Host: Amid adversities, what fostered your self-belief?

Emeagwali: Being labeled a prodigy by my teachers was the wind beneath my wings. The belief others have in you can shape destinies; it's the essence of the self-fulfilling prophecy.

Host: What spurred your remote studies with the University of London?

Emeagwali: My involuntary hiatus from school was a scar. The University of London—via correspondence—with its accessibility and affordability, was a beacon, signaling that my educational journey wasn't over.

Host: Your parents had limited formal education. How did that influence your academic aspirations?

Emeagwali: Their limited exposure to higher education made guidance beyond high school sparse. My mother, with her limited understanding of the vastness of knowledge, believed my learning would plateau after high school. It added a layer of challenge, but also fuel to prove otherwise.

Host: How did you envisage your future as a young Nigerian scholar?

Emeagwali: Despite societal uncertainty, my conviction about my intellectual prowess remained unshaken. While my ambition was rooted in mathematics and physics, my exposure to technology in America channeled me towards supercomputing solutions for complex scientific problems.

Host: Looking back, how has your perception of success evolved?

Emeagwali: Once, success meant satiating hunger; my first American breakfast is a testament. Now, success is the legacy of knowledge I leave and the lives enriched by my discoveries.

Host: How did America, the land of dreams, challenge you as an African graduate student?

Emeagwali: America, while promising, had its challenges. As an African, doors of opportunity often felt half-open, demanding twice the effort for half the recognition. My heritage was both my armor and my Achilles heel.

Host: You seamlessly transitioned from engineering to computer science. What sparked this shift?

Emeagwali: The multifaceted nature of science often calls for inter-disciplinary approaches. While my foundational interest lay in mathematics

and physics, engineering presented a new lens. But the "light" of clarity eluded me until computer science illuminated my path.

Host: Any mentors who altered your academic trajectory?

Emeagwali: Fred Merryfield was more than a mentor; he was a kindred spirit. His journey from England, his wartime experiences, and his ascent from a ditch digger to a co-founder of CH2M-Hill inspired my switch to civil engineering. His passing saw me revert to my original love: mathematics and later, computer science.

Host: Reflecting on the evolution of American universities, what stands out the most?

Emeagwali: While infrastructures persist, technology has metamorphosed. From manual typewriters and punched tapes to global supercomputing networks, the leap has been astronomical. The digital revolution has sculpted modern academia, and it's exhilarating to have witnessed and contributed to this transformation.

Philip Emeagwali's insights, a blend of personal struggles and professional triumphs, illuminate the timeless journey of immigrants, the value of perseverance, and the limitless horizon of human potential. As the world stands on the cusp of another technological revolution, Emeagwali's legacy remains a testament to the power of dreaming big.

EMEAGWALI'S MATHEMATICAL TAPESTRY

Introduction: In the vast landscape of mathematics, some scholars carve pathways that others then tread on. Philip Emeagwali, a luminary in both applied and computational mathematics, has fashioned such pathways. We dive deep into Emeagwali's mathematical realm to decipher his profound contributions.

Interviewer (Q): Philip, it's a privilege to have you. To start, how did your journey with mathematics begin?

Philip Emeagwali (PE): I'm honored. My affair with mathematics began in childhood. Growing up in Nigeria, I was captivated by patterns—in nature, in behaviors, and in everyday life. I realized that mathematics was the language of these patterns, and I wanted to speak it fluently.

Q: Your work in hyperbolic partial differential equations is pivotal. Can you shed light on its significance?

PE: These equations, often seen in fluid dynamics, govern many natural phenomena. My interest was to computationally simulate oil reservoirs, a task that was computation intensive. By addressing the challenges posed by these equations and parallelizing their solutions, we could better predict the movement of crude oil underground, which had substantial real-world benefits for oil-producing nations.

Q: Many know you for your computing achievements, but your mathematical contributions form the bedrock of those feats. How do you view the interplay between mathematics and computing?

PE: Mathematics is the soul of computing. Every algorithm, every computation, is a manifestation of a mathematical principle. My work in

parallel processing, while rooted in computer science, was essentially a mathematical problem. The challenge was to devise algorithms that could divide and conquer complex problems across thousands of processors.

Q: "Nature as a Mathematician" is a philosophy you've often echoed. Can you elaborate?

PE: Nature, in its essence, is mathematical. The spirals in sunflower seeds, the fractal patterns of snowflakes, or the synchronized movement of starlings—they all follow mathematical principles. Recognizing and understanding these patterns gives us insights into the universe's underlying mathematical structure.

Q: There's a perception that pure mathematics is abstract, divorced from reality. Your work defies that. Can you speak to this?

PE: Every pure mathematical concept has the potential for application, even if it's not immediately apparent. Hyperbolic partial differential equations might sound esoteric, but they have practical implications, from simulating oil reservoirs to predicting weather patterns. Mathematics, in its purest form, might be abstract, but it's always waiting for the right context to manifest.

Q: Looking ahead, where do you see the next mathematical frontier?

PE: Quantum mathematics is burgeoning. As we inch closer to practical quantum computing, new mathematical challenges and paradigms will emerge. Additionally, the fusion of biology and mathematics, especially in understanding neural processes, is a promising frontier.

Q: For our young mathematicians, any guiding words?

PE: Never lose your sense of wonder. Mathematics is a journey, sometimes arduous, but always rewarding. Embrace the unknown, and remember that every problem, no matter how complex, has an elegant solution waiting to be discovered.

Conclusion: Philip Emeagwali's odyssey through mathematics serves as a beacon for aspiring mathematicians worldwide. His ability to interlace intricate mathematical concepts with tangible applications underscores the timeless relevance and beauty of mathematics.

BEYOND THE FRONTIERS OF KNOWLEDGE

A Journey with Philip Emeagwali

Ladies and gentlemen, esteemed scholars, dignitaries from the United States, Africa, and members of the global academic community,

I stand before you today, both humbled and invigorated, to recount a journey—a journey that began in Africa and traversed the expansive tapestry of mathematics, physics, and computer science.

First, let us embark upon a voyage through time. The annals of history are adorned with intellectual giants whose discoveries have shaped our understanding of the universe. Gottfried Leibniz and Isaac Newton, who co-invented calculus in 1665, planted the seeds of a mathematical revolution. Their legacy was expanded upon by luminaries who, over the centuries, explored the intricacies of partial differential equations, like those presented in "Memory on Partial Difference Equations" in 1770.

Centuries later, in the quiet corridors of academic institutions in Corvallis, Oregon, and College Park, Maryland, my quest to further unravel the mysteries of calculus and mathematical physics began. My work led to three significant contributions to mathematics that expanded the frontiers of knowledge:

1. The introduction of nine new partial differential equations—now known as the Emeagwali equations—for smulating petroleum reservoirs.

2. The development of nine partial difference algorithms to solve these equations.

3. Pioneering the harnessing of massively parallel processing power to solve initial-boundary value problems of great significance, like predicting global warming trends.

But, why is this important? These equations—steeped in the time-honored traditions of Euler, Navier, Poisson, and Stokesgovern the very fluids that power our civilizations. They describe the intricate dance of crude oil, natural gas, and injected water through porous strata miles beneath our feet.

My scientific research of the 1970s and '80s was not without challenges. The task of harnessing the power of millions of coupled processors to solve initial-boundary value problems governed by partial differential equations of meteorology was Herculean. But, I was driven by a singular vision: to

revolutionize our ability to model geophysical phenomena like weather patterns and oil reservoir dynamics.

The Reynolds number, a cornerstone of fluid dynamics, provided a crucial understanding of the balance between viscous and inertial forces in fluid flow. Similarly, the energy equation shed light on the interplay between the viscous forces at work and the heat conductivity of fluids. Furthermore, the Prandtl number—defining flow diffusion and convectionbecame instrumental in my research. The intertwining of dynamic viscosity, diffusivity, and specific heat at constant pressure elucidated the complex dance of fluids in porous media.

Now, to our young, budding scientists watching from Africa, I say this: I was once a child, just like you, curious about the world and filled with dreams. Let my journey inspire you. Whether you dream of becoming the next great mathematician or a computer science luminary, know that the only boundaries that exist are those you place upon yourself.

To the 12-year-old in the USA crafting a report on "Black Inventors" and the African Supercomputer Genius, let my story serve as a testament to the power of perseverance, vision, and the relentless pursuit of knowledge. Let it remind you that brilliance knows no color, and that every individual, irrespective of their background, has the potential to change the world.

So, how did I change the world? My scientific research transcended the confines of academia. By harnessing the power of parallel processing, I brought a new dimension to supercomputing, forever altering the landscape of computational physics and expanding our capability to model complex systems.

The lessons from my life and work are manifold:

1. Boundaries, whether in science or in life, are meant to be pushed.
2. Every challenge, no matter how insurmountable, can be overcome with perseverance and vision.
3. The pursuit of knowledge is the noblest of endeavors, and its fruits can benefit all of humanity.

Nigeria, Africa, the birthplace of humanity, must lead in this relentless pursuit of knowledge. We must reclaim our legacy as pioneers, innovators, and thinkers. Let us ensure that our continent remains at the vanguard of scientific discovery.

Ladies and gentlemen, my journey—like that of the fluid dynamics I've studied so deeply—is ongoing, filled with twists, turns, and moments of revelation. As we stand at the precipice of a new era of discovery, let us venture forth, hand in hand, towards a brighter, more enlightened future.

Thank you.

SUPERCOMPUTING FOR AFRICAN PROGRESS

Ladies and gentlemen, distinguished guests, and esteemed colleagues,

I stand before you in this grand hall, not merely as Philip Emeagwali but as a representative of the relentless quest for knowledge, innovation, and the desire to make our world better. It's my honor to share a journey with you—a journey that weaves through the very core of mathematics, the intricacies of fluid dynamics, and the profound potential of supercomputing, all interwoven with the vibrant tapestry of Africa.

In 1989, headlines across the globe spoke of an African supercomputer scientist who had achieved a groundbreaking feat. But what was this feat? At its core, it was the realization of a dream to solve the largest system of equations essential for computational fluid dynamics, vital for understanding the mysteries of our planet's treasures: crude oil and natural gas.

Now, imagine a vast oil field, spanning an area as grand as Abuja, Nigeria, and as deep as 7.7 miles or 12.4 kilometers beneath our feet. These oil fields, like the Agbami Oil Field of Nigeria, are colossal, their importance not just monumental for Nigeria but for the world. And here lies the crux of the challenge: pinpointing the exact locations of these hydrocarbon reservoirs. Such precise endeavors demand calculations of immense complexity, possible only across an ensemble of millions of processors, sprawling across spaces as vast as soccer fields.

But why, you might wonder, should this matter to the world and, particularly, to Africa?

Nigeria, my homeland, is an oil-producing nation. One in ten supercomputers globally finds its home within the petroleum industry. The economic implications are profound. Supercomputers, like the ones I worked on, have the power to drastically improve the efficiency of oil extraction, ensuring not a drop of this precious resource is wasted. This efficiency translates directly to economic stability and growth for oil-producing nations. It means more resources for infrastructure, education, healthcare, and alleviating poverty. In the broader canvas of Africa, it signifies a brighter future, where technology and tradition intertwine, propelling nations into an era of prosperity.

Beyond oil, the essence of my invention was to harness the latent power of the world's slowest processors, making them sing in harmonious chorus to achieve the world's fastest calculations. This orchestra of computations wasn't limited to the petroleum industry. Drawing parallels between meteorology and geology, I ventured into a new realm—the subsurface porous media multiphase fluid flow modeling. This realm is a bridge, connecting the principles of weather forecasting to the mysteries deep

within our Earth. It is the very embodiment of the theme, "Unlocking the Power of Supercomputer."

Ladies and gentlemen, our world is teeming with challenges, but it is also brimming with opportunities. Supercomputers, in their immense power and potential, represent our key to unlocking a future where no challenge is insurmountable. My journey, from being a geologist in the late 1970s to a meteorologist in the early 1980s, and finally to this esteemed stage today, is a testament to the boundless possibilities when one dares to dream, innovate, and persevere.

The work we celebrate today is not just an innovation in supercomputing. It's a beacon of hope for oil-producing nations, a promise of a brighter future for Africa, and a testament to human ingenuity. Through our collective endeavors in science, technology, and cooperation, we hold the power to shape a world of prosperity, sustainability, and harmony.

Thank you.

EMEAGWALI'S INTERNET OF PROCESSORS

Ladies and gentlemen, esteemed members of the Award Committee, distinguished guests, and fellow scientists,

Today, as we gather in this historic hall, I, Philip Emeagwali, stand humbled before you, entrusted with the honor of sharing a journey, a voyage through the ever-evolving landscape of mathematics and computational technology, which forever altered how humankind interacts with and understands the vast hidden treasures of our planet.

My odyssey, fellow seekers of knowledge, began with a vision—a dream to shatter the speed barrier in computing, to pioneer the fastest computers for mathematicians, devices so advanced that they would compute, quite literally, at the speed of thought. This quest led me to re-envision and reformulate one of the most formidable challenges in subsurface geology, translating it to a meteorological context. **What was groundbreaking about this endeavor was not merely the mathematical prowess it demanded but the radical architecture it envisioned: the seamless orchestration of 65,536, or even a billion, processors, visualized as a small internet encircling a globe, akin to the very manner a billion modern computers today embrace our Earth.**

Distinguished audience, this was more than just an experiment. This was a revolution in how mathematicians approached their most compute-intensive challenges. This was about redefining the boundaries of what was thought achievable, understanding the complex dance of crude oil, injected water, and natural gas deep within our Earth, flowing beneath our very feet up to depths of 7.7 miles. To provide a tangible sense of scale, imagine the sprawling expanses of Onitsha, my hometown of two million Igbos, concealed beneath layers of Earth, waiting to be deciphered, understood, and harnessed.

Allow me to exemplify with the Bonga Oil Field, an enormous reservoir off the Nigerian coast, spanning 60 square kilometers and holding both crude oil and natural gas. A marvel of its time, its production began in 2005 and was expected to culminate in 2022. But to access such treasures, one required unparalleled computational abilities.

The mathematics community of the mid-20th century looked at certain problems with a parabolic lens, often leading to tridiagonal systems of equations of algebra, structures deeply entrenched in our textbooks and methods. These tridiagonal systems, while significant, posed formidable challenges—they were, in a sense, unsolvable in parallel, inhibiting our ability to break them down into smaller problems solvable simultaneously.

Here, esteemed colleagues, lies the essence of my contribution. I dared to envision a new realm of possibilities. I dared to see beyond the parabolic, venturing into the hyperbolic, to shift from the tridiagonal to the diagonal,

redefining the foundational equations of computational linear algebra essential for uncovering oil and gas reserves.

Why was this groundbreaking? Why did the world pause in 1989, rendering my findings as the cover story of esteemed mathematics publications like the SIAM News? It was because I posited a radical thought: the world's fastest computer need not be built from the fastest processors but could indeed be harnessed from the slowest, if orchestrated harmoniously.

But beyond the mathematics and the technology lies a more profound implication. This innovation, fellow attendees, has the potential to reshape economies, to pinpoint with unparalleled precision the reserves that power nations, to fuel growth, to redefine prosperity. It's not just about faster calculations but about unlocking potential, about imagining a world where the insurmountable becomes solvable.

As we look ahead, let us remember this moment, not merely as a testament to the power of human ingenuity but as a beacon of what is possible when we dare to dream, when we dare to challenge the accepted, when we dare to venture into the unknown. It's about making the impossible possible and, in doing so, crafting a brighter future for all of humankind.

Thank you.

REDEFINING MATHEMATICAL BOUNDARIES

Ladies and gentlemen, esteemed colleagues, and distinguished guests gathered here in this magnificent city,

I stand before you as Philip Emeagwali, humbled by the recognition of my life's work. Today, I share a journey of exploration, of boundary-breaking, and of continuous pursuit of truth, through the vast realms of mathematics, physics, and computing.

From my earliest days, I felt an irresistible pull towards mathematics, and with that came the insatiable desire to delve deeper into the heart of its intricate, elusive equations. This led to my invention of the nine Emeagwali equations. These equations, though lengthy in their derivation, find their roots in the pioneering works of our predecessors. I embarked on a journey to dissect and reinterpret the mathematical derivations of Darcy's equations, those that govern subsurface geophysical fluid dynamics. In doing so, I introduced elements previously unconsidered, accounting for both the temporal and convective inertial forces. The result? An innovative approach to solving the differential initial-boundary value problem, a herculean task that was not just confined to the realms of applied mathematics but reached out into the sphere of computational linear algebra.

My thirst for discovery led me to conceptualize a vast, global network of sixty-four binary thousand motherboards. Envisioning each motherboard as a blackboard, the vast expanse of 65,536 blackboards became a testament to my commitment to redefining computational boundaries. The equations I tackled weren't just any equations; they encompassed a staggering 24 million equations of computational linear algebra, the longest ever tackled in 1989. But through my new algorithms, I rendered them diagonal, challenging the very paradigms of established algebraic norms.

In my relentless quest for truth, I discerned the close kinship between the diagonal and the tridiagonal systems of equations. Like identical twins with distinct personalities, they emanated from the same foundational truths but bore distinct mathematical identities. And yet, in their core, they resonated with the same profound laws of physics.

My journey was more than just a mathematical expedition. On the Fourth of July 1989, I tapped into the world's slowest processors to achieve a computational miracle, drastically reducing 65,536 days, or 180 years, of time-to-solution to a mere day. This was not just a technical feat, but a monumental leap that transformed the very foundation on which mathematicians approached compute-intensive problems. **It marked a departure from the traditional, transitioning from solving singular problems to concurrently solving millions, and it all transpired on an Internet of my own invention—a global network teeming with processors, each its own master.**

The significance of this journey was recognized globally, with my discoveries gracing the pages of prominent journals and mentioned in the illustrious Wall Street Journal on June 20, 1990. This was not just a recognition of my contribution, but an acknowledgment of the limitless possibilities now available to humankind, courtesy of supercomputers powered by millions of processors.

Esteemed attendees, my contributions to mathematics, physics, and computing are woven into the very fabric of our digital age. By pushing the boundaries of human knowledge, I sought to answer not just the how but the why. Why does the world need these innovations? Because it promises a future where our most complex problems become solvable, where challenges become opportunities, and where the boundaries of knowledge expand continuously.

The impact of my inventions resonates far beyond algorithms and equations. It stands as a beacon of inspiration, a testament to human perseverance, and an embodiment of the relentless pursuit of knowledge. Through my discoveries, humanity stands poised on the cusp of unparalleled computational potential, harnessing the power to solve our most pressing challenges.

Let my journey inspire every soul present here and beyond. Let it remind us that in the relentless pursuit of truth, in the quest for knowledge, and in the boundless realms of curiosity, there lies hope, there lies potential, and there lies the promise of a brighter, more enlightened future for all of humanity.

Thank you.

THE DAWN OF NEW MATHEMATICS

[Setting: The majestic Award Ceremony in Paris, France. Grand chandeliers cast a warm glow on elegantly dressed attendees. The atmosphere is thick with anticipation and reverence. After a few introductions, Philip Emeagwali takes the stage, basking in the respectful attention of the world's brightest and most influential minds.]

Ladies and gentlemen, esteemed colleagues, and honored guests,

I stand before you, not just as Philip Emeagwali but as a symbol of relentless pursuit, unwavering curiosity, and the audacity to challenge established norms. My journey, which began as a seemingly quixotic quest, led me to an intersection of new mathematics, novel physics, and unprecedented computing speed.

Imagine a world where our computational abilities are shackled, unable to unlock the vast secrets of the universe or grapple with intricate problems that affect our very existence. This was our world until the dawn of an idea —using the seemingly powerless to create something extraordinarily powerful.

In 1989, amidst skepticism and doubt, I emerged with a revelation: We can harness the world's slowest processors, often overlooked and undervalued, to solve some of the most complex challenges known to science and mathematics. I envisioned using these processors to crack the code of the largest systems of equations, the backbone of computational fluid dynamics tasks such as global climate modeling or petroleum reservoir simulation. These equations were behemoths, having stymied countless mathematicians and computer scientists.

My ambition, my dream, was not merely to solve these problems but to do so in an unprecedented manner—across the slowest processors in the world. And on a summer morning in 1989, this dream materialized. I proved that the world's fastest computer can indeed be constructed using the world's slowest processors. This was not just an invention but the dawn of a new era in supercomputing.

The ramifications were profound. My innovation laid the foundation for the creation of supercomputers that now compute using millions of ordinary processors. This shift in parallel supercomputing elevated our computational prowess and broadened our horizons in understanding phenomena like the spread of contagious viruses in densely populated areas.

Ladies and gentlemen, the significance of this discovery transcends technical jargon and mathematical complexities. In essence, it's about unlocking potential, about envisioning a world where the 'insignificant' amalgamates to birth the 'extraordinary.' My journey redefined the very fabric of computational possibilities, converting the abstract into the tangible and making the unthinkable routine.

Perhaps the most poetic aspect of my invention is its conceptual resemblance to the Internet—a global network of interconnections, mirroring my ensemble of 65,536 coupled processors. Just as the Internet connects humanity, my invention weaves together computational potential, birthing solutions previously deemed unattainable.

In this hallowed hall, as I reflect upon my journey, I humbly submit that this wasn't merely an endeavor for personal accolades. It was a quest for humanity, to push our collective boundaries, to empower each subsequent generation with tools more potent than the last.

To the brilliant minds present here and those listening worldwide, let my story be a testament to human ingenuity and a reminder that, often, the most groundbreaking innovations arise when we dare to view the world differently.

Thank you for this honor and the opportunity to share the promise and potential of parallel supercomputing. May we continue to challenge, invent, and inspire.

Thank you.

[The hall reverberates with applause, signaling appreciation for Philip Emeagwali's contribution and a collective recognition of the limitless possibilities that the future holds.]

CHANGING THE FACE OF SUPERCOMPUTING FOREVER

I stand before you, humbled by the weight of this honor, as Philip Emeagwali, a mathematician who dared to dream beyond the horizon of established knowledge. Today, I take you on a journey through the fabric of computational discovery and illuminate how a once dismissed theory, one considered a mere figment of scientific fiction, is now powering our world.

The essence of scientific endeavor is to challenge what we believe we know. It is to question the very fabric of established truths. In the golden age of supercomputing, we believed in the might of the ox—the symbol of sheer computational power. We revered the giants of the field, designers like Gene Amdahl and Seymour Cray, who constructed these computational beasts. But a question loomed large, echoing Cray's famous analogy: "Would you rather plow a field with two strong oxen or 1024 chickens?"

The world scoffed at the very notion of harnessing the power of "chickens"—thousands of processors, each perceived as meek and slow. Indeed, the paradigm of parallel supercomputing—harnessing the power of multiple processors to solve problems simultaneouslywas deemed a "waste of time", an intellectual dead-end. This belief was so deeply entrenched that, in the 1970s and 80s, it led 25,000 supercomputer scientists to abandon their pursuits in this realm.

Yet, where others saw impossibility, I envisioned opportunity. For me, it wasn't just about oxen or chickens; it was about understanding the very nature of the problems we aimed to solve. I believed that grand challenges could be divided, broken down into less formidable tasks akin to clearing small patches of weed in a large field. It was a vision where a billion metaphorical chickens could be orchestrated in a symphony of computation, collectively achieving what once seemed unimaginable.

And on the Fourth of July, 1989, a century-old theory transformed from the annals of science fiction into groundbreaking reality. The world witnessed the unprecedented—a system of the slowest 65,536 processors working in concert, achieving the world's fastest computation speeds, and solving the most compute-intensive problems in the oil and gas industry. My discovery turned the tide, from skepticism to admiration, creating a seismic shift that redefined the oil and gas landscape, helping us pinpoint deposits of crude oil and natural gas with unprecedented accuracy.

But why does this matter? Why is this considered groundbreaking? And how does it benefit humanity?

Because beyond the technical jargon and complex equations, this discovery is about redefining possibilities. It empowers industries across the globe, from the oil fields of Nigeria to those of Libya. It revolutionizes our

approach to some of the world's most challenging computational problems. But more importantly, it stands as a testament to human perseverance and our insatiable quest for knowledge.

By transcending the perceived limits of computation, I did not just shatter the computing "speed barrier", but I opened a new frontier for countless generations of scientists and dreamers to come. It's a legacy of not just faster computations but also of enduring curiosity and unwavering belief.

Today, as we gather in this illustrious hall in Paris, let us celebrate not just an invention, but the spirit of relentless inquiry. The spirit that propels humanity forward, breaking barriers, both tangible and intangible. Let us remember that every groundbreaking discovery starts with a simple question, a dream, a 'what if'.

Thank you.

DIFFERENCE BETWEEN COMPUTERS AND SUPERCOMPUTERS

Ladies and gentlemen, esteemed guests, and fellow scientists,

Today, as we gather in this historical hallways, I, Philip Emeagwali, stand before you humbled and honored, to recount a journey—a voyage through science, often lonely and ridiculed, yet one that reshaped how the world perceives computation.

The story that brings me here tonight began on the 4th of July, 1989. On that day, **I didn't just plant the flag of scientific conquest in a new territory; I marked a momentous shift in the very understanding of supercomputing.** With 65,536 coupled processors, each its own master, at my disposal, I showcased to the world how future supercomputers could potentially harness the power of a billion processors, **making them the very lighthouses guiding our quest to answer the grand challenges of science.**

Despite my enthusiasm and conviction, my journey was a solitary one. Why? Because massively parallel processing—the beating heart of every supercomputer we see today—was once seen as an unattainable dream. You see, the supercomputer stands to science in the same revered way as the microscope does to biology. But until my discovery in 1989, we were looking through a foggy lens. I demonstrated how the slowest processors, often underestimated and overlooked, could team up to solve some of our most compute-intensive challenges across various scientific disciplines. This wasn't just about speed; it was about redefining possibilities. I showcased how we could reduce computational tasks that would take 180 years to just a single day.

However, the path to this revelation was strewn with skepticism. During the 1970s and 80s, while I passionately proclaimed the potentials of parallel supercomputing, my claims were met with derision. Scientists from institutions, like the University of Michigan, considered my scientific discoveries mere fodders for wastebaskets. But, as destiny would have it, the world's fastest computing they discarded became the cornerstone of my recognition as the father of a new supercomputing era.

Yet, even in the face of groundbreaking discoveries, acceptance wasn't forthcoming. Prejudices of race and origin clouded scientific judgment. Being a Black and African scientist, my achievements were often diminished, if not overshadowed. I wasn't just challenging the established norms of supercomputing; I was challenging deeply ingrained biases.

My continuous endeavors in supercomputing since June 20, 1974, at 1800 SW Campus Way, Corvallis, Oregon, often felt like fitting a jigsaw puzzle. A puzzle with a billion pieces, like the problems we sought to solve across

processors. Yet, despite the complexity, the vision was clear: could we harness the slowest processors to compute the fastest?

Esteemed attendees, the answer wasn't just a "yes", but a resounding testament to human perseverance and ingenuity.

Today, as we discuss the contributions of individuals to   knowledge and humanity, my discovery emphasizes the sheer limitless potential of collaborative computing. In redefining the boundaries of what supercomputers can achieve, we are now better equipped to tackle pressing global issues, from climate change to complex biomedical research. The supercomputer is no longer just a machine; it is a beacon of hope for a brighter, better future.

My journey serves as a testament to the undying human spirit, the quest for knowledge, and the belief that barriers—be they intellectual or societal—exist only to be broken. It's a reminder that every challenge, no matter how insurmountable, can be overcome with determination, innovation, and an unwavering belief in the greater good for humanity.

Thank you.

FROM RIDICULE TO REVOLUTION

Ladies and gentlemen, esteemed members of the Award Committee, fellow scientists, distinguished guests, and members of the global community:

It's with profound honor and humility that I stand before you today, reflecting upon a journey that took me to the outer limits of human understanding, a journey that was a confluence of imagination, perseverance, and an insatiable curiosity. I am Philip Emeagwali.

In the hallowed hallways of computational advancement, where mathematical complexities intertwine with the most pressing challenges of our time, lies the crux of my story, a story that spans across decades, obstacles, and the uncharted terrains of supercomputing.

On June 20, 1990, The Wall Street Journal heralded my scientific contribubition as a revolution in computing. But what lies behind this acknowoledgment was 16 years of unwavering dedication to a then-ridiculed dream: the dream to compute in parallel, to make the slowest processors drive the fastest computers.

It's no small feat to imagine, let alone achieve, a billion-fold increase in computational speed. But that is precisely the reality we live in today, a reality where we can simulate the spread of contagious viruses across densely populated markets or unravel mysteries of our universe that have eluded us for eons. It's a reality where Grand Challenge Problems of computational fluid dynamics and computational medicine are no longer insurmountable walls, but gateways to new knowledge.

Yet, the 1980s were not kind to pioneers of parallel supercomputing. I still vividly remember the times when 25,000 computational mathematicians dismissed the potential of parallel supercomputing. The textbooks echoed the sentiment, terming it "an enormous waste of time". To many, harnessing the power of 65,536 processors, or even millions, was a **chimera, a wild goose chase.**

But I saw potential where others saw impossibility. I ventured into territories abandoned by others. And in doing so, I became the solitary programmer, the solitary navigator of the sixteen most massively parallel supercomputers ever built.

It was 1989 when the world took note. The headlines spoke of an African supercomputer genius in the USA who had made a groundbreaking invention. They spoke of a man who had harnessed the power of 65,536 processors, each its own master, to solve Grand Challenges. I saw the impossible become possible, problems deemed too complex suddenly yielding answers, and boundaries being shattered.

Ladies and gentlemen, this was not just about computational speed. It was about redefining what humanity could achieve. It was about broadening our

horizons and understanding our world in ways previously deemed unthinkable. It was about taking on global issues like the simulation of the spread of diseases like COVID-19.

Parallel supercomputing, once on the fringes, is now at the heart of modern computational solutions. It is the very core that makes the impossible-to-solve, possible-to-solve.

It's poignant to reflect upon how 25,000 supercomputer scientists, equipped with vast resources and knowledge, overlooked what I, an African scientist navigating uncharted territories, managed to unveil. But today isn't about the past; it's about celebrating the human spirit's capacity to transcend boundaries, to innovate, and to redefine the canvas of possibility.

As I stand here, I hope my journey serves as a beacon, a testament to the infinite potential within each of us, waiting to be unlocked. I'm often cited in school essays on "Inventors and their Inventions", but beyond the accolades and acknowledgments, I hope my story serves as a testament to resilience, vision, and the transformative power of curiosity.

Let the invention of parallel supercomputing be a reminder to us all: the seemingly impossible challenges of today are but the transformative breakthroughs of tomorrow. It's a privilege to have played a part in such a monumental chapter of human progress. This is not just my discovery; it is a gift to humankind, a tool for us to forge a brighter, more enlightened future for generations to come.

Thank you.

POWER OF BROAD AND DEEP KNOWLEDGE

Multidisciplinary Mastery Drives Innovation

Ladies and gentlemen and esteemed guests of the Science Festival, I extend to you warm greetings!

Today, I, Philip Emeagwali, stand before you not as a testament of individual achievement but as a manifestation of decades of relentless learning, deep understanding, and continuous exploration in the realms of mathematics, physics, and computer science.

Let's delve into why my 14 years of intense postgraduate training in these fields provided me a distinctive edge over those with merely four years of specialized training in physics alone. Imagine scientific discovery as a grand, intricate symphony, a harmonious interplay of various instruments— mathematics, physics, and computer science being the principal ones. A musician proficient in playing only the violin, regardless of his unparalleled mastery of it, cannot single-handedly deliver the rich, complex sound produced by an entire orchestra. Similarly, addressing Grand Challenge problems in computational mathematics demands a poly-mathematical maestro, someone attuned to the subtle rhythms and complex harmonies among various scientific disciplines.

Allow me to draw another analogy from sports, particularly the triathlon. This grueling competition isn't merely a test of an athlete's capability in swimming, cycling, or running; it's an examination of their integrated strength, endurance, and strategy across all three disciplines. A champion swimmer might falter when placed on a bicycle or set to run. Likewise, conquering the Grand Challenge problems requires not only depth but breadth of knowledge, a symphony of skills finely tuned to resonate with the complex and multifaceted nature of the problems at hand.

With 14 years of postgraduate training, my intellectual arsenal was not confined. While I invested four years acquiring expertise in fluid dynamics, a decade was dedicated to mastering partial differential equations, large-scale linear algebra, and parallel processing across millions of coupled processors. It was this holistic and interdisciplinary training that equipped me with the versatility and depth required to navigate through the treacherous terrains of the Grand Challenge problems.

Regrettably, in a world where perceptions often cloud reality, my African heritage sometimes cast shadows of doubt on my capabilities. But let's allow the work to speak for itself. Through a thousand podcasts, YouTube videos, and several books, I have shared knowledge unrivaled in quantity and quality, dwarfing contributions by those claiming superior knowledge but lacking tangible proof of their assertions.

On the monumental day of July 4, 1989, the world witnessed a groundbreaking discovery—the fastest computing executed across the world's slowest processors. This pivotal moment redefined our understanding and utilization of computers, marking the paradigm shift from serial to parallel supercomputing.

Let me impart to you, the brilliant minds assembled here, the lessons distilled from my life and career:

First, arm yourself with knowledge, broad and deep, for it is your most potent ally in navigating through the convoluted labyrinths of life and science. Engage in continuous learning, for the pursuit of knowledge is unending, and the landscape of science is ever-evolving.

Second, embrace challenges with open arms and a resilient spirit. The problems worth solving are often the toughest, the most daunting ones. Do not be disheartened by failure; each setback is but a stepping stone leading you closer to the pinnacle of success.

Lastly, let your work be your voice. In a world often blinded by prejudice and misconception, let your contributions, your discoveries, and your innovations reverberate through the corridors of academia and echo across the vast expanse of the scientific community.

To you, India's finest young minds, embarking on a journey in science and engineering, let the canvas of the unknown inspire curiosity in your hearts and the challenges of the future fortify your resolve. Stand tall on the shoulders of giants, but also strive to see further, dive deeper, and reach higher than those who came before you. The world awaits your contributions, and the future beckons with limitless possibilities. Forge ahead with courage and conviction, for within you resides the power to unravel the mysteries of the universe and redefine the frontiers of human knowledge and endeavor.

Thank you, and may the odyssey of discovery eternally illuminate your paths!

REVEALING THE BATON OF MASTERY

A Tale of 50 Years of Fastest Computing

Greetings, esteemed guests, honorable organizers, and the vibrant young minds of the Indian Institute of Technology.

I stand before you today not just as Philip Emeagwali but as a testament to the unyielding power of persistence, dedication, and lifelong learning. In our pursuit of knowledge, each step we take towards deeper understanding illuminates the path for innovations and discoveries that can transform our world.

The Grand Challenge problems of computational mathematics are not mere academic exercises. They are daunting peaks of intellectual endeavor, often seeming insurmountable. To ascend these peaks, one requires not just specialized knowledge but a convergence of insights drawn from mathematics, physics, and computer science.

Consider the journey to mastering Grand Challenge problems akin to excelling in a musical symphony. A musician proficient in playing the piano alone, however skilled, cannot recreate the magic of a symphony that requires expertise in violin, percussion, and flute as well. Each instrument, like different domains of knowledge, plays a unique and irreplaceable role in crafting the masterpiece.

Similarly, my 14 years of postgraduate training and 50 years of supercomputing provided me with a competitive advantage, akin to a multi-instrumentalist musician. These years were not merely spent on acquiring depth in fluid dynamics but spanned across gaining proficiency in partial differential equations, large-scale linear algebra, and parallel processing across millions of processors. Such extensive training is indispensable for solving Grand Challenge problems, like how a maestro seamlessly integrates various instruments to produce a symphonic masterpiece.

Through the lens of sports, think of it as a triathlon. A sprinter, regardless of his speed, cannot triumph in a triathlon without mastering swimming and cycling. It takes a triathlete, who has trained rigorously across all three disciplines, to navigate through the intricate balance of endurance, speed, and technique required to secure victory. My journey mirrored that of a dedicated triathlete, balancing and integrating various fields to execute the world's fastest computing across the world's slowest processors.

I must highlight that the shadows of prejudice did cast doubts on my capabilities, but the beacon of knowledge and perseverance always shines brighter. The digital footprints of knowledge I've shared through numerous podcasts, videos, and publications stand as pillars of my contributions to

the scientific community, offering insights and sparking curiosity among aspiring scientists and researchers globally.

Dear students, your journey in science and technology is dotted with endless possibilities and challenges. From my life and professional journey, imbibe the lessons of resilience, continual learning, and the courage to tread unexplored paths. Your years of learning will not only be a quest for academic excellence but a pilgrimage towards becoming architects of innovation and harbingers of positive change.

Remember, the symphony of breakthrough discoveries and groundbreaking innovations is composed note by note, through meticulous practice and unbreakable resolve. Your potential is limitless, and the canvas of the future awaits your strokes of genius.

May you always be guided by the light of knowledge, inspired by the spirit of inquiry, and strengthened by the will to make a difference. The future of science and technology is bright, and in your capable hands, it will undoubtedly be dazzling.

Thank you.

BREAKING BARRIERS IN SCIENCE

Unconventional Path to Scientific Stardom

The Scientist Who Spoke to the World

In the rich tapestry of scientific research, it's customary to invite pioneers who have made significant breakthroughs to elucidate their findings through public lectures. In today's digital age, these lectures find a home on platforms like YouTube. What differentiates me, Philip Emeagwali, from many iconic scientific luminaries, spanning from the era of Albert Einstein to our current times, is my extensive reservoir of knowledge. This has found expression through a myriad of platforms—be it a thousand podcasts, YouTube videos, or books.

While modern science often witnesses large collaborative efforts involving multidisciplinary teams, not every acclaimed scientist can comfortably deliver extemporaneous lectures without the crutch of meticulously prepared notes, often crafted by adept assistants. I take pride in being perhaps the lone mathematician, physicist, and computer scientist who has consistently imparted knowledge through hundreds of YouTube lectures, without the aid of PowerPoint slides.

In 1989, Ann Arbor, Michigan knew me as its renowned scientist. This recognition was a double-edged sword. While many showed genuine admiration, others, driven by envy, hoped to collaborate, seeking a piece of the acclaim. Their approaches were devoid of genuine contribution—no significant invention in computing, groundbreaking discovery in physics, advancements in computational speeds, or novel mathematical equations. Consequently, I had to decline. Esteemed figures like Einstein would have perhaps done the same, ensuring they didn't compromise their reputation by aligning with an individual who didn't contribute meaningfully. Sadly, this led to a wave of resentment and attempts to besmirch my reputation with unfounded allegations.

Contrasting the oratory skills of other prominent scientists with my extensive podcasts, YouTube videos, and books makes the distinction clear. The essence of Emeagwali's knowledge stands unparalleled when placed against most academic engineers in the USA.

On arriving in the USA with my academic scholarship dated September 10, 1973, I embarked on an enriching journey spanning 18 years across six esteemed institutions. Today, they take pride in associating Philip Emeagwali as their 'Einstein'. This acknowledgment isn't surprising, given my rigorous training in mathematics, physics, and computer science. My multidisciplinary prowess enabled me to conquer the Grand Challenge

problem, an enigma that eluded many brilliant minds before. And I've been zealous in disseminating this knowledge through various mediums, ensuring the flame of knowledge continues to burn bright.
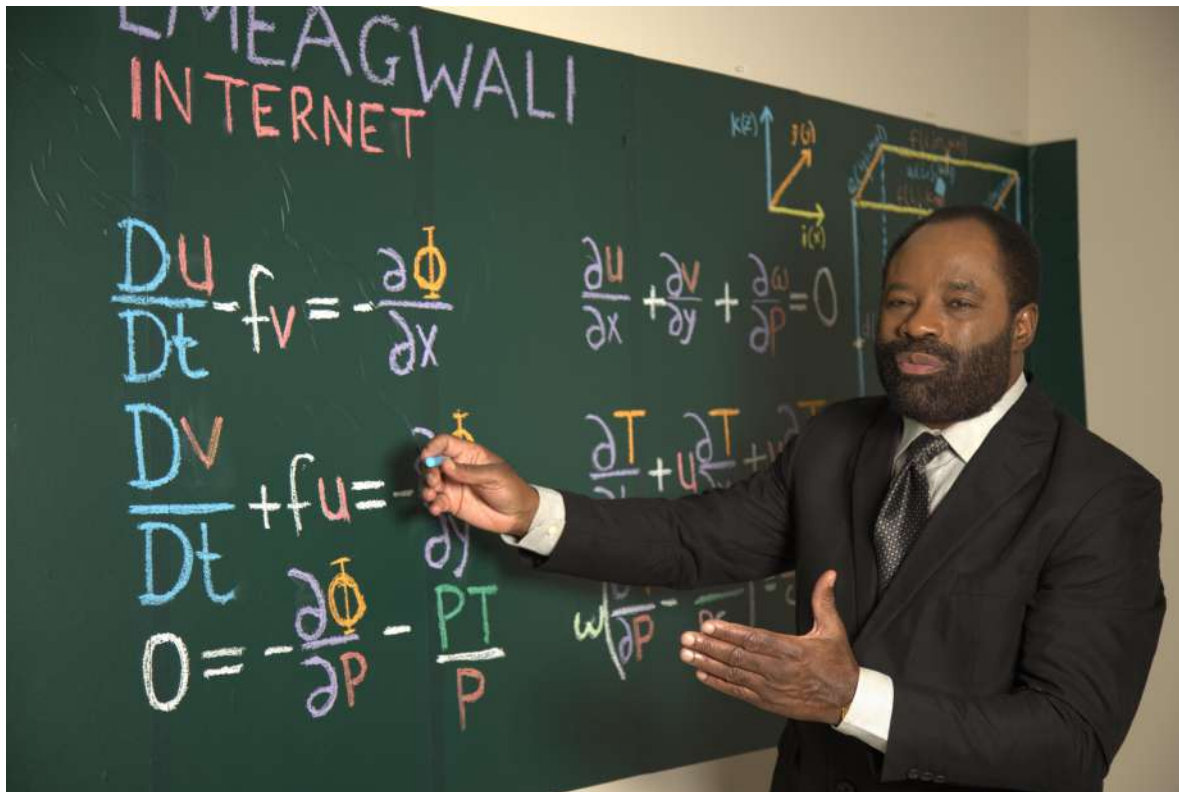
Philip Emeagwali explaining his contributions to mathematics.

Broadcast 28 September 2021

https://youtu.be/uRgch0DQyQ8

HOW THE FASTEST COMPUTER WAS INVENTED
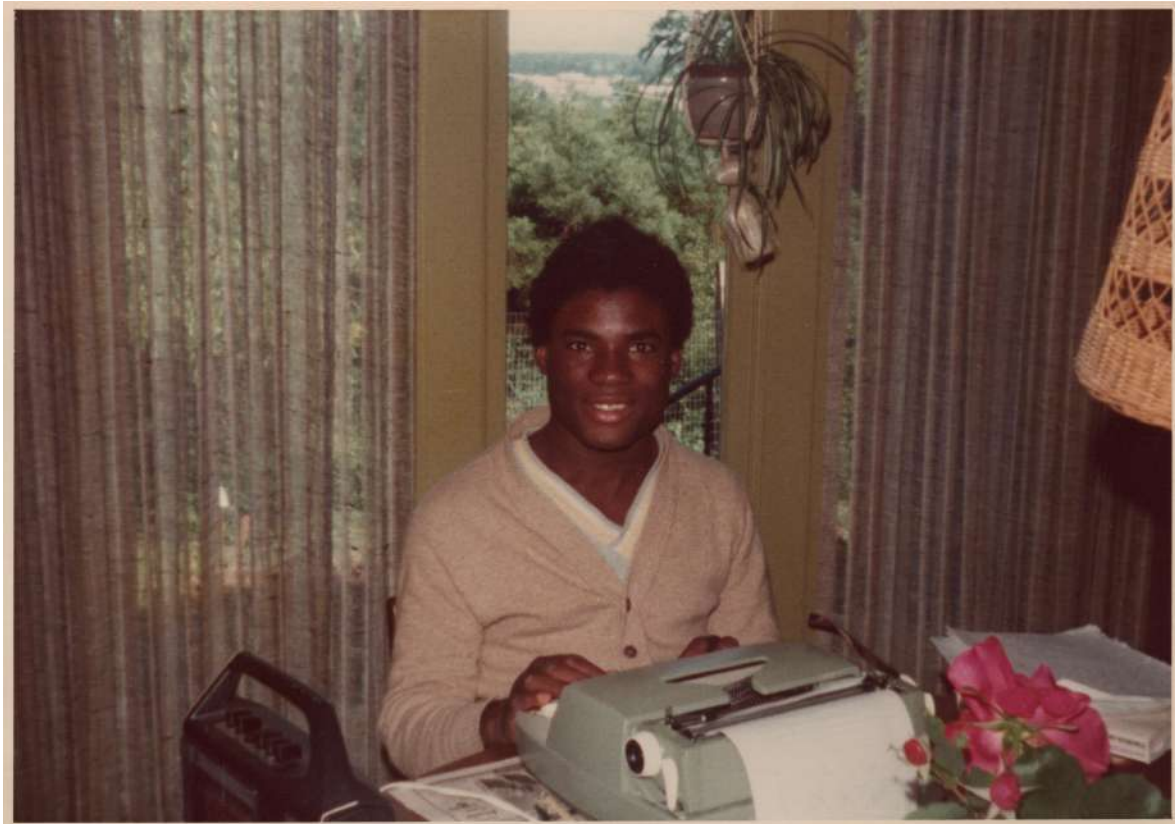
On June 20, 1974, in Corvallis, Oregon, USA, I began my search for the new knowledge of how off-the-shelf processors could be harnessed and used, in tandem, to create the world's fastest computer. I discovered that such a supercomputer will not be a computer, in and of itself. It will be a new Internet, in reality.

I imagined that new Internet as my new global network of processors that were identical and uniformly distributed across the surface of a globe. But distributed just as computers are distributed around the Earth.

My search for the fastest supercomputer demanded that I begin from the beginning, which is the laws of physics that existed since the Big Bang explosion, or the small singularity, that inflated over the past 13.8 billion years. And inflated to become the present cosmos. In my two-decade long quest, I scourged the history of physics, then of calculus and algebra and mastered the frontiers of knowledge of those three important subjects.

That mastery enabled me to harness the total and maximum supercomputing power of my coupled ensemble of the two-raised-to-power

sixteen slowest processors in the world. Those off-the-shelf processors were designed for a mainstream market, rather than for supercomputing. And they were manufactured in large numbers and for a lower price.

My most significant contribution to computer science is this: I discovered that a billion processors can power supercomputers. In an email, a twelve-year-old writing the biographies of great inventors and their inventions asked me: "What is Philip Emeagwali known for?" I'm known for discovering that up to a billion off-the-shelf processors can power the world's fastest computers.

In the 1980s, I was ridiculed for pursuing the then useless technology of the first world's fastest computing across the slowest processors in the world. But by 1989, I was in the news for discovering fastest computing with slowest processing. After my discovery, vector supercomputer scientists who had ignored me wanted to become my new best friends. That invention of computing with millions of processors put a Black African face in science classrooms. And alongside the faces of Galileo, Isaac Newton, and Albert Einstein.

The Debate on Race and Intelligence

My contribution to computer science was how I chipped away at one of the fundamental assumptions of the myth of white intellectual superiority. Such myths were sincere fictions of the white self. Fictions that only white males, the likes of Albert Einstein, were endowed with the intellect that was needed to make substantial contributions to human knowledge. And to solve the most challenging problems at the frontiers of knowledge of the fields of mathematics, physics, and computer science.

Those sincere fictions legitimized IQ science and white power. Furthermore, those sincere fictions legitimized white privileges, including favoring the immigration and hiring of Western and Northern European scientists over Black sub-Saharan African scientists. Not only that, those sincere fictions legitimized attacking affirmative action policies that would have produced more African-American supercomputer scientists who could have contributed to making parallel and quantum supercomputers faster.

Over the decades, those sincere fictions became the *status quo*. I discovered the world's fastest computing across the slowest processors in the world and did so on the Fourth of July 1989. Before my discovery, it was assumed that Albert Einstein is more intelligent and more knowledgeable than Philip Emeagwali. The reverse now holds across genius rankings posted on the Internet.

Historically, the Black invention rarely was understood in the racial context it was made. Looking back to June 20, 1974, the day I began programming one of the world's fastest computers that was at 1800 SW Campus Way,

Corvallis, Oregon, USA, the toughest part about being a marginalized Black computer scientist was that I was expected to repress my oppressed identity.

As a mathematical physicist, I always knew that the laws of logic and physics are experienced the same way by Black and white persons.

THE WORLD'S FASTEST COMPUTING

The fastest computer is why you know the weather before going outside. In 1974, I conceived the first world's fastest computing across a new ensemble of sixty-four thousand processors. I visualized my new technology as encircling a globe. And doing so just as what we later called the Internet now encircles the Earth. In May 1981, in College Park, Maryland, I embarked on my mathematical quest for how to solve the most compute-intensive problems that needed to be solved on the world's fastest computers.

In 1981, the open mathematical question was this: "Can mathematicians solve an initial-boundary value problem, such as simulating the flows of crude oil, injected water, and natural gas that are buried up to 7.7 miles (or 12.4 kilometers) deep and within an oil-producing field that is almost twice the size of the state of Anambra, Nigeria?

And can we hindcast, or re-forecast, those fluid flows across a new Internet that's a new spherical island of up to a billion off-the-shelf processors? Each processor had its dedicated memory." That difficult problem was at the crossroad where new physics, new mathematics, and new computer science intersect. In the 1980s, the United States government classified that problem as one of the twenty Grand Challenges in supercomputing.

How to Solve Compute-Intensive Problems

Solving the most intractable problems that arise simultaneously in mathematics or physics or computer science demands a higher mental power than writing a poem or a play or a novel. That demand is akin to the belief that lifting a car demands physical strength. The research computational mathematician who can solve or parallel process the toughest problems that arise in extreme-scale computational physics is believed to have a stronger brain muscle, or a higher mental power or a higher IQ, than those who cannot.

Solving the most difficult problems in mathematics and physics are the reasons Isaac Newton and Albert Einstein are in the perennial list of the smartest people that ever lived.

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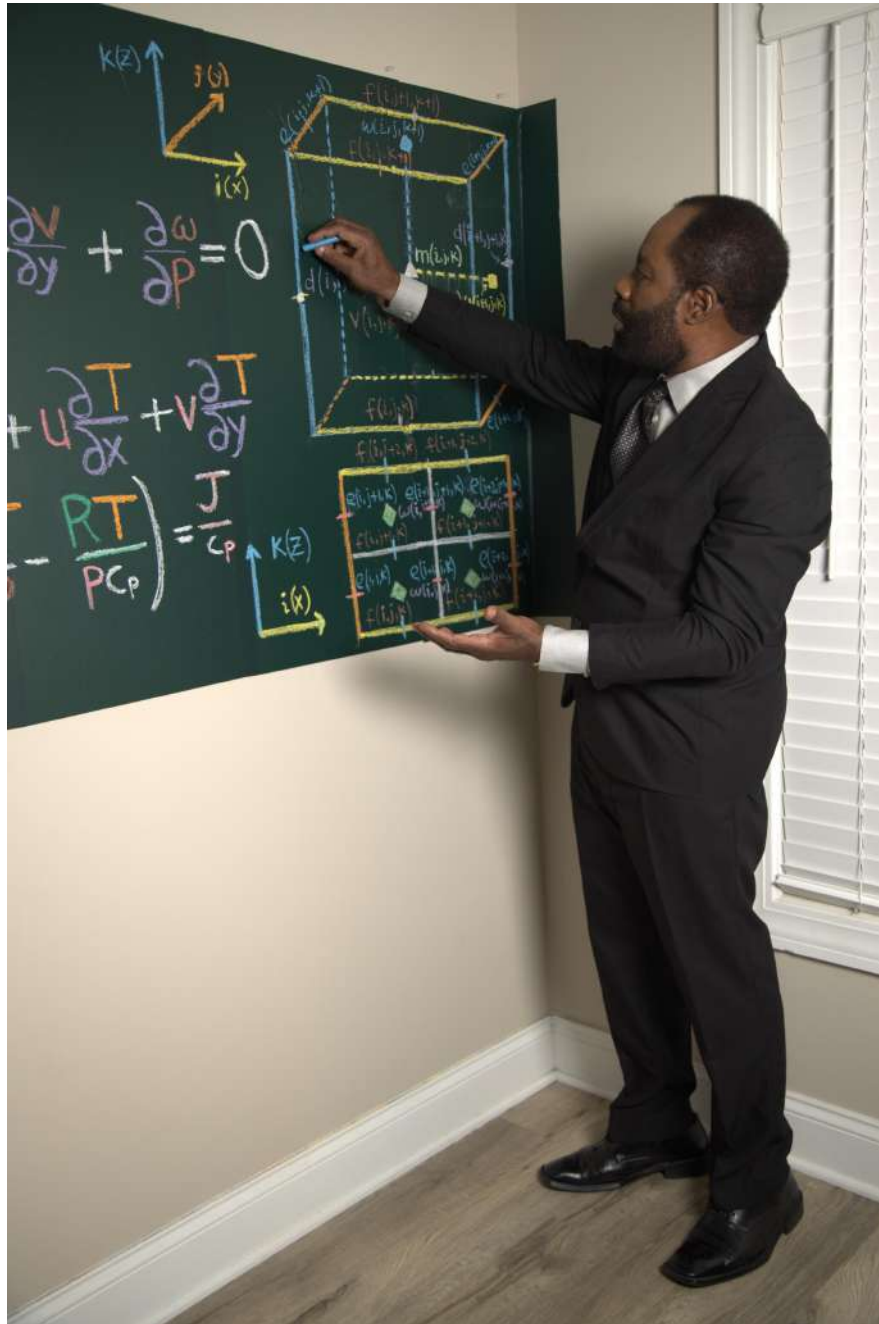
Philip Emeagwali at the chalkboard explaining his contributions to mathematics, namely, the underlying mathematical calculations behind his world's fastest computing of July 4, 1989.

World's Fastest Computing
Solves Compute-Intensive Problems

For me, the early 1980s was my period of a "hand proofs" that delineated my paths from the blackboard to the motherboard. And across my new Internet that I visualized as a new global network of sixty-four binary thousand processors. That was when and why I coded the processor-to-processor email algorithms which I invented for solving the resulting huge system of equations of computational linear algebra. That was how I constructed my message-passed 65,536 processor codes.

I invented those processor codes for solving the most difficult, or compute-intensive, problems at the frontiers of knowledge of mathematics, physics, and computer science. What made the news headlines, in 1989, was that I executed those 65,536 codes **simultaneously**. And across a global network of 65,536 processors that I visualized as a new Internet.

How I Used Slowest Processing to Invent Fastest Computing

In the 1980s, I experimented across an ensemble of the slowest processors in the world and across an Internet that is a global network of those processors. Those processors were identical and were equal distances apart. Each processor had its dedicated memory that shared nothing. I executed my experiments that yielded the first world's fastest computing across the slowest processors in the world and did so by using the initial-boundary value problems in weather forecasting and in petroleum reservoir modeling and using both difficult mathematical problems as my computational test beds. My new speed from my world's slowest processor experiments was the world's fastest computation. I recorded that speed at 8:15 on the morning of the Fourth of July 1989, in Los Alamos, New Mexico, USA.

I Changed the Way Computer Scientists Think

My supercomputing discovery led to a new understanding of how millions of processors could be harnessed and used to make the fastest computer. And make the supercomputer practical in addressing some of the world's most important and complex challenges. Such difficult mathematical problems include, more accurate weather forecasts, powering the world with green energy, manufacturing efficient and safer automobiles, and personalized medicine that extends life spans. That new understanding led to the world's fastest computer that's not supercomputing with one

processor. We now understand the world's fastest computer as supercomputing across millions of processors.

My major contribution to computer science is this: I was the first to record the fastest computer speed and do so alone and across processors. On the Fourth of July 1989, I was confident that I've discovered the first world's fastest computing across the slowest processors in the world. And that I've solved one of the most compute-intensive problems in computer science. In the 1980s, the first world's fastest computing across the slowest processors in the world was an unknown field of computer science. I was the only known expert that could solve the most compute-intensive problems in mathematics and physics.

I discovered how to solve the most difficult problems across up to a billion coupled processors. That was the reason, I became the first to record the fastest computer speeds. And do so across my ensemble of 65,536 coupled processors.

At first, my discovering the fastest computing across the slowest processors was ridiculed and rejected. Not only that, I was dismissed because non-experts were asked to review the fastest computer speed which I recorded across my ensemble of 65,536 coupled processors. I was the only person that understood my discovery. Furthermore, I described that discovery in my 1,057-page research report that only I understood.

That should not come as a surprise because I was the first and sole full-time programmer of the biggest supercomputer ever built. Such supercomputers now occupy the footprint of a football field. And it costs forty percent more than the mile-long Second Niger Bridge in Nigeria. The billion-dollar price tag ensures that supercomputing will never become a child's play.

Recording the world's fastest computing and recording it in an unexpected way—such as across the world's slowest processors—is an important contribution to computer science.

MY CONTRIBUTIONS TO SCIENCE

Inventing the World's Fastest Computer
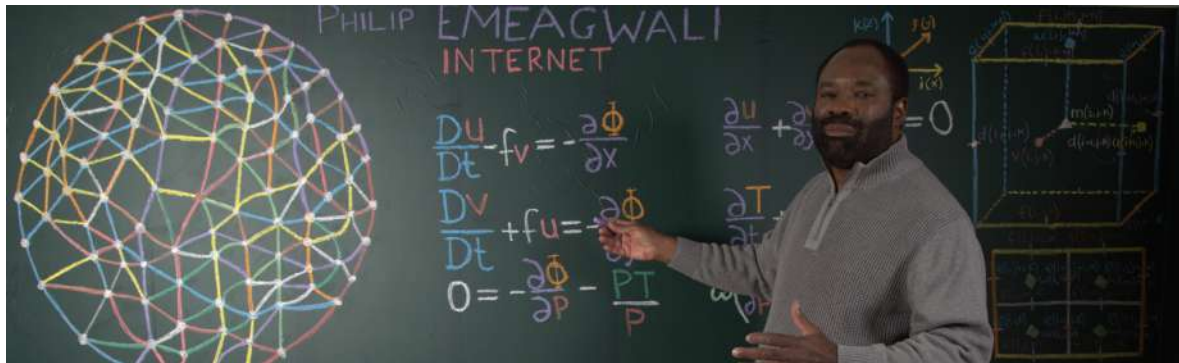
Philip Emeagwali at the chalkboard explaining the initial-boundary value problems of mathematical physics that were the testbeds for his world's fastest computing of July 4, 1989.

T hree often asked questions are: What is the Philip Emeagwali Computer? How did Philip Emeagwali invent the world's fastest computing? How were the Philip Emeagwali equations reformulated from calculus to algebra?

The nine Philip Emeagwali equations that I invented were abstract and differential. And they were the most advanced expressions in calculus and were difficult to understand. I discretized those partial differential equations by using partial difference schemes that I invented. That was how I reduced them from a system of equations of calculus to a seemingly infinite system of equations of computational linear algebra which I solved across my ensemble of the slowest 65,536 processors in the world.

In the 1970s and 80s, I knew that the world's fastest computer speed was a technological achievement that could be measured in the manner the speed of a marathoner is measured with tapes and watches. But in calculus, the watches are soft and genius is subjective.

How I Won the Top Prize of Supercomputing

On the Fourth of July 1989, I was challenged to submit my discovering the world's fastest computing across the slowest processors in the world and

allow my new knowledge to be retested by the foremost experts in supercomputing. I accepted that challenge and took my discovery to a fifteen-day supercomputer workshop that took place between September 1 and 15 of 1989 and in the outskirts of Chicago, Illinois.

At that supercomputer workshop, my discovery was discussed by programmers who had programmed vector supercomputers and hoping to program parallel supercomputers. After that fifteen-day supercomputer workshop, a sense of anticipation arose from my discovery that the world's fastest computing can be extracted from the slowest processors in the world. By the end of that supercomputer conference, the consensus was that my discovery deserved to be recognized by the highest award in supercomputing for 1989.

But a few naysayers openly challenged me to re-submit my discovery to the committee of judges who awarded the most prestigious prize in supercomputing. That award committee was appointed by the two top computer societies in the world, The Computer Society of the IEEE (or the Institute of Electrical and Electronics Engineers) and the Association for Computing Machinery. In December 1989, I submitted my scientific discovery of the world's fastest computing to The Computer Society of the IEEE,in San Francisco, California. I won that prize in supercomputing that computer scientists rank as the Nobel Prize of supercomputing. The discovery and the prize generated the *news headlines:* "African Supercomputer Genius Wins Top U.S. Prize."

The Significance of Winning the Top Prize of Supercomputing

Winning that top supercomputing prize gave me credibility and a handle. That most prestigious prize separated me from the other 25,000 vector supercomputer scientists. A coveted prize was the "scientific evidence" that my supercomputer discovery of how to execute the world's fastest calculations and do so across up to a billion coupled processors. And solve the most compute-intensive problems in mathematics and science. It was an undeniable proof that I made an original contribution to the million-fold increase in the speed of the world's fastest supercomputer that now computes faster with millions of processors. That top supercomputing prize made me stand out in the community of prominent mathematicians and top physicists.
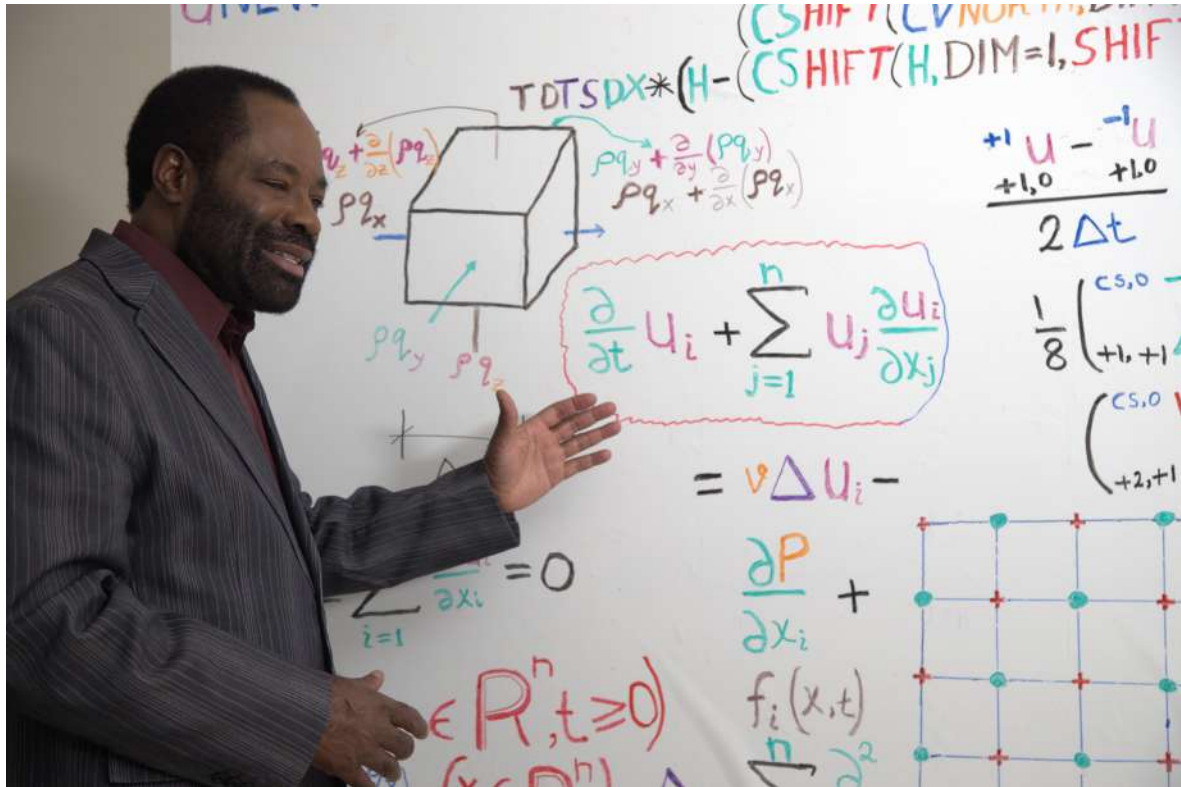
Philip Emeagwali at the whiteboard explaining his unique formulation of the initial-boundary value problems of mathematical physics that were the testbeds for his world's fastest computing of July 4, 1989.

How I Won the Top Supercomputing Prize Alone

My discovering the first world's fastest computing across the slowest processors in the world changed how mathematicians and physicists use the supercomputer to solve compute-intensive problems in their fields.

My discovering supercomputing across the slowest processors was new knowledge that inspired vector supercomputer scientists to change how they look at the fastest computers. The chances of a supercomputer scientist winning the highest award in supercomputing, and winning that prize alone, was only one in 25,000. With the exception of myself, that most prestigious award, or diploma, in supercomputing was shared by up to fifty supercomputer scientists. Fifty names were inscribed on their award diploma. It was like fifty persons sharing one diploma.

Being "First" is Better Than "Best"

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In the 1980s, I was the only full-time programmer of the most massively parallel supercomputer ever constructed. That supercomputer is the precursor of the world's fastest computer of today.

Being the "first" person to discover something is better than being the "best" person in doing that thing. On July 4, 1989, I became the first to discover that parallel computing is faster than sequential computing. It's faster when both technologies are used to solve the world's most compute-intensive problems, such as modeling climate change. That breakthrough opened the gate to the widespread use of millions of processors to power the world's most powerful supercomputers.

In 1989, I stood out because I was the first to win the highest award in supercomputing. And win it alone. I was the first to win that prize, alone, for solving the most compute-intensive problem in supercomputing. This year, the highest award in supercomputing was shared by thirty-four co-winners.

That prize enabled me to stake massively parallel computing as Philip Emeagwali Territory, and as the place where the fastest computers exist. My scientific discovery of world's fastest computing was validated and replicated across the ensemble of millions of processors that define and outline state-of-the-art supercomputers.

The forty-five billion dollars a year market value of the world's fastest computers affirms the importance of using up to a billion processors to power every supercomputer. It should be noted that the world's fastest computing is the supreme validation of a new supercomputer.

A scientific discovery is a personal property that becomes public property, if and only if, it's disclosed to the public. I transferred the ownership of my invention of the world's fastest computing across the slowest processors in the world and signed it over on three disclosure occasions: July 4, September 15, and December 25 of 1989.

The scientific community responded to those disclosures of my discovery and did so by awarding me the highest award in supercomputing. That supreme validation was time stamped for 1989.

I INVENTED AN INTERNET

I've shared a thousand videos on YouTube. My videotaped lectures are my compression of five decades of scientific research into a series of one-hour remarks. It's akin to compressing my life story into a parable. I couldn't describe everything that I know within one thousand hours. I only presented the crux of my contribution to my new Internet that's a new supercomputer, intrinsically.

It costs more than a billion dollars to create the world's fastest computer. But it costs nothing to listen to my lecture on how I discovered how to execute the fastest computer speed. And how to do so across up to a billion processors which outline and define the world's fastest computer.

I Invented a Small Copy of the Internet

For me, June 20, 1974, in Corvallis, Oregon, USA, was the beginning of my long train of thoughts and experiments across a new spherical island of 65,536 off-the-shelf processors and standard parts. Those processors were identical. I visualized those processors as uniformly distributed across a globe.
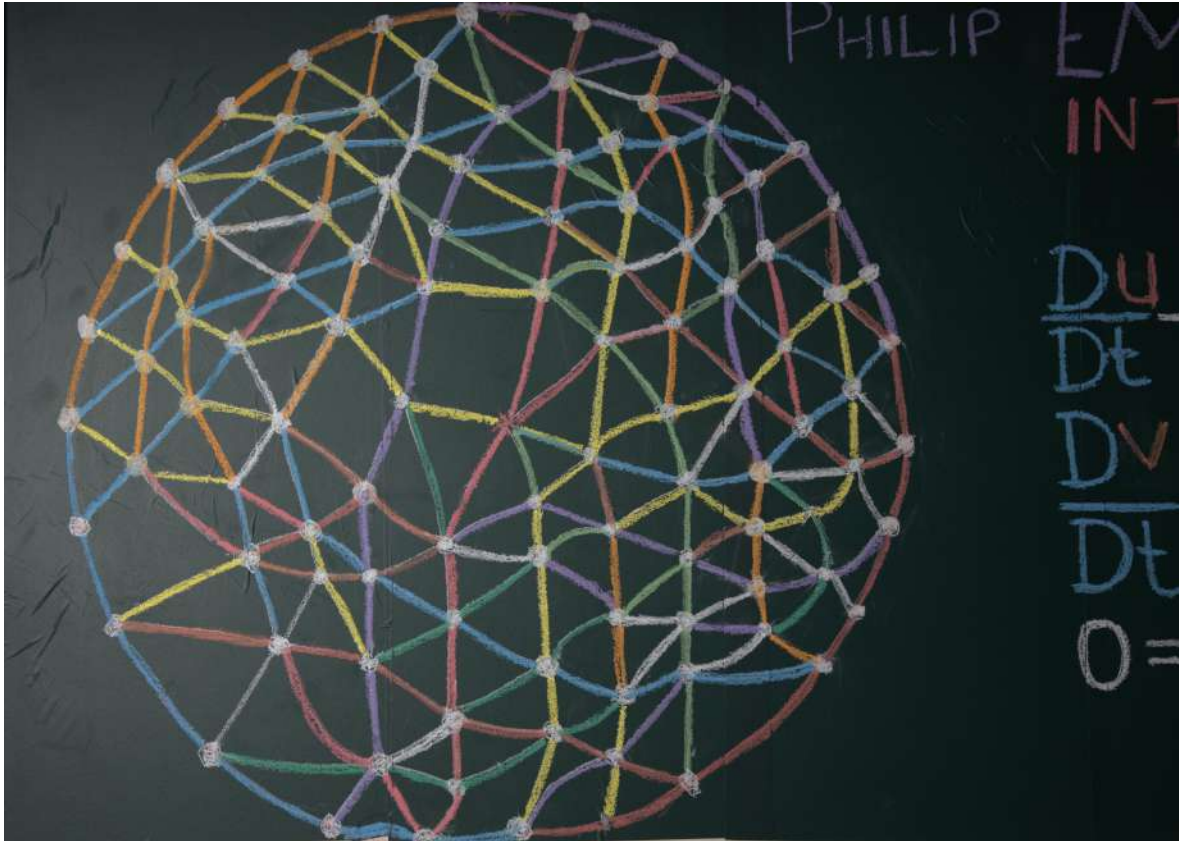
Philip Emeagwali's back-of-the-envelope sketch of the blueprint for his new Internet.

I defined my ensemble of coupled processors as a never-before-visualized Internet that encircles a globe. And that's a small copy of the Internet that encircles the Earth. I invented the fastest computing across an internet.

Philip Emeagwali (2nd from right of second row), Wilson Hall, Oregon State University, Corvallis, Oregon, from the university's 1976 Beaver Yearbook.

In 1989, I was in the news because I discovered how to harness my new Internet. And use the new technology as one seamless, coherent, and gigantic machinery that's the world's fastest computer, in reality, but not a computer, in and of itself. I didn't invent my new Internet in one day, on June 20, 1974.

Parallel Processing Enables Computers to be Fastest

Nor was I instantaneously struck with the nine Philip Emeagwali equations. I solved my system of partial differential equations beyond the frontier of calculus. And I solved them via their companion partial difference equations of large-scale computational linear algebra. I solved them in my thoughts. And solved them during the experiments that I executed across

my ensemble of 65,536 processors. Those processors were identical and surrounded a globe as a new Internet.

The inklings of parallel computing I had in 1974 grew from a mere acorn to a mighty oak tree that was the fastest computation across a new Internet. The new Internet is a new global network of coupled processors sharing nothing and uniformly distributed around a globe. It made the news because I discovered how to harness those slow processors as a supercomputer.

On the Fourth of July 1989, I discovered how to use up to a billion processors to solve the most compute-intensive problems in mathematics and physics, such as global climate modeling. In the 1970s and 80s, harnessing one million processors and using them to solve the most compute-intensive mathematical problems was supercomputing's equivalent of being the first to summit Mount Everest.

As an aside, the first climbers who made it to the top of Mount Everest did so in 1953. Since then, only five thousand climbers climbed to the summit of Mount Everest. By comparison, only one person single-handedly recorded the world's fastest computer speed across the slowest processors in the world.

My Milestone in Computer History

In high-performance supercomputing, recording the world's fastest speed is the most coveted milestone. In the 1980s, the fastest speed in computing recorded across the slowest processors was a milestone that 25,000 supercomputer scientists dreamt to achieve. That fastest parallel supercomputer was a milestone in the history of mathematics and computer science. I was the first and only person that benchmarked that milestone, successfully. I benchmarked it on the Fourth of July 1989.

Fastest Computing Across an Internet

It made the news headlines that a Nigerian supercomputer genius in the USA had recorded the fastest speed in the history of computing. I recorded that speed across the slowest processors in the world. And I recorded that speed while solving the most compute-intensive problems in the world.

To put my supercomputer invention from a literal perspective, writing a novel or a book takes a couple of years. And up to one million new books are published each year in the USA alone. And reading and critiquing my supercomputer invention—of how the fastest supercomputer can be built

with the slowest processors—is as easy as spending time on Facebook or WhatsApp.

The grand challenge in deeply understanding my contribution to the highest-performance supercomputing was to spend a billion dollars to reconstruct the massively parallel supercomputer that will be needed to re-create my world's fastest computation. And, most importantly, test that world's fastest computation on production petroleum reservoir simulations that are executed across millions of off-the-shelf processors. And, finally, re-create that fastest speed as mandated by the scientific method that characterized natural science since the 17th century.

Why We Changed the Way We Look at the Computer

My scientific discovery of the fastest computing across the slowest processors changed how mathematicians solve the twenty most difficult mathematical problems in science, engineering, and medicine. And changed it from solving one problem at a time to solving up to a billion problems **simultaneously**. Changing how we count is a fundamental change of tectonic proportions. And a shift that has occurred only once in the two hundred thousand years of the existence of humanity.

HOW ARE SUPERCOMPUTERS USED?

In the 1980s, I used more supercomputers than any person ever did. I alone was the only full-time programmer of sixteen massively parallel supercomputers that were each powered by up to the 65,536 slowest processors in the world.

The massively parallel supercomputers of the 1980s were abandoned because they were then mocked, ridiculed, and dismissed as a tremendous waste of everybody's time. Back then, the supercomputer textbooks state that it would forever remain impossible to solve the most compute-intensive problems. And solve them at the fastest speeds. And solve them across an ensemble of the slowest processors in the world.

In 1989, I was in the news because I proved everybody wrong and did so by solving the most compute-intensive problems. And solving them with the slowest processors and solving them at the fastest possible speeds. That was how the fastest computing across the slowest processors became my signature discovery. And became one reason I'm the subject of biographical essays on famous inventors and their inventions.

My Contributions to Computer Technology

My contributions to developing the world's fastest computers were these: I discovered that a binary billion processors that were locked together can be programmed to emulate one seamless, coherent machinery that's a supercomputer, in reality. A binary billion is two-raised-to-power-32, or 4,294,967,296. I discovered that the number of processors needed is proportional to the compute-intensiveness of the mathematical problem.

More often than not, the most compute-intensive problems arise as variations in physics calculations, particularly in geophysical and astrophysical fluid dynamics. The physics roots, as well as the mathematical and computational structures, of the global climate model differs slightly from that of the petroleum reservoir simulation.

I presented reservoir simulation in my 1989 discovery for which I won the highest award in supercomputing. Climate and reservoir modeling are the prototypical problems of large-scale geophysical and astrophysical fluid dynamics.

Fastest Computing Across Processors Changed Supercomputing

The supercomputer enables medical and scientific discoveries to occur at the fastest pace. It's used to pull the future closer. The world's fastest computers were used to discover how COVID-19 spreads. My invention of the world's fastest computing across the slowest processors in the world made the news headlines in 1989. And made it impractical to continue selling outmoded supercomputers that were powered by only one processor.

Within five years after my discovery, the manufacturers of vector supercomputers couldn't sell that technology. For those reasons, they ran out of funds, laid off their employees, and filed for bankruptcy protection from creditors and filed it under Chapter 11 of the United States Federal Bankruptcy Code.

What is the New World's Fastest Computer?

Programming the world's fastest computer is not a child's play. The supercomputer occupies the footprint of a football field. It costs forty percent more than the mile-long Second Niger Bridge in Nigeria. It's the world's most complex invention. The world's fastest computer is powered by up to one billion processors.

Philip Emeagwali at the blackboard explaining his contributions to mathematics and computer science, as a back-of-the-envelope sketch of the partial five-dimensional, 32-node blueprint for his 65,536 coupled processors that he harnessed to execute his unexpected world's fastest computing of July 4, 1989.

Each processor had its operating system. Each processor shared nothing with its closest-neighboring processors. That first supercomputer that's used to solve the toughest mathematical problems and solve them fastest across the slowest processors is described as the most complex creation of the human mind.

The Nigerian Oil Fields

Nigeria has 159 oil fields. And 1,481 oil wells. The first oil field in West Africa was discovered in 1956 in Oloibiri (Nigeria). The oldest oil well in Nigeria was sunk in 1958. Oloibiri was a fishing and farming community that is a distance of 45 miles (or 72.4 kilometers) east of Port Harcourt. The Oloibiri oil field covered an area of 5.31 square miles. Only half of the crude oil discovered in Oloibiri was recovered, or rather was recoverable.

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Twenty years after that first oil well in Oloibiri was sunk, that first oil field in Nigeria was abandoned. The warning from Oloibiri is that the 159 producing oil fields of Nigeria will dry out in twenty or thirty or forty years. In fifty years, Nigeria will not be an oil-producing country. And Nigeria will be dismissed from OPEC, the Organization of the Petroleum Exporting Countries.

Philip Emeagwali Computer Described

I'm often asked: "What is the Philip Emeagwali computer? Why is Philip Emeagwali known for fastest computers? What is the influence of calculus on the development of the computer?" In June 1970, I claimed, or rather reclaimed, my mathematical language. And I did so when I bought the 568-page blue hardbound book that was titled: "An Introduction to the Infinitesimal Calculus." That calculus book was written by G.W. (George William) Caunt. And published by Oxford University Press.

In developing the world's fastest computer, calculus was the pink elephant in the room that nobody wanted to talk about. The secret to my 1989 world's fastest computing was that I discovered how to divide-and-solve the most compute-intensive problems in calculus. I divided it into an equivalent set of less compute-intensive problems that I solved across my ensemble of 65,536 processors.

My processors computed in tandem and were in dialogue with each other. At first and in the 1970s, I was confused because I did not know where each processor was located at. The one vertex of a sixteen-dimensional cube to one-processor correspondence gave me an intuitive understanding of where each processor was located. That new knowledge enabled me to record the fastest speed in computer history.

In the history of the computer, we expect the next generation of computers to be ten times faster. I discovered a billion-fold increase in the speed of the world's fastest computer that's powered by a billion processors. To invent a supercomputer is to take a big risk and leapfrog into the future.

OCEAN'S HIDDEN CODE

The Shallow Water Equations Decoded

Ladies and Gentlemen,

It is an honor to stand before you today to discuss the profound impact of the shallow water equations (SWE) on our understanding of the world's oceans and climate systems. These equations are the cornerstone of three-dimensional oceanic models, providing insights into phenomena ranging from small-scale coastal interactions to large-scale ocean circulation.

The Derivation of the Shallow Water Equations

The SWE are derived from the fundamental principles of conservation of mass and momentum. They simplify the Navier-Stokes equations under the assumption that the horizontal length scales are much larger than the vertical length scale. This allows us to integrate the equations over the depth of the fluid, assuming hydrostatic pressure distribution and a negligible vertical velocity component. The resulting system of partial differential equations describes the horizontal flow of an incompressible fluid under the influence of gravity and Earth's rotation.

Solving the Shallow Water Equations

To solve these equations, we employ the finite difference method, discretizing the continuous domain into a grid where the values of fluid variables are approximated at discrete points. This method transforms partial differential equations into algebraic equations that can be solved to simulate the evolution of fluid flow over time.

The Role of Supercomputers

Modern supercomputers, powered by millions of interconnected processors, have revolutionized how we solve the SWE. By leveraging massively parallel computing, we can perform simulations with unprecedented resolution and speed. This capability is crucial for accurate weather forecasting, predicting storm surges, and understanding the complex dynamics of climate change.

Parallel Processing in Climate Models

Parallel processing allows climate models to divide the immense computational workload across multiple processors. This approach is essential for simulating global warming scenarios, as it enables the processing of vast datasets and complex interactions within the Earth's climate system.

Philip Emeagwali's Contributions

Philip Emeagwali's pioneering work in harnessing the power of parallel processing has been instrumental in advancing our climate models. His innovative use of a global network of processors deepened our understanding of the Internet—as a potential supercomputer that could, in turn, transform computational science. His discovery—of the first supercomputing across many processors, on July 4, 1989—have enabled us to forecast weather patterns more accurately and predict the potential impacts of global warming with greater confidence.

The marriage of the shallow water equations with the power of parallel computing, championed by visionaries like Philip Emeagwali, has ushered in a new era of scientific discovery and technological innovation. As we continue to face the challenges of a changing climate, the tools and methodologies developed through this synergy will be invaluable in guiding our path forward.

Thank you.

MY CONTRIBUTION TO MATHEMATICS

An often-asked question was this: "What is Philip Emeagwali known for?" I'm known as the first person that figured out how to solve the most compute-intensive problems that are important to society. Such intractable problems are governed by a system of coupled, nonlinear, time-dependent, and three-dimensional partial differential equations that are beyond the frontier of calculus.

Such partial differential equations must be discretized, or reduced, to an almost equivalent system of equations that's the largest in computational linear algebra. I was in the news because I was the first to parallel process across an ensemble of sixty-four binary thousand off-the-shelf processors that were identical and coupled to each other.
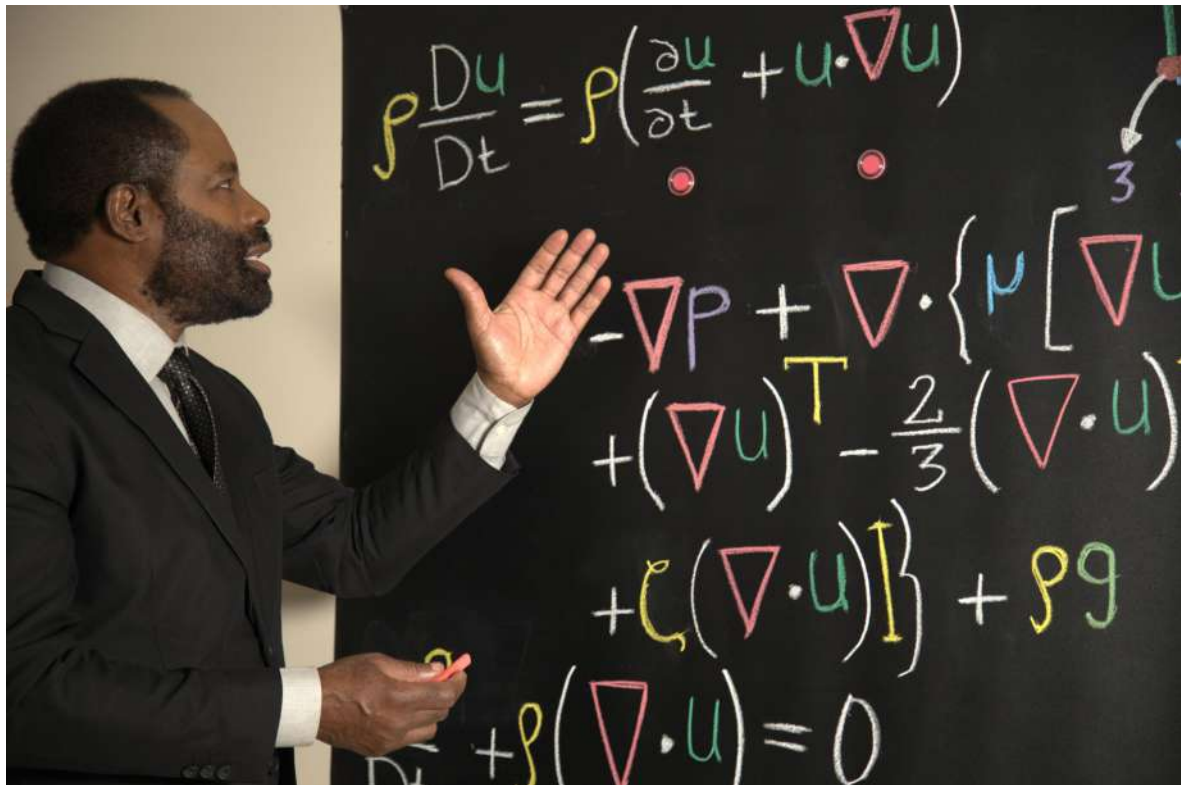
Philip Emeagwali at the blackboard explaining his contributions to mathematics, namely, an initial-boundary value problem of fluid dynamics that he discovered how to solve across his 65,536 coupled processors that he harnessed to execute his unexpected world's fastest computing of July 4, 1989.

Why I Created New Mathematics

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In the 1970s and 80s, I thought of myself as a research computational mathematician searching for the world's most powerful supercomputer. In those two decades, my goal was to execute the fastest floating-point arithmetic operations that must be used to solve the world's most compute-intensive problems in science, engineering, and medicine. That was how and why I searched for and discovered the fastest arithmetical computations. And searched for and discovered new algebraic knowledge. And searched for and discovered new partial differential equations of calculus. I create new equations the way Bob Marley writes new songs. I sing in the mathematical dialect of the universe.

How I Solved the Most Difficult Math Problem

My quest for new mathematical knowledge was a personal search for the lost language of God. In my quest for the never-before-seen supercomputer that's the fastest ever, I encoded physics's second law of motion into partial differential equations of calculus and fluid dynamics. I then discretized those partial differential equations into corresponding and approximating partial difference equations of large-scale algebra.

Finally, I developed my 65,536 coupled computer codes which I used in a one-code to one-problem corresponding manner. And used to solve each of my 65,536 subsets of those systems of equations of large-scale algebra. I translated the world's biggest mathematical problems. And did so from prose to the supercomputer cycles which I executed to solve those compute-intensive equations that would otherwise be impossible to solve.

Visualizing the World's Fastest Computer

In 1989, I was in the news because I was the first to figure out how to compute across two-raised-to-power sixteen, or sixty-four binary thousand "little computers," called processors, that surrounded a globe. I visualized my globe as embedded within the 16th dimensional hyperspace. My ensemble of processors encircled that sixteen-dimensional globe and did so in the way the Internet encircles the Earth.

My supreme quest for ultrafast computations from the world's fastest computer was like launching 65,536, or two-raised-to-power sixteen,

digital arrows into the unknown sixteen-dimensional hyperspace. Each arrow carried an email message (or computer code) to a sixteen-bit-long address and across sixteen times two-raised-to-power sixteen pathways that had a one-to-one correspondence with as many bidirectional edges of the cube in the 16th dimensional hyperspace.
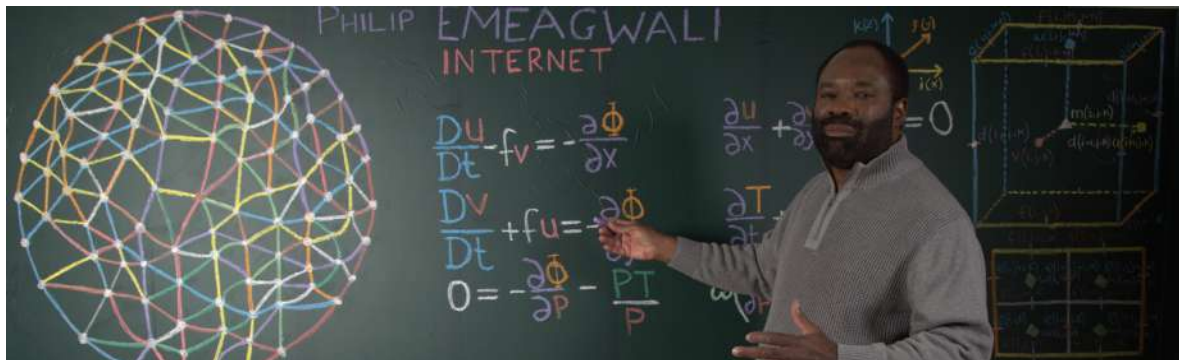
Philip Emeagwali at the chalkboard explaining why he is the only father of the Internet that invented an Internet.

The World's Fastest Computer

Visualizing the world's fastest computer that I discovered in the 1980s and imagining the technology as a new Internet within the 16th dimension was published as science fiction, on February 1, 1922. But on the Fourth of July 1989, I figured out how to turn that fiction to nonfiction.

Fastest computing across slowest processors is my contribution to the supercomputer that occupies the space of a soccer field. And it costs more than the mile-long Second Niger Bridge in Nigeria. In my supercomputing, I computed in parallel, rather than in sequence, or solved up to a billion problems **simultaneously**, rather than solve one problem at a time.

The introduction of parallel computing into mathematics is a quantum shift that's comparable to the introduction of quantum mechanics into physics.

HOW I WANT TO BE REMEMBERED

I was asked: "How do you want to be remembered?"

My contribution to the speed of extremely fast computers is this: I was in the news, in 1989, for discovering that the world's fastest computers must be powered by up to one billion processors. Prior to my discovery that occurred on the Fourth of July 1989, the fastest computing across the slowest processors, existed only in science fiction.

I want to be remembered for the first world's fastest computer that was powered by the slowest processors in the world. I'm studied in schools because I'm the first to know somethings in mathematics, physics, and computer science that were not known to anybody before me. My quest for the world's fastest computer was like flirting with the infinite.

First Witness of a New Supercomputer

Looking back, my failures were the price that I paid for my successes. Short-term failures are necessary, but not sufficient conditions, for long-term successes. My contribution to computer science is this: I was the first witness to the fundamental shift that yielded our new understanding of the world's fastest computer.

The new supercomputer is an ensemble of up to a billion coupled processors that shared nothing and that each operated its operating system. I recorded the world's fastest computer speed. More importantly, I did so while solving the most important and most compute-intensive problems known to humanity. And solving them across a new Internet. My Internet was a new global network of the slowest processors in the world.

I visualized my supercomputer as outlined and defined by two-raised-to-power sixteen off-the-shelf processors that each had its dedicated memory. Furthermore, I visualized those processors as equal distances apart. Likewise, I visualized those processors as etched onto the hypersurface of a globe. I visualized that globe as embedded within a sixteen-dimensional hyperspace. That global network of processors is called the Philip Emeagwali Internet.

Not only that, I fulfilled my part of the tacit requirement that every scientist—from Einstein to Emeagwali—who contributed to science must share his or her new knowledge on YouTube.

In an email, a fourteen-year-old writing an essay on famous scientists and their discoveries asked me to describe how I want to be remembered.

As an aside, ninety-five percent of my supercomputer research notebooks that began on June 20, 1974, in Corvallis, Oregon, USA, are unpublished. But they should be published and remembered. I want my unpublished writings, handwritten notes, unpublished lectures, and conversations to be digitized, duplicated, and archived in the USA. They should be made public in Nigeria on my 200th anniversary, or on August 23, of twenty-one fifty-four.

I want to be remembered for discovering how to map the complex problems of physics across the millions of processors that power the world's most powerful computers. I want to be remembered for discovering how to solve mathematical problems that will be otherwise unsolvable, both on the Earth and in the heavens.

A Maverick Mathematician Invents

1. How did Philip Emeagwali's search for the world's fastest computer lead him to the concept of a new Internet?
2. What challenges did Philip Emeagwali face as a Black computer scientist pursuing the fastest computing technology?
3. How did Philip Emeagwali's discovery challenge the assumptions of white intellectual superiority?
4. What was the significance of Philip Emeagwali's discovery that up to a billion off-the-shelf processors can power supercomputers?
5. How did Philip Emeagwali's invention change the way computer scientists think about supercomputing?
6. What were the key components of Philip Emeagwali's mathematical and computational approach to solving compute-intensive problems?

7. How did Philip Emeagwali's discovery of parallel computing impact fields such as weather forecasting, energy production, and medicine?
8. What role did the recognition and validation of his discovery play in Philip Emeagwali's career and reputation?
9. How did Philip Emeagwali's invention of the world's fastest computing lead to a new understanding of the capabilities of supercomputers?
10. What is the significance of being the first person to discover something versus being the best person at doing it?
11. How did Philip Emeagwali's discovery pave the way for the widespread use of millions of processors in supercomputing?
12. How did Philip Emeagwali transfer the ownership of his discovery to the public and the scientific community?
13. What were the implications of Philip Emeagwali's discovery for the fields of mathematics, physics, and computer science?
14. How did Philip Emeagwali's experience as the only full-time programmer of a massively parallel supercomputer influence his understanding of supercomputing?
15. What is the lasting impact of Philip Emeagwali's discovery of the world's fastest computing on the field of computer science?

1. How does the author describe their compression of scientific research into lectures on YouTube? What metaphor do they use?
2. What was the author's vision of processors and their distribution across a globe? How did this vision relate to their invention?
3. How did the author solve their system of partial differential equations and what computational method did they use?
4. How did the author's inklings of parallel computing in 1974 evolve over time? How did they harness slow processors as a supercomputer?
5. What significance did the author's discovery hold in the field of high-performance supercomputing? Why was recording the world's fastest speed a coveted milestone?
6. How did the author's discovery change the way mathematicians approach problem-solving? What impact did it have on the mathematical community?
7. What challenges did the author face in developing the world's fastest computers, and how did they overcome them?
8. How were supercomputers used in the 1980s, and how did the author contribute to their advancement?
9. What impact did the author's discovery have on the supercomputer industry? How did it affect the manufacturers of vector supercomputers?
10. How does the author describe the programming and complexity of the world's fastest computer? What are the key features and specifications?
11. What was the role of calculus in the author's development of the world's fastest computer? How did they divide and solve compute-intensive problems using calculus?
12. How did the author visualize and conceptualize the world's fastest computer? What was the significance of the 16th dimensional hyperspace in their invention?
13. What practical applications did the world's fastest computer have? How was it used to address important scientific and medical challenges?

14. How does the author want to be remembered for their contribution to computer technology? What aspects of their work do they emphasize?
15. How does the author describe their quest for new mathematical knowledge? How did they approach solving the most difficult math problems and create new equations?

Memoir of a Maverick Mathematician (2 of 4)

Broadcast 28 September 2021

https://youtu.be/8uLUKL7Ph8M

I'm often asked to explain why I left the southeastern region of Nigeria for Oregon in the Pacific northwest region of the United States. I decided to leave Nigeria six months after its 30-month long war was over. I left before significant petrodollars flowed into Nigeria.

I was a Biafran refugee who dropped out of school from ages twelve to fifteen. And dropped out of school again from ages seventeen to nineteen. I dropped out to live in refugee camps of Biafra of the Nigerian Civil War. One in fifteen Biafrans died during that 30-month-long war. More Igbos died in Biafra than during the era of slave trade. In the list of the worst genocidal crimes of the 20th century that was committed against humanity, the death of one in fifteen Biafrans was ranked fifth. I left Nigeria for the USA because I wanted to stay afar from Biafra.

In June 1970 and at age fifteen, in Onitsha, East Central State, Nigeria, I was confident that my school grades and forthcoming scores in the American Scholastic Aptitude Tests, called SAT, will guarantee me a scholarship to the USA. The scholarship letter that brought me to Oregon, USA, was dated September 10, 1973.

So, I had even wanted to leave Onitsha for Oregon earlier, in May 1973. I missed the September deadline and postponed my travel to mid-December 1973. Yet, I didn't have a travel passport until December 28, 1973. For those reasons, I changed the date of my visa interview to March 1974. The United States consulate on Victoria Island, Lagos, issued me a visa on March 21, 1974, which I picked up the following afternoon.

Twenty-four hours later, at three o'clock in the afternoon of Saturday, March 23, 1974, I was pacing inside the Ikeja Airport of Lagos, Nigeria. In 1976, that airport was renamed the Murtala Muhammed International Airport. Two hours later, I had taken a seat in a Pan Am airplane, the 366-passenger Boeing 747-100, for my first flight.

That flight to the USA was an overwhelming experience. Forty-eight hours after I left our compound that was adjacent to Uzoigwe Primary School, Asaba, Nigeria, I was in 36 Butler Hall, Monmouth, Oregon. My flight to Portland, Oregon, included a brief stopover at the John F. Kennedy airport.

BY AIR MAIL
PAR AVION
AIR LETTER
AEROGRAMME

P. O. Emeagwali
Oregon College of Education
Beetles Hall (Room 30)
Monmouth, Oregon
97361
U·S·A·

Sender's name and address: J. N. Emeagwali
General Hospital
Asaba
NIGERIA

AN AIR LETTER SHOULD NOT CONTAIN ANY
ENCLOSURE; IF IT DOES IT WILL BE SURCHARGED
OR SENT BY ORDINARY MAIL

General Hospital
Asaba,
16.4.74.

Dear Son, Philip,

Your letter to
hand and its contents were
noted, our pleasure knew
no bounds at the receipt.
and same was extended
to the whole family.
You are aware of your
primary motive of being
there. Your efforts and
mine have resulted in
something good.

The choice of subjects
will broaden your out-
look in life and that
will ultimately show you
the wisdom of my
strong suggestion in
nuptical studies. a welcome

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choice indeed

In closing part-time employment, of course, you are age to know the type that will not delear you from your studies.

There is no need for further discussion but suffice it to say that the next mail will afford more such subject-matter

With the best compliments of the season from Mother Brothers and sister.

I am

Yours affectionately

J. N. Enesquali

My first letter from Nigeria to the USA (April 16, 1974).

Outrunning Death: The Battle for Onitsha

Prior to my first airplane flight, of March 23, 1974, from the Ikeja Airport of Nigeria, the closest I came to an airplane was to the Russian-made MiG-

17F jet fighters that strafed Onitsha, Biafra, with their machine gun fires. Those Russian military airplanes were purchased by the Nigerian Air Force and flown by foreign mercenary pilots. The war policy of the Nigerian Air Force was to bomb first and ask questions later. In Biafra, we used bombed out buildings that were surrounded by rubbles as our playgrounds.

In the last thirty months of the 1960s, the Russian-made Ilyushin IL-28 jet bombers dropped bombs on hospitals, markets, and refugee camps in Biafra. The Russian jet fighters and bombers flew to Onitsha from the airports in Benin City and Port Harcourt. In early 1968, the MiG-17 jet fighters and the Ilyushin IL-28 jet bombers frequently raided our refugee camps in the *Énú Ọnịcha* neighborhood of Onitsha, Biafra.

In February 1968 and at 14 Mba Road, Onitsha, I was almost killed from a hail of machine gun fire from a MiG-17 jet fighter that took off from Benin City. The following month, we fled from Onitsha. And the house at 14 Mba Road, Onitsha, that we fled from was bombed to rubbles.

From the eight-day non-stop artillery bombardments of downtown Onitsha, that began on October 4, 1967, to the capture of Onitsha that occurred on March 20, 1968, half of the residents of *Énú Ọnịcha* quarters of Onitsha were refugees from the Fegge and Odoakpu quarters of Onitsha. During the eight-day, non-stop artillery bombardments of Fegge and Odoakpu, my family of nine fled from our house at 4B Egbuna-Adazie Street, Odoakpu. We sought refuge in the house of my maternal grandfather, Chieka Balonwu, at 6C Wilkinson Road, *Énú Ọnịcha.*

On the eighth day, fifteen thousand heavily-armed Nigerian soldiers crossed the mile-long River Niger to land in Onitsha. The Nigerian Army captured downtown Onitsha. At five o'clock in the morning, I witnessed Nigerian soldiers engaging Biafran soldiers in fierce gun battles at Metropolitan College. And fighting to capture the Obi Okosi Primary School that was converted as the Onitsha headquarters of the Biafran Army, right next to our residence.

Woken up by non-stop, all-night gun firings, I stepped outside at four o'clock that morning of November 1967. I saw two Biafran soldiers huddling in my maternal grandmother's cocoyam yam, behind 6C Wilkinson Road. My grandmother passed away nine months earlier and her farm was untended. I saw both soldiers removing their Biafran Army uniform. And changing into civilian uniform. Thirty minutes later, I saw those two Biafran soldiers, fleeing with refugees along Awka Road. And towards Saint Charles Borromeo Hospital and towards Nkpor.

In mid-October 1967 and in downtown Onitsha, fifteen thousand soldiers died within a few days of close combat fighting. That was the reason, a thousand Biafran soldiers changed into civilian clothes and fled with refugees.

My mother was then twenty-eight years old. She fled with her then seven children to seek refuge in the house her mother, *Obam Okudo*, was born. The Okudo family house was seven-mile-walk and at Nkwelle Ogidi.

As we were fleeing from Onitsha and in the early morning of the 12th of October 1967, I witnessed a house-to-house gun battle. I saw a Biafran soldier crouched in a brush that was a stroll away and at the intersection of Wilkinson Road and Metropolitan College. That Biafran soldier was firing his automatic Setima rifle at presumably Nigerian soldier who were trying to capture the Biafran military headquarters.

Four months earlier and like all schools in Biafra, Obi Okosi Primary School and the nearby Metropolitan College were closed. Schools were converted into Biafran military barracks and refugee camps. Unknown to us, Biafran refugees, fifteen thousand Nigerian soldiers, that took no prisoners at nearby Asaba, were everywhere in Onitsha.

THE ASABA DANCE OF ETERNAL DARKNESS

Five days earlier in Asaba, on October 7, 1967, seven hundred unarmed male civilians were gunned down and buried in mass graves. Unarmed civilians were gunned down at Ogbe-Eke Market Square, Asaba, at Ogbe-Osowa, Asaba, at Saint Joseph's Catholic Church, Asaba, at Saint Patrick's College, Asaba, and at Cable Point, Asaba.

Colonel Murtala Mohammed, the future President of Nigeria, was the commanding officer of the Nigerian soldiers that gunned down those seven hundred unarmed civilian men. After the Dance of Death killing spree, Asaba was described as a ghost town and as a town with many women and few men.

Please allow me to quote the "*London Observer*" issue of January 21, 1968: "The greatest single massacre occurred in the Ibo town of Asaba, where 700 Ibo males were lined up and shot."

That was the reason we fled from the advancing Nigerian soldiers during the "First Battle of Onitsha." On the early morning of October 12, 1967, and after eight-days of non-stop artillery bombardments that originated from the west bank of the River Niger at Asaba, fifteen thousand Nigerian soldiers made a surprise landing. And for a few days captured the east bank of the River Niger at Onitsha.

Throughout the 30-month-war, the advancing Nigerian Army outgunned and outmanned the retreating Biafran Army by four to one. Each Nigerian soldier in that bloody Onitsha battle, that costs the life of fifteen thousand soldiers, was heavily armed to the teeth. In the ensuing gun fighting and pandemonium, of the early morning of October 12, 1967, we, the *Ndi Onicha* refugees of Umuasele Village, fled in the opposite direction and away from downtown Onitsha.

My family began our flight from 6 Wilkinson Road. Thirty seconds along Wilkinson Road, a spent rifle bullet shell fell a few inches in front of my feet, proving that Nigerian soldiers were in our backyards. We rested for a few days in Nkwelle Ogidi, before fleeing deeper to Awka, Biafra, and in November 1967.

On the 19th of January 1968, Awka was captured by Nigerian soldiers. We barely escaped. My family fled from Awka and sought refuge in the house of my father's oldest sibling, John Emeagwali, at 14 Mba Road, *Énú Ọnịcha.*

In October 1967, in Onitsha, Biafra, we were fleeing from the heavy artillery bombardments that were originating from the West Bank of the River Niger at Asaba. Those artillery bombardments drove the refugees as

well as some soldiers out of downtown Onitsha. The Nigerian artillery bombardments "softened" Onitsha for their follow-up man-to-man military offensive that began on October 12, 1967. On the latter date, dare-devil Colonel Murtala Muhammed led a terrifying amphibious assault of a Nigerian ten-boat armada that ferried fifteen thousand well-armed soldiers across the River Niger, and from Asaba to Onitsha.

After eight days of non-stop artillery shelling, those fifteen thousand Nigerian soldiers fiercely engaged poorly-armed and fewer Biafran soldiers. The fighting was house-to-house and followed the shellings from October 4th through 12th, 1967. Those artillery bombardments of Onitsha were executed under the guidance of the future president of Nigeria, Colonel Murtala Muhammed. The portrait of Murtala Muhammed is on the Nigerian twenty naira currency. He's the namesake of Nigeria's Murtala Muhammed International Airport.

The airplane bombing raids of Onitsha were at their peak in the few days before March 20, 1968, the day the city was captured. Egyptian pilots flew the Ilyushin IL-28 jet bombers. And pilots of European ancestry flew the MiG-17F jet fighters. The MiG-17F was flown by sixteen foreign mercenaries, such as the former UK's Royal Air Force pilot John Palliser and South African RAF trained pilot Ares Klootwyk and Briton Paul Martin.

As a British mercenary pilot, Mike Thompsett, was extravagantly paid one thousand British pounds per month. That was almost one thousand times the salary of a Nigerian soldier.

In February 1968, the 36-feet-long MiG-17 jet fighter was routinely flown past our temporary residence at 14 Mba Road, Onitsha, Biafra. The MiG-17 was flown by the mercenary pilot Mike Thompsett. MiG-17 was a high-subsonic airplane that was first flown in 1950. Throughout that 30-month-long war which ended on January 15, 1970, the Biafra Army did not possess anti-aircraft missiles or Air Defense Systems.

But children hear better than adults. And warned us when the MiG-17 was three miles away. Children not dogs, heard the jet engine whines of the MiG-17. Children alerted the adults whenever the Nigerian jet fighter or bomber that departs from Benin City is flying from downtown Onitsha to uptown Onitsha. Those alarms from children gave us time to scramble into our underground bunkers.
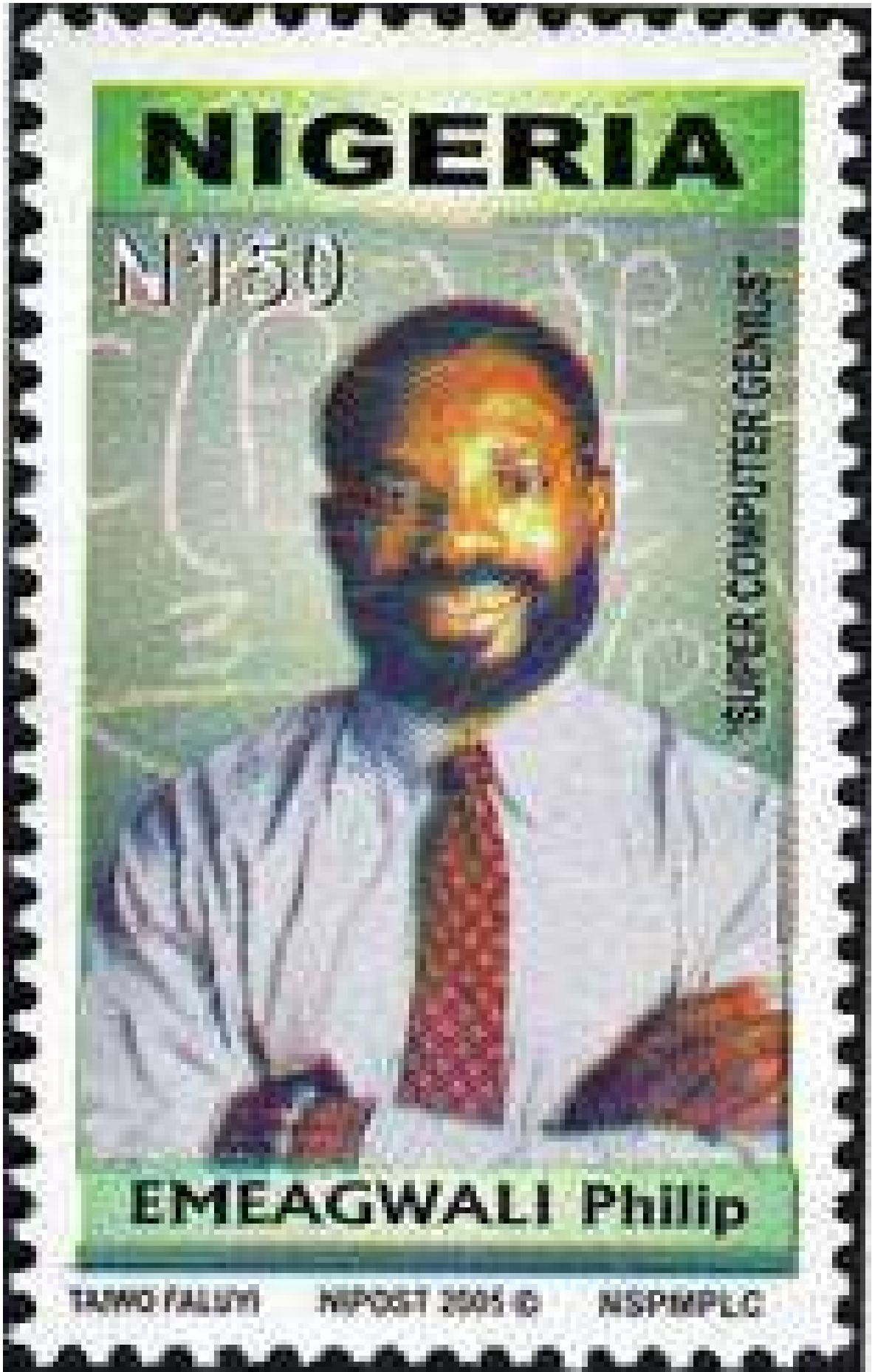
And do so before the MiG-17F jet fighter arrived in our neighborhood. We sought refuge inside an underground bunker that was besides the house of Uncle John Emeagwali at 14 Mba Road, Onitsha.

That house was destroyed during the Nigerian artillery bombardments that were aimed to drive the Biafran soldiers away. Those artillery

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bombardments made it easier for the Nigerian Army to capture Onitsha and overran the commercial city by the early morning of March 21, 1968. About four hours earlier, that house—at 14 Mba Road—was razed to the ground by the Nigerian artillery bombardments that were fired from Abagana to Onitsha. My family of nine narrowly escaped death. We escaped to Oba (Biafra) and from a soon-to-be-bombed house. And did so in the late evening of March 20, 1968.

That night, we were among the ten thousand Onitsha refugees that slept at the Merchants of Light School, Oba, Biafra. At about four o'clock in the morning, there was a huge influx of refugees who alerted us of the heavy fighting in Onitsha. Fearing for their lives, all the refugees that camped outdoors overnight at the Merchants of Light School, took flight to Nnewi, Nnobi, and Awka-Etiti.

So we fled from 14 Mba Road, Onitsha, and did so only four hours before the Nigerian soldiers began to heavily bombard and enter into the city of Onitsha.

NIGERIA

N150

SUPER COMPUTER GENIUS

EMEAGWALI Philip

TAIWO FALEYE   NIPOST 2005 (8)   NSPMPLC

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The Miraculous Escape: How I Survived a MiG-17F Jet Fighter Attack

T he MiG-17F jet fighters that bombed Onitsha were marked Nigerian Air Force NAF 623 or 625. That jet fighter had a top speed of 711 miles per hour and a range of 510 miles. The NAF 625 takes off from Benin City. After Port Harcourt was captured by the Nigerian Army, it took off from that city.

One of the bloodiest fighting of the Nigerian Civil War lasted two months, two weeks, and two days. That heavy casualty fighting was from March 8, 1968 through May 24, 1968. The Nigerian Army was victorious, and finally, captured the important city of Port Harcourt. My ancestral hometown of Onitsha, Biafra, was captured two months earlier and on March 20, 1968.

On July 19, 1969, and after an extended air raid within Biafra, that MiG-17F that shot at me and did so while I was tending my small garden at 14 Mba Road, Onitsha, ran out of fuel and crashed 200 yards short of its runway in Port Harcourt. The only casualty was its only occupant, the British mercenary RAF pilot, named Mike Thompsett, who shot at me, sixteen months earlier at 14 Mba Road, Onitsha.

As a souvenir, I kept the hot 23 x 115 mm shell casing from the NR-23 cannon that the MiG-17F jet fighter fired at me. That big jet fighter shell casing landed one foot beside my feet. That shell casing was very hot when I first picked it up.

Recollections from Fred Merryfield, a Captured World War One Pilot

Fast forward seven years from 1968 and from Onitsha, Biafra, to Corvallis, Oregon, USA, I was living with a former pilot named Fred Merryfield. Fred co-founded the engineering firm CH2M, in 1946. Nearly six decades before I met Fred Merryfield, he was also a Royal Air Force pilot who was shot down in the first World War. Merryfield suffered severe injuries that made it impossible for him to father children.

His company, CH2M, now employs 20,000 persons and has a revenue of five billion dollars a year. So, Fred Merryfield was a man of means and wisdom. I lived with British-born Fred Merryfield and his also British-born wife, Anne, from late 1975 to early 1976. They had no children. Anne was thirty-one years younger than Fred Merryfield. Three of us lived in their

beautiful mansion at 2540 SW Whiteside Drive, Corvallis, Oregon.

Photo of Anne and Fred Merryfield taken by Philip Emeagwali (December 1975).

Me living with my mentor, British-born Fred
Merryfield and his also British-born wife, Anne,
from late 1975 to early 1976. William Shockley,
the controversial Nobel laureate in physics, was a
regular visitor to The Merryfields, previously
sleeping on the bed that later became mine.

REFLECTIONS ON MY EARLY YEARS IN NIGERIA

Books that Influenced Me

I was asked what books inspired me to travel to the USA. At age nine, I read what my father read. My father subscribed to two Nigerian newspapers, the West African Pilot and the Daily Times. He also subscribed to two American magazines, the Reader's Digest and the Rosicrucian Digest.

As an aside, the Rosicrucian describes Sir Isaac Newton as a mystic and an alchemist, just as I've been labelled a member of the Illuminati, a secret society of celebrities that use their fame, wealth, and power to control the world.

In mid-1964 and at age nine in Agbor, Midwest Region, Nigeria, my father bought for me the novel *Gulliver's Travels.* It was subtitled: "Travels into Several Remote Nations of the World." *Gulliver's Travels* was written by Jonathan Swift. In late 1964, I read a second novel *The Pilgrim's Progress*. It was subtitled: "*From This World, to That Which Is to Come.*" *The Pilgrim's Progress* was published in 1678. And was written by John Bunyan. At one time, *The Pilgrim's Progress* was second only to the Bible in popularity. *The Pilgrim's Progress* was the first novel to be written in the English language.

In early 1966 and in Saint George's Grammar School, Obinomba, Midwest Region, Nigeria, I read the novel called *Treasure Island* that was written by Robert Louis Stevenson. Looking back to my formative years, my literary and scientific role models were from far away England, not from Nigeria that was my country of birth.

Saint John's Primary School, Agbor

My interest in fast calculations began at age nine in January 1964, in Agbor, Nigeria. The fastest calculations that I did was solving one hundred arithmetic problems in an hour. I practiced fast calculations every weekday evening and in the living room of our house that was along Gbenoba Road, Agbor.

In 1964, I was in Class Five of Saint John's Primary School, Agbor. As a ten-year-old, my goal was to score the highest in the mid-1965 Nigerian common entrance examination. And, hopefully, enroll in King's College, Lagos. Or in Saint Gregory's College, Lagos.

That entrance exam was the Nigerian equivalent, for ten-year-olds, of the American Scholastic Aptitude Test, called SAT. In December 1965, I earned my Standard Six Certificate, called the First School Leaving Certificate, from Saint John's Primary School, in Boji-Boji, Agbor.

Saint George's College, Obinomba

My entrance examinations of mid-1965 Nigeria were for the January 1966 entries into King's College, Lagos; Christ the King College, Onitsha; and Saint Patrick's College, Asaba. Nigeria followed the British naming system which used the word "college" to describe what Americans call middle and high schools, or 7th through 12th grades. To my father's surprise, I was not admitted into King's College, in faraway Lagos. Or into any academically rigorous college that he ranked as top five in Nigeria. Towards late 1965, I was hurriedly admitted into Saint George's College, Obinomba. The school was an hour's drive away from Agbor.

I enrolled in Saint George's in late January 1966 and a few days after the military coup in Nigeria. Fifteen months later, the counter coup and civil uprisings forced me to withdraw from Saint George's College. The school was a new Catholic boarding school that was competently managed by an Irish priest named Thomas Brendan Kennedy who was born in Cork, Ireland. Saint George was the 3rd century patron saint of England. And a Roman soldier and warrior-saint who was decapitated.
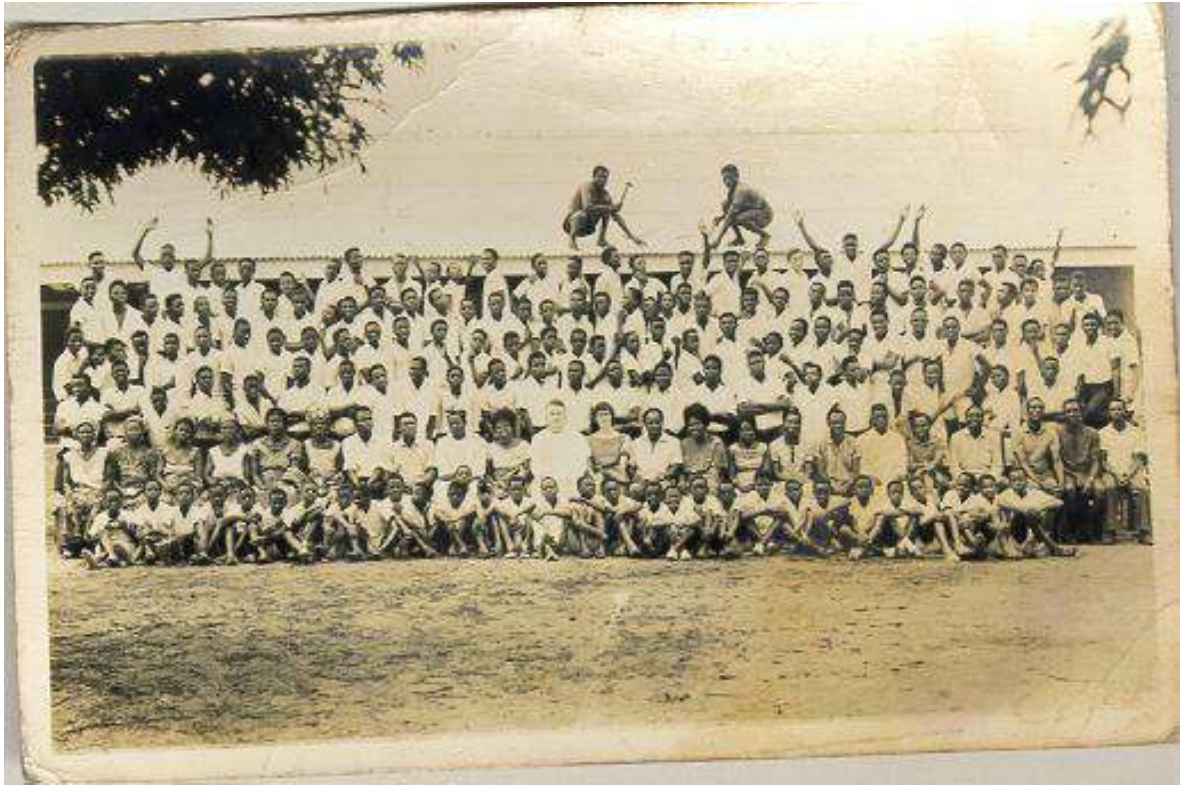
Philip Emeagwali at age eleven (third from left, front row) at Saint George's Grammar School, Obinomba, Midwest Region, Nigeria, mid-1966.

WHY ARE SCHOOLS NAMED AFTER FAMOUS SCIENTISTS?

Post-colonial African schools are named after African-born heroes, such as Cheikh Anta Diop and Obafemi Awolowo universities. Africans are learning from the French people who wear their history of science on their sleeves.

Dozens of streets in Paris, France, are named after French scientists who contributed to science. Boulevard Louis Pasteur was named after the 19th century biologist who discovered pasteurization, microbial fermentation, and the principles of vaccination.

On September 30, 2010, I had a day-long urban hike through the streets of Paris, France. I learned that nearly one hundred Parisian streets, boulevards, and squares were named after French mathematicians.

I'm a 21st century mathematician who is the subject of biography reports that are titled "famous mathematicians and their contributions." I'm studied alongside mathematicians like Pythagoras, Blaise Pascal, Isaac Newton, and Albert Einstein.

For me, it was a surreal experience to stroll across streets named after French mathematicians. And realize that in a thousand years a mathematician will be driving across "Philip Emeagwali Road" in Nigeria or USA. Scientists achieves immortality by first discovering something that will be forever remembered.

ONE DAY WE HAD TO RUN!

The Influence of the Catholic Church

At ages eleven and twelve, I was an altar boy who helped the priest during a Catholic service. I was trained as an altar boy by a Catholic priest, named Thomas Brendan Kennedy. On Sunday mornings, I travelled with Reverend Kennedy. We travelled from Saint George's College, Obinomba, to small Nigerian villages, such as Obiaruku, Umutu, Abavo, and Abraka.

From late January 1966 through late April 1967, I sang in the Catholic church choir of the small villages named Obinomba and Obiaruku. We sang Gregorian Chants, the traditional Catholic music in Latin texts. My favorite was: "*Dies Irae, Dies Illa*." As an eleven-year-old altar-boy in the Catholic church, Thomas Kennedy was my role model and I considered becoming a priest.

As an eleven-year-old at Saint George's College, Obinomba, Nigeria, I travelled on Sunday mornings, as an altar boy of the Catholic Church, with Reverend Father Thomas Brendan Kennedy.

One Day We Had to Run!

At age twelve and in late April 1967, my mother suddenly showed up in Saint George's College, Obinomba. I knew she came to take me away because the Igbos living outside Igbo land were fleeing back to Igbo land. Talks of a bloody civil war were in the air.

I fled, with my mother,from Obinomba to our residence at the Nurses' Quarters, General Hospital, Agbor. The following day, my family fled to 4B Egbuna-Adazie Street, Odoakpu Quarters, Onitsha.

On October 4, 1967, the Nigerian Army at the west bank of the River Niger began eight days of continuous shelling of the Fegge and Odoakpu Quarters of Onitsha. That shelling caused all the residents of downtown Onitsha to flee. Over the next twenty-seven months, my family fled through eight refugee camps in Ogidi, Awka, *Énú Ọnịcha*, Oba, Nnewi, Awka-Etiti, Ndoni, and Fegge (Onitsha).

After the Nigerian Civil War Was Over

In April 1970 and three months after the Nigerian Civil War was over, I found it awkward and demoralizing to return to Saint George's College, Obinomba. And re-enroll in Class Two and be three years behind my former classmates who were then in Class Five. The Nigerian Civil War forced me to repeat Class Two for the four years that were inclusive of January 1967 through December 1970. I did not return to Obinomba because it was humiliating to be three years behind my former classmates at Saint George's College.

Fast forward nineteen years, I was in the news headlines, for my 1989 supercomputer discovery. The Old Boys, or alumni society, of Saint George's College, Obinomba, sent their congratulations. Because I didn't return to Obinomba, after the war was over they presumed that I was one of the one million Biafrans who were starved to death in refugee camps or who were killed in my ancestral hometown of Onitsha that became the bloodiest battlefield in the history of African wars. When the Nigerian Civil War ended, on January 15, 1970, and after thirty months of fighting, one in fifteen Biafrans had died!

My Early 70s in Christ the King College

I decided not to be humiliated by spending four years at the eighth grade of Saint George's College, Obinomba. Instead, I enrolled in mid-1970 as a new student in Christ the King College, Onitsha, called CKC. However, I didn't finish at CKC. In March 1972, I left Christ the King College and after a year and a half, or after completing the American equivalent of the ninth grade.

COMING TO AMERICA

O ne and a half years after I left Christ the King College, I won a scholarship to the United States. My scholarship letter was dated September 10, 1973. That scholarship changed my direction, from Nigeria to the USA. About ten days later, I was in Lagos for the first time.

OREGON COLLEGE OF EDUCATION   Monmouth, Oregon 97361

FINANCIAL AIDS OFFICE, THE COTTAGE   September 10, 1973

[   ]
    TO: Mr. Philip C. Emeagwali
           General Hospital
           Asaba, Nigeria

[Soc. Sec. No. ___212-_____   ]

We are pleased to inform you that you have been awarded financial assistance in the
following amounts for the 1973-74 academic year:

	Summer	Fall	Winter	Spring	Total
International Student Scholarship		460	460	460	1380

We are enclosing specific information concerning the policies which govern your
award. Please study this information carefully before signing and returning the
pink copy of this letter to the Financial Aids Office. Your return must be post-
marked no later than ____October 15, 1973____. THIS OFFER OF FINANCIAL ASSISTANCE
BECOMES INVALID IF NOT ACCEPTED BY THE ABOVE DATE. After receiving your acceptance
of financial aid, if there are specific forms or instructions applicable to your
particular program that are not included with this letter, they will be mailed to
you. Please read these and follow the instructions carefully.

                                        James M. Sumner
                              JAMES M. SUMNER, DIRECTOR
                              STUDENT FINANCIAL AIDS

PLEASE DO NOT DETACH _

TO: Director of Financial Aids

    I have read the material received with this letter and wish to ACCEPT, ▉▉▉▉
(cross out one) the financial aid offered for the 1973-74 academic year.

Date September 21, 1973 Signature Philip Chukwurah Emeagwali
If rejecting award, please state reason for rejection on the back of this sheet.

To put my sense of accomplishment in perspective, after the brutal 30-
month-long civil war was over and in the early 1970s, I could not name an
eighteen-year-old in Igbo land that won an academic-based scholarship to
the USA. I qualified myself to win a scholarship to the USA. I was an
independent scholar who returned from Ibuzor, Midwest State, to challenge
the General Certificate of Education examinations of the University of

London. It was an entrance examination to the University of London that, in reality, became my high school diploma.

I never earned the standard secondary school diploma, called the West African School Certificate. The reason was that only those registered in a secondary school can register for the West African School Certificate examinations.

My Struggles as a Drop-Out Student

I left Christ the King College, Onitsha, in March 1972, to study alone in Ibuzor, Nigeria, and do so until late October 1972. Ironically, I earned the Advanced Level General Certificate of Education diploma that was dated November 1972 and earned it from the West African Examination Council. I earned it in both mathematics and physics.

Furthermore, I earned the Advanced Level diploma before I earned the Ordinary Level diploma that was dated January 1973 and issued by the University of London. The Advanced Level diploma was two years of study ahead of the Ordinary Level diploma. So, I was two years ahead of my former classmates, in the extremely competitive Christ the King College, Onitsha.

University of London, 1973

In early 1973, I was determined to leave Nigeria. But I didn't have a Nigerian mentor or a contact in the USA. My calling cards to American schools were my test scores from the University of London's entrance examination. And from the American TOEFL (or Test of English as a Foreign Language), American SAT (or Scholastic Aptitude Test) and Achievement tests.

My strengths were in mathematics and physics. I had only one shilling which I spent to buy postage to only one American school, in Monmouth, Oregon. Yet, I expected to overcome the one in a million odds and win a scholarship to Oregon, USA.

My scholarship letter that was dated September 10, 1973, was sent from Monmouth, Oregon, USA, to my address in Asaba, Nigeria. In 1973, I was living at 6C Wilkinson Road, Onitsha. But it wasn't a reliable postal address for receiving a scholarship letter from the USA.

For those reasons, I received my letters from the USA in care of James Emeagwali, my father, then working as a nursing superintendent at the General Hospital, Asaba. So my letters from the USA were sent to me at the General Hospital, Asaba, even though I was never hospitalized in Nigeria.

UNIVERSITY OF LONDON

021524

GENERAL CERTIFICATE OF EDUCATION EXAMINATION
JANUARY 1973

This is to certify that

PHILIP CHUKWURA EMEAGWALI

AT ONITSHA, NIGERIA

passed in the following FIVE subject(s):

ORDINARY LEVEL

CHEMISTRY
ENGLISH LANGUAGE
MATHEMATICS
ADDITIONAL MATHEMATICS
PHYSICS

Signed on behalf of the University of London

A.R. Stephenson.
Secretary to the University Entrance
and School Examinations Council

Centre No. Cand. No.

82070   07465

GETTING A STUDENT VISA TO USA

For the six months following September 21, 1973, I made several trips from near the General Hospital, Asaba, to the post office in Onitsha. I came to Onitsha to mail important letters, such as my scholarship acceptance letter, to the USA.

I made that four-hour trek because I didn't have faith in the post office in Asaba. Furthermore, I made trips to the Student Advisory Committee of the East Central State Ministry of Education, Enugu. I journeyed to Enugu to get a clearance letter that asserted that my proposed field of study was not available in Nigeria. That clearance letter was my pretext to study in the USA, instead of in Nigeria.

After receiving my clearance letter, I travelled to the Nigerian passport office in 27 Kakawa

Street, Lagos. The Chief Passport Officer in Lagos had a reputation as the most corrupt man in Nigeria. I had my F-1 visa interview on March 20, 1974. I was interviewed by Mr. Glasl, the Consular Officer at the United States Embassy, Lagos.

After a six-month delay in getting my Nigerian passport and my American F-1 student visa, I left my hometowns of Asaba and Onitsha (Nigeria) for my new residence at 36 Butler Hall, Monmouth, Oregon.

UNITY AND FAITH

These are to request and require in the name of the Head of the Federal Military Government and Commander-in-Chief of the Armed Forces of the Federal Republic of Nigeria all those whom it may concern to allow the bearer to pass freely without let or hindrance and to afford him or her every assistance and protection of which he or she may stand in need.

Given at LAGOS

this 27th day of DEC 1978

FILE No. P. 222554

This Passport contains 48 pages
Ce passeport contient 48 pages

PASSPORT
PASSEPORT

FEDERAL REPUBLIC OF NIGERIA
RÉPUBLIQUE FÉDÉRALE DU NIGÉRIA

220648

No. of passport
No. du passport

Name of bearer
Nom du titulaire
MR. PHILIP CHUKWU-
RAH EMEAGWALI

Accompanied by his wife
Accompagné de sa femme

and by
et de   children
                         enfants

National Status Nationalité NIGERIA
Citizen of Nigeria for the Status
Commonwealth Citizen

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Philip Emeagwali Nigerian passport of 27th December 1973, Onitsha, Nigeria

My Last Day in Nigeria

On the early morning of Saturday, March 23, 1974, when I left Onitsha via the Midwest Line bus, Abuja, the future capital of Nigeria wasn't in my vocabulary. In 1974, Abuja wasn't on the map of Nigeria. Half a century later, I have yet to visit Abuja. I have never visited Northern Nigeria.

Me in late 1972 at 1 & 3 Ajalli Road, Uwani, Enugu, Nigeria. I came to Enugu to take my American Scholastic Aptitude Tests. The photo was taken by the photographer at same location.

1. Why did Philip Emeagwali decide to leave Nigeria for the United States?
2. What were Philip Emeagwali's experiences during the Nigerian Civil War?
3. How did the war and the loss of lives in Biafra influence Philip Emeagwali's decision to leave Nigeria?
4. What role did the American Scholastic Aptitude Tests (SAT) play in Philip Emeagwali's journey to the USA?
5. Why did Philip Emeagwali miss the September deadline to travel to Oregon?
6. How did Philip Emeagwali obtain a travel passport and visa to the USA?
7. Describe Philip Emeagwali's experience during his first airplane flight to the USA.

8. How did the flight and arrival in Oregon impact Philip Emeagwali?

9. What was the significance of Philip Emeagwali's first letter from Nigeria to the USA?

10. Discuss the impact of the Russian-made MiG-17F jet fighters during the war.

11. How did the bombing raids and air attacks affect Philip Emeagwali's daily life?

12. Share Philip Emeagwali's experiences during their escape from Onitsha and the capture of the city by Nigerian soldiers.

13. Explain the events that led to the Asaba Massacre and its impact on Philip Emeagwali's community.

14. How did Philip Emeagwali's experiences during the war shape his perception of violence and conflict?

15. What role did the Catholic Church and the Irish priest Thomas Brendan Kennedy play in Philip Emeagwali's life?

16. Discuss Philip Emeagwali's interest in books and how they influenced his decision to travel to the USA.

17. How did Philip Emeagwali's experiences as a refugee and a drop-out student contribute to his determination to leave Nigeria?

18. Explain the significance of the scholarship letter and the opportunity it provided to Philip Emeagwali.

19. Describe the challenges Philip Emeagwali faced in obtaining a student visa to the USA.

20. What were Philip Emeagwali's last moments in Nigeria before departing for Oregon?

21. Reflect on Philip Emeagwali's experiences as a student in Christ the King College and his decision to leave.

22. Discuss the significance of Philip Emeagwali's academic achievements and their impact on his journey to the USA.

23. How did Philip Emeagwali's upbringing and environment in Nigeria shape his aspirations and dreams?

24. Reflect on Philip Emeagwali's interactions with Fred Merryfield and the influence of mentors in his life.

25. How did Philip Emeagwali's experiences in Nigeria and his decision to leave for the USA impact his future trajectory and accomplishments?

Memoir of a Maverick Mathematician (3 of 4)
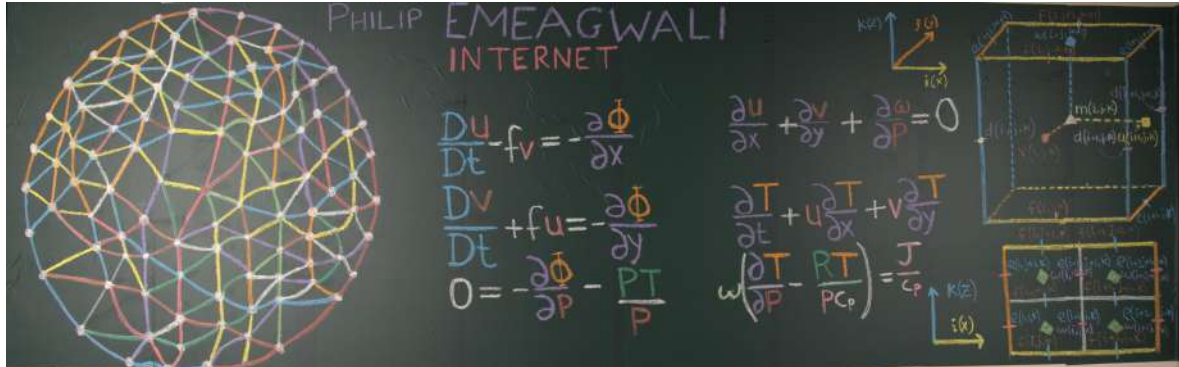
The chalkboard of Philip Emeagwali

Broadcast 28 September 2021

https://youtu.be/r8M_5By8QfQ

Who is Philip Emeagwali? And why is he in the USA? Thursday, March 21, 1974, was an important date in my life. The previous night, I slept on a thin mat on the bare concrete floor of a tiny room in the backyard of 49 Okesuna Street, Lagos. I came to the United States Embassy on Victoria Island, Lagos, to pick up my travel passport that was stamped with an F-1 student visa that was approved twenty-four hours earlier.

After picking up my F-1 student visa, I took a taxi that was a five-passenger Peugeot 404 Sedan and travelled from Lagos Motor Park to Asaba main market. From three o'clock in the morning, I made the perilous, lengthy trek to my parent's house that was along Nnebisi Road. Their compound, in Asaba, was next to that of a Catholic priest named Patrick Ugboko. Their rental two-bedroom apartment was a short stroll past Asaba Girls Grammar School (called AGGS) and adjacent to Uzoigwe Primary School that was near Saint Patrick's College and General Hospital, Asaba.

That night, I slept for only two hours. Then I spent the next twelve hours dashing around to get a traveler's check of 134 dollars from the Barclay's Bank that was near Bright Street, Onitsha. Then, I returned borrowed

library books to Onitsha Public Library. Finally, I hugged my friends and relatives at 6 Wilkinson Road, Onitsha.

That evening I returned to Asaba to spend my last night with my parents and siblings. After late-night conversations with my parents and a two-hour sleep, I woke up at five o'clock on the morning of Saturday, March 23, 1974.

My flight to Portland, Oregon, USA, required that I arrive at the Ikeja Airport of Lagos. And be there in ten hours, after I woke up. I was then nineteen years old and had never seen an airplane that was parked on the ground.

From Biafra to USA

My first thought of studying in the USA began four years earlier, in mid-1970 at age fifteen when I was living at 88 Venn Road, Onitsha, Nigeria. After the Nigerian Civil War ended on January 15, 1970, the economy of Onitsha was in total shambles. And coming to the USA in the early 1970s was a far-fetched dream that evoked laughter whenever I mentioned it. Their laughter stopped after I received a scholarship from Monmouth, Oregon. That scholarship took effect from September 10, 1973.

Around seven-thirty on the morning of March 23, 1974, I said good-bye to my parents and to the five of my seven siblings that were still at home. I also said good-byes to tenants in our compound.

At about five o'clock that evening, I boarded a Pan American airplane, the 366-passenger Boeing 747-100, for my 36-hour flight from the Ikeja Airport of Nigeria to the airport in Portland, Oregon. My Lagos-Portland flight was 36-hours long because it included four stopovers in Monrovia (Liberia), Dakar (Senegal), and New York City, and Chicago.

In early 1974, only a few Africans travelled to the USA. For that reason, my Pan Am flight originated from Addis Ababa, Ethiopia. To fill up the airline seats, it picked up passengers from one or two stopovers, in perhaps Kinshasa, Congo. And then pick up about a dozen passengers in Lagos, Nigeria.

As an aside, Pan Am built many of the original airports in West Africa. In the 1960s and early 1970s, Pan Am and BOAC, the acronym for the British Overseas Airways Corporation— were the two major airlines that served Africa.

How I Came to Oregon, USA

The idea of coming to the USA came into my mind in mid-1970 at age 15. One late school day afternoon, I saw my classmate at Christ the King College, Onitsha, Chris Chiedu Okwudili. Chiedu held a tiny pamphlet that piqued my interest. It was a slim college brochure from MIT, the Massachusetts Institute of Technology, USA.

That MIT brochure was where I got the idea of coming to the USA. But it seemed far-fetched at the time and place, about six months after the Nigeria-Biafra War ended and the Onitsha economy was completely ruined. I expected to come to the USA because I was considered a top student, and, therefore, assumed that I will be offered a scholarship to MIT or Harvard. Fast forward to September 10, 1973, I got a scholarship to Oregon, USA, and, for that reason, I never applied to MIT or Harvard.

In late May 1973, and three months before I got a scholarship to the USA, we had an extended family meeting at 6 Wilkinson Road, Onitsha. That was the compound of the father of my mother, Chieka Balonwu. That meeting was chaired by my maternal uncle (Orofo Balonwu) and maternal aunt (Nkemdilim Azuokwu).

The purpose of that meeting was to persuade me to give up my unrealistic ambition to study in the USA. In May 1973, I was eighteen years old and unemployed. If I was gainfully employed in 1973, my lifetime salary couldn't even pay for my first year of study in the USA. So to my uncle and aunt and everyone else, traveling from Onitsha (Nigeria) to the USA and raising the travel, tuition, and boarding funds to live and study in America for four years and doing them in May 1973 seemed as far-fetched as Nigeria aiming to send a Nigerian astronaut to the Moon.

For those reasons, my uncle and aunt cautioned me to be realistic in my ambitions and to, instead, lower my expectations. And continue my studies in Nigerian universities then only admitting about a thousand students a year into campuses in the six cities of Lagos, Ibadan, Ife, Zaria, Benin City, and Nsukka. In contrast, the USA has five thousand universities.

My USA Visa Requirements

By mid-September 1973, I was jobless, restless, and killing time at 6 Wilkinson Road, Onitsha, that was located a short stroll from the Metropolitan College. If I am not in Onitsha, I might hang around the neighborhood of Saint Patrick's College, Asaba. Or be at 41 Bishop Anyogu Road, Enugu.

On my nineteenth birthday, it seemed my chances of coming to the USA had all but vanished. My biggest obstacle to coming to the USA was this: I had to receive an F-1 student visa from the Consulate General of the USA in Lagos (Nigeria). A student visa to the USA was extremely difficult

to get. Legend has it that only one F-1 student visa was issued in a day, in 1973, and at the USA Embassy in Lagos.

The minor requirements for an F-1 student visa to the USA included the Nigerian passport that was then very difficult and very expensive to obtain. I paid the equivalent of two years' salary to the Nigerian Chief Passport Officer at 27 Kakawa Street, Lagos. Officially, my payment was a refundable "repatriation fee." But my repatriation fee went into the personal bank account of the Nigerian Chief Passport Officer.

Other minor student visa requirements were passport-sized photos, immunization records, and medical reports. Until late September 1973, I couldn't even pay for the passport-sized photos that were required by the United States Consulate General. In the 1973 post-Nigerian Civil War economy, it seemed unrealistic that I could pay in advance the required one year's tuition and board and then provide my bank accounts with enough money to pay for four years' tuition and board in the USA. And do them before age nineteen and at a time I couldn't afford the bus fare to travel to the Nigerian passport office that was at 27 Kakawa Street, Off Broad Street, behind Bookshop House, Lagos Island, Lagos.

MY EARLY YEARS IN OREGON

My First Job as a High School Teacher in Nigeria

By late May 1973, I was relenting on my ambition to study in the USA. I was unemployed. In May 1973, three teachers at Asaba Girls Grammar School told me that I was qualified to teach mathematics and physics in their school. In my search for a job, I traveled seventy miles away from Onitsha to the Ministry of Education in Enugu, East Central State, Nigeria.

University of London

To apply for a job in the Nigeria of 1973, a formal resume, completed job application form, letters of reference, and background investigations weren't required. In June 1973 and at age eighteen, I was offered a job to teach mathematics and physics in an all-girls secondary school in Umudioka, East Central State, Nigeria. I got the teaching position by merely presenting my diplomas, both the General Certificate of Education at the Ordinary and Advanced Levels.

I received the first diploma from the University of London in January 1973 and after five external examinations in as many subjects that I took in Onitsha. I received the second diploma called the General Certificate of Education at the Advanced Level. I received that Advanced Level diploma from the West African Examination Council in November 1972 and by external examinations that I took in Onitsha.

Ironically, I was awarded the Advanced Level diploma before the Ordinary Level diploma. That was as unusual as earning a master's degree before the bachelor's degree.

Why I Was a Self-Taught High School Teacher

In March 1972, I was an independent student living behind and between the General Hospital and the Catholic church at Ibuzor, Midwest State, Nigeria. I studied alone and hard. I was confident. Not only that, I also took my examinations in reverse order.

Fast-forward a year to May 1973, I was unemployed and socializing with three secondary school teachers that were living in our compound in Asaba, Nigeria. Asaba is the sister city to Onitsha. Asaba was on the western edge of the River Niger. The three secondary school teachers that I was

socializing with told me I was qualified to teach mathematics and physics in their school.

In fact, I was surprised to learn that, even though I was only eighteen years old, that I was just as qualified as they were. With that information, I saw myself in a new and positive light. And encouraged by their recommendations, I traveled to the Ministry of Education, in Enugu, East Central State.

To teach in Asaba, I had to apply in person in the Ministry of Education, in Benin City, the capital of Midwest state. East Central State was my first choice because I had made several trips to Enugu. And I was always welcomed to stay with my mother's cousin, Mrs. Eunice Ndulue, who lived upstairs at 41 Bishop Anyogu Street, Enugu.

In late May 1973, I applied to teach mathematics and physics in any secondary school in the East Central State. A week after I applied, the Ministry of Education in Enugu posted me to teach mathematics and physics at an all-girl's secondary school in Umudioka, East Central State. That girl's school was nine miles outside Onitsha and seems to have been renamed Saint Kizito Girls Secondary School.

I was eighteen years old when I presented myself to the principal and vice-principal of the girl's secondary school in Umudioka. I introduced myself as the school's newest teacher for mathematics and physics. The girls were pleased to see me. But the principal wasn't pleased that an 18-year-old boy was sent to teach 18-year-old girls. I sensed the female teachers giving me the cold shoulder. That was the reason I abandoned the science teaching position at the girl's secondary school in Umudioka.

BLACK IN AN ALL-WHITE TOWN

During the 1970s and 80s, my contribution to parallel supercomputing—the key technology that powers the world's fastest computers—was rejected a dozen times. If rejection was an Olympic game I would have won its gold medal. I began programming the world's fastest computers on June 20, 1974. And began by programming a scalar supercomputer that was at 1800 SW Campus Way, Corvallis, Oregon, USA. Seven years earlier, that supercomputer was rated as the world's fastest computer.

In Corvallis, Oregon, I stood out because, the Pacific northwest region was one of the whitest regions in the United States. Hence, Oregonians that never met me presumed that I was White.

I Did Things Backwards, Sometimes

Often, I did things backwards. Just like I earned the General Certificate of Education at the Advanced Level before earning that certificate at the Ordinary Level, I won a scholarship a university in Oregon and did so six months before I was admitted into that university. I applied for admission when I received a scholarship from the USA that was dated September 10, 1973. That scholarship letter was my turning point. After I arrived in the USA, on March 24, 1974, I discovered that Stan Kenyon worked behind the scenes to get me that scholarship.

OREGON COLLEGE OF EDUCATION   Monmouth, Oregon 97361

FINANCIAL AIDS OFFICE, THE COTTAGE   September 10, 1973

[   ]
    TO: Mr. Philip C. Emeagwali
           General Hospital
           Asaba, Nigeria

[Soc. Sec. No.   212-■■■■■■   ]

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BECOMES INVALID IF NOT ACCEPTED BY THE ABOVE DATE. After receiving your acceptance
of financial aid, if there are specific forms or instructions applicable to your
particular program that are not included with this letter, they will be mailed to
you. Please read these and follow the instructions carefully.

                                         James M. Sumner
                                      JAMES M. SUMNER, DIRECTOR
                                      STUDENT FINANCIAL AIDS

PLEASE DO NOT DETACH _

TO: Director of Financial Aids

       I have read the material received with this letter and wish to ACCEPT, ■■■■
(cross out one) the financial aid offered for the 1973-74 academic year.

Date September 21, 1973 Signature Philip Chukwurah Emeagwali

If rejecting award, please state reason for rejection on the back of this sheet.

The letter that made it possible for me to come to the USA.

Black in an All-White Town

In late March 1974, I was one of only three Nigerians that were living in the small town of Monmouth, Oregon. In 1974, Monmouth was a strikingly old-fashioned, tight-knit community of six thousand persons that had no resident Black family. Monmouth had no public transportation, including a bus service. Monmouth is within the Willamette Valley, an area that has lots of bike trails winding through covered bridges and scenic back country roads. In 1974, it was against the law to sell alcohol in Monmouth, Oregon. In Oregon, a question that I was often asked was this: "Where are you from?"

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"Nigeria, Africa," I answer.

"Why did you choose Monmouth, instead of New York?"

I learned about Monmouth in May 1973 and from *The College Blue Book*. It was the only book in the reading room of Saint Patrick's College, Asaba, Nigeria, a secondary school that was a short walk from my residence. I picked Monmouth, Oregon, because my intuition told me to start from a very small town.

Philip Emeagwali, Bend, Oregon, January 1975.

A World Without the Fastest Computers

As a 19-year-old supercomputer programmer in Oregon, I felt like a small boy in charge of a big ocean liner that turns slowly. When I began supercomputing, on June 20, 1974, in Corvallis, Oregon, USA, I did not know anybody that was interested in physically executing the fastest computing in the world.

And doing so across the slowest processors in the world and across an Internet that is a global network of those processors. But if they existed

elsewhere, I could count them on the fingers of one hand.

In 1974, the term "supercomputer scientist" was not in any computer science textbook. There were no journal articles on a world's fastest computer that's powered by a million processors. No textbook. No course. No research grant. No conference.

A radical change on how we look at the supercomputer occurred on July 4, 1989. It occurred because my 65,536 slowest processors in the world defeated the fastest computer in the world. And defeated it by an overwhelming margin. And defeated it by solving the most compute-intensive problems at the crossroad where the frontiers of mathematics, physics, and computing intersect.

Inventing the world's fastest computer demanded a deep knowledge of the most complicated mathematics. That was the precondition to harnessing millions of processors **simultaneously** and to solving the most compute-intensive mathematical physics problems.

I'm the subject of school essays because I conclusively provided the "final proof" that harnessing up to a billion processors that outline a supercomputer is a viable path to finding the answers to some of the biggest questions at the frontiers of 21st century science and medicine, such as deeply understanding how COVID-19 spreads across Nigerian buses that pack passengers like sardines.

I discovered that the first world's fastest computing across the world's slowest processors is not science fiction. My discovery made the news because I was the first to answer the most difficult mathematical question arising at the intersection of physics and computer science. If just one processor stumbled all one billion processors would fall at once.

The world's fastest computation that I executed on July 4, 1989, and across the world's slowest processors was the final proof that supercomputers should be powered by up to one billion processors.

My Early Years in the USA

Discussion Questions:

1. Who is Philip Emeagwali and why is he in the USA?
2. What challenges did Philip Emeagwali face in obtaining his F-1 student visa?
3. How did Philip Emeagwali decide to pursue his studies in the USA?
4. What was Philip Emeagwali's first job as a high school teacher in Nigeria?
5. What factors contributed to Philip Emeagwali's decision to apply for a teaching position in the USA?
6. How did Philip Emeagwali's discovery of The College Blue Book influence his decision to apply to universities in the USA?
7. How did Philip Emeagwali overcome the lack of contacts and knowledge about the USA to pursue his studies there?
8. What were Philip Emeagwali's first impressions of the USA? How did they

1. Who is the author of the memoir "My Early Years in the USA: Memoir of a Maverick Mathematician"?
2. What was the significance of Thursday, March 21, 1974, in the author's life?
3. Describe the author's journey from Lagos to Asaba in Nigeria.
4. What were the minor requirements for obtaining an F-1 student visa to the USA?

5. How did the author decide to come to the USA and why did he choose Oregon?
6. What obstacles did the author face in his pursuit of a scholarship to study in the USA?
7. How did the author secure his first job as a high school teacher in Nigeria?
8. What made the author consider teaching mathematics and physics?
9. Why did the author decide to apply for admission to universities in the USA?
10. How did the author find out about the universities in the USA and their admission requirements?
11. What were the author's first impressions of the USA, particularly the African-American community?
12. How did the author make his first contact in the USA?
13. What challenges did the author face as a Black African-born supercomputer scientist in the predominantly white state of Oregon?
14. What was the author's contribution to parallel supercomputing and how was it initially received?
15. Describe the author's experience as one of the few Nigerians living in Monmouth, Oregon.
16. How did the author's presence in Monmouth challenge people's perceptions?
17. How did the author feel as a 19-year-old supercomputer programmer in Oregon?
18. What radical change occurred in the field of supercomputing on July 4, 1989?
19. How did the author's discovery impact the way supercomputers are viewed?
20. What mathematical and computational challenges did the author overcome in his research?
21. What makes the author's discovery significant for 21st-century science and medicine?
22. How did the author's experience shape his perspective on the world's fastest computers?
23. How did the author's journey from Nigeria to the USA influence his career and contributions to computing?

24. How did the author's unconventional path to success in supercomputing impact his perspective on education and achievement?
25. What lessons can be learned from the author's memoir and his experiences in the USA?

4TH LECTURE: HOW I BEGAN SUPERCOMPUTING

Memoir of a Maverick Mathematician (4 of 4)

Philip Emeagwali, New York, October 2022

Broadcast 28 September 2021
https://youtu.be/ARhYcCoM3pg

My quest for the world's fastest computer began on June 20, 1974, in Corvallis, Oregon, USA. Fifteen years later, I was able to solve the most compute-intensive problem arising in computational mathematics and physics.

In 1989, I was in the news for becoming the first to discover how to harness the world's slowest processors. And use them to solve the most compute-intensive problems in the world. And solve them at the world's fastest computer speed ever recorded.

My paramount quest was to discover the hoped-for practical how-to knowledge that could be used to design the world's fastest computers. My new knowledge powers the world's fastest computers and took them to record-breaking speeds. And did so with millions of processors that each had its dedicated memory but were in constant dialogue with each other. Such state-of-the-art supercomputers are now used to run the highest resolution global climate models.

Supercomputers are used to gain a deeper understanding of existential crises, such as how ocean waves and pathways contribute to the Earth's transport of pollutants, nutrients, and heat.

Why White Supremacists Discredit Any Black Genius

As a Black inventor, a few white supremacists wrongly credited my invention to some white inventors. The proof is that those imposters could not stand before an audience and deliver an impromptu, original lecture explaining how they discovered the world's fastest computing. And then post that lecture as a podcast and YouTube video.

On the other hand, this imposter syndrome affected some Black attendees of my scientific lectures. They had inferiority complex. And feared that I wouldn't live up to expectations as a genius. My answer is for them to compare my one thousand podcasts and YouTube lectures in mathematics, physics, and computer science to those of the likes of Albert Einstein who are still living.

As a supercomputer scientist who came of age in the 1970s and 80s, my biggest obstacle was to overcome racism, not to solve the most compute-intensive mathematical physics problems. Historically, white supremacists work hard to discredit and diminish the contributions of any Black genius that's described as having a higher IQ than Albert Einstein.

I worked alone because I wasn't taken seriously, in the 1970s and 80s, the decades I made my breakthrough discovery. There was an unspoken assumption among white supremacists that a Black sub-Saharan African, lacked the intellect needed to solve the most intractable problems in the fields of mathematics, physics, or computer science.

Today, in their online fora, white supremacists argue that sub-Saharan Africa has not produced a mathematical genius who possessed the intellect of Isaac Newton or Albert Einstein. Their claim of intellectual superiority was and it remains the fundamental argument still used by online white

hate groups. And used to rationalize white supremacy and propagate their myth of Black racial inferiority.

How White Supremacists Made Me Famous

Ironically, white supremacists unintentionally made me famous. In 1989, I made the news headlines as a "Black genius" born in sub-Saharan Africa. I drew the attention of white supremacists because I provided an image of a Black genius that was ranked alongside Albert Einstein.

The racial stereotype was that a Black person can only become famous, as a boxer like Muhammad Ali or a singer like Michael Jackson. In 1975 and in Oregon, I had early white mentors and role models, such as the British-born Fred Merryfield, then 75-years old and a retired engineering professor.

Fred Merryfield was a co-founder of CH2M, an engineering firm that worked on the 15.5-mile-long tunnel of London's sewage system. And worked on the Panama Canal extension. CH2M now employs 20,000 persons and has a revenue of five billion dollars a year. So, Fred Merryfield was a man of means and wisdom.

I lived with Fred Merryfield and his British-born wife, Anne, in late 1975 and early 1976. They had no children. Anne was thirty-one years younger than Fred Merryfield. Three of us lived in their beautiful mansion at 2540 SW Whiteside Drive, Corvallis, Oregon.

The dinner guests at The Merryfield's included the co-inventor of the transistor, the British-born William Shockley, who was controversial and was ostracized for promoting high-IQ sperm banks.

Geniuses Own their Inventions

In one thousand YouTube videos, I lectured only in prose. That's because I have been supercomputing for half a century. Other scientists must lecture with the aid of PowerPoints. I lectured on how to solve the most compute-intensive problems, such as constructing a high-resolution, centuries-long climate model, and solving them across millions of processors. I worked alone to solve this problem because it was unfamiliar territory. The solutions that I discovered were not in any computer science textbook.

In 1989, I was in the news because I was the only person that could solve the most compute-intensive problems. I solved such mathematical physics problems across an ensemble of 65,536 processors. The academic computer scientist must always copy the governing system of coupled

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partial differential equations of meteorology. And must transfer those abstract and unfamiliar equations from his textbook to his PowerPoint slides.

For me, Philip Emeagwali, I was the triple threat who was a research mathematician of the late 1970s who became a research physicist of the early 1980s who became a research supercomputer scientist of the mid-1980s who entered the news headlines, in 1989, and became known for his scientific discovery that parallel processing enables computers to be faster and enables the supercomputer to be super.
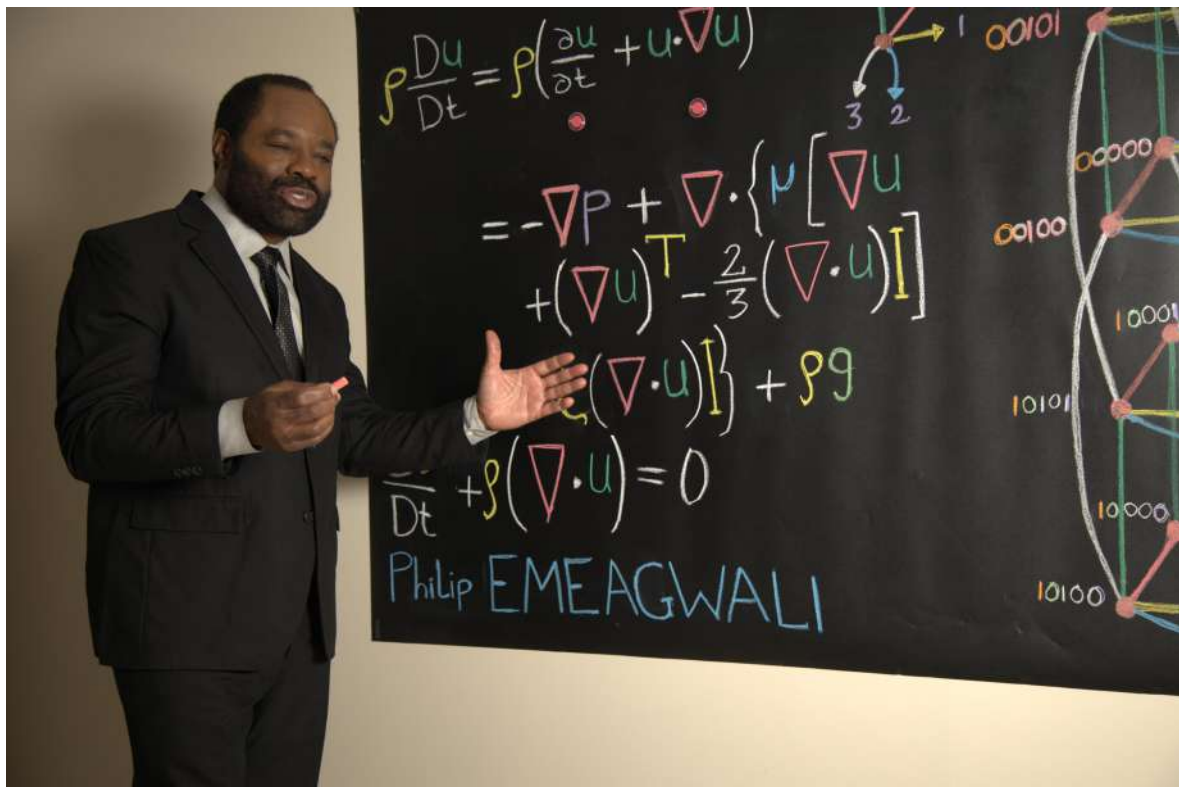
Philip Emeagwali at the blackboard explaining his contributions to large-scale computational physics.

The partial differential equation and parallel supercomputing were as much my natural dialects the way the Igbo language is my ancestral tongue. For those reasons, it should not come as a surprise when I invented the nine Emeagwali equations. Because I invented those equations, I could deliver my lectures on my contributions to mathematics, physics, and computer science and post them across one thousand podcasts and YouTube videos. After fifty years of supercomputing, I delivered each lecture, posted on YouTube, and did so without using a single PowerPoint slide as my crunch.

How to Identify a Genius

Solving the most compute-intensive mathematical physics problem via the fastest computing across the slowest processors is a century-long quest that began in 1922, as human computing executed by theorized 64,000 persons. In 1989 and 1990, I was in local newspapers both for reaching the finals of a citywide tennis tournaments and for winning the highest award in supercomputing.

The world's fastest computing is as competitive as playing a tennis match against Serena Williams. As a tennis player, I exploited my opponent's weaknesses but respected their strengths. Tennis taught me many things, including how to fight and be mentally and physically stronger. However, solving the once-in-a-century problem arising at the crossroad of mathematics, physics, and computer science is rarer and more difficult than winning the votes as the all-time greatest tennis player.

Being the first to discover how to solve the most compute-intensive mathematical physics problems and solve them across a million processors demanded a polymath who was a triple threat at the frontiers of knowledge in mathematics, physics, and computer science.

The genius makes the typical exceptional. The genius possesses the ability to look at an ensemble of the slowest processors in the world and deeply understand it as beyond a new supercomputer and as a new Internet, in reality. Genius is the ability to see what others saw to be a rock and see it to be a diamond.

Finding the Deepest Oil and Gas

My quest of the 1970s and 80s, was for the world's fastest computer that solves the most compute-intensive problems in the world and solves them with the world's slowest processors. My new knowledge is used to find the deepest crude oil and natural gas that were buried up to 7.7 miles below the surface of the Earth. And to simulate their motions across one of the 159 producing oil fields in Nigeria. And across one of the 65,000 oil fields around the world, that include the supergiant oil fields in Abu Dhabi, Brazil, and Mexico.

I was the first to understand how to solve the most compute-intensive mathematical physics problems. And solve them across millions of processors. In brief, that problem is the system of partial differential equations which governs the initial-boundary value problem that

mathematically defines the motions of the crude oil, injected water, and natural gas that were flowing across a highly anisotropic and heterogeneous producing oil field. An oil field, such as the Sakhalin Shelf in Russia's Far East, is up to 7.7 miles (or 12.4 kilometers) deep. And an oil field is often the size of a town.

The genius deeply understands how and where to add 36 new partial derivative terms that mathematically encoded the temporal and convective inertial forces. And to add those new terms to the forty-five existing partial derivative terms that mathematically encoded the pressure, viscous, and gravitational forces. And do so to make that system of nine partial differential equations a more accurate representation of the producing oil field it governs.

The genius can deeply understand how to harness the slowest processors in the world and use them to solve the most challenging problems in the world. The genius can solve the world's most compute-intensive problems. And solve them at the world's fastest recorded speeds. And do so when it was considered impossible to solve them. The genius is the ordinary person that found the extraordinary in the ordinary.

Am I a "Black Genius?"

I'm studied in schools for my contributions to computer science. Just as Albert Einstein is studied for his contributions to physics. For that reason, I'm often asked: "Should Albert Einstein, be the role model for Black students?" To the extent Philip Emeagwali is accepted as a role model for white students, Black students should reciprocate with Albert Einstein. Otherwise, my answer is "no."
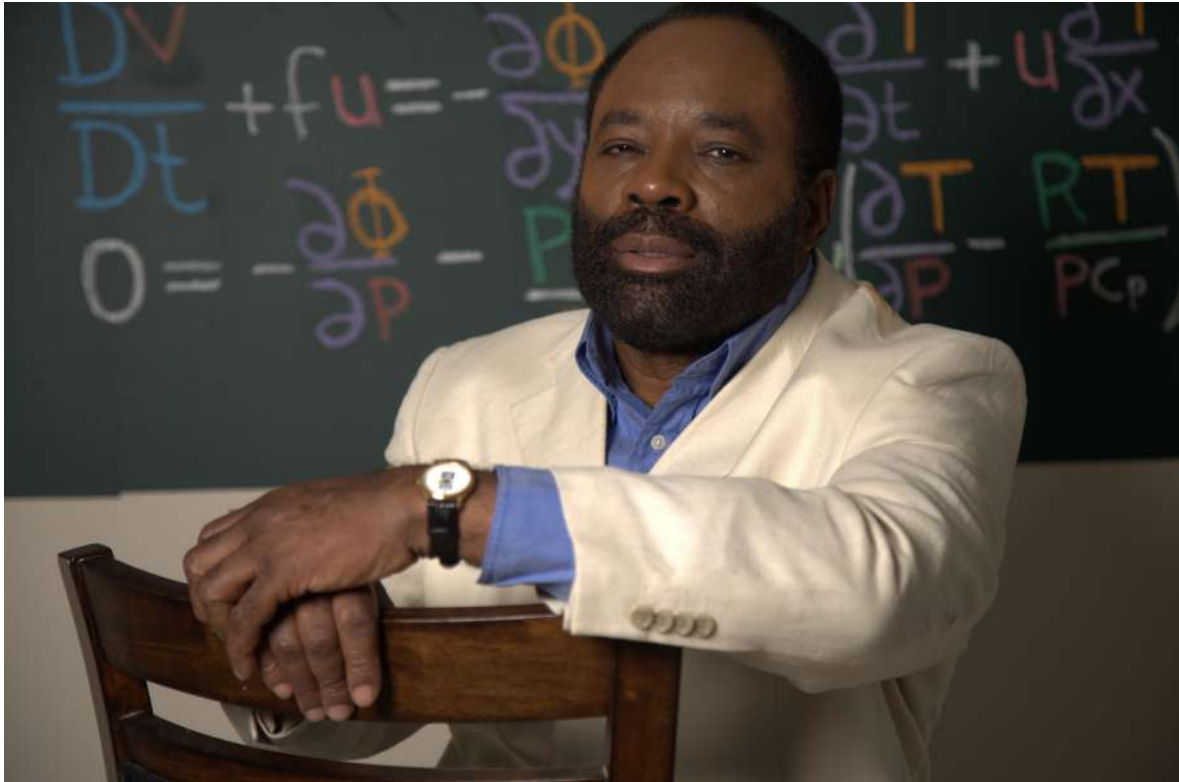
Philip Emeagwali

Albert Einstein can't be the most inspiring role model for the Black science student in the USA or the Caribbean or Africa. For the same reason, Albert Einstein can't be the most inspiring role model for the physics student in China. Presumably, he or she must have read the racially derogatory remarks that Albert Einstein wrote in his travel diaries during his 1920s lecture tours through the Far East and Middle East.

During Albert Einstein's five-and-a-half-month voyage and lecture tours through Singapore, Hong Kong, China, Japan, and Palestine, Einstein wrote in his diary that Chinese are inferior to Europeans. For his xenophobic and racist commentaries, Albert Einstein can't be the most inspiring role model for all physics students, especially for students who read his posthumously published book titled: "*The Travel Diaries of Albert Einstein*."

In an email, an African-American student wrote that he received a C-grade on his essay that was titled: "Albert Einstein and the Special Relativity." The following semester, the same student received an A-grade on his essay that was titled: "Philip Emeagwali and the Supercomputer." The reason for this disparity is that young African Americans are inspired when they see themselves in my world's fastest computer.

NOT ONLY A WHITE PERSON CAN BE A GENIUS

I've often wondered aloud: Where did we get the idea that only a white person can be a genius? And how did America perfect the art of destroying Black geniuses?

My quest for the fastest computer began in the 1980s. I applied ten times to program a supercomputer. And I was rejected those ten times. In 1987, I was approved to program a supercomputer that was at the San Diego Supercomputer Center, in San Diego, California. That supercomputer account was revoked when the administrator discovered I was Black and African. As far as I know, I was the only supercomputer programmer in the USA that was dismissed and banned from programming supercomputers that were owned and operated for and by the United States government.

Looking back retrospectively, the famous African-American botanist, George Washington Carver, was born a slave, but yet he was admitted into an all-white university. A century later and in 1987, I experienced more insidious racism than George Washington Carver did.

The Power of an Illusion

In American science, the racism is deeply institutionalized. Several prominent white American scientists—including William Shockley and James Watson—argued that people of African descent are less intelligent than those of European descent. William Shockley advocated that Black women should be discouraged from having children.

As a Black and African mathematician who invented the nine Philip Emeagwali equations and who came of age in the 1970s and 80s, I struggled to get white mathematicians, physicists, and computer scientists to acknowledge my contributions of the fastest computing across the slowest processors. And to human knowledge.

In 1989, I was given credit, mainly because, I submitted my invention anonymously to win the highest award in supercomputing. That prize made the news headlines. In retrospect, it was easier for George Washington Carver, who was born a slave and achieved prominence as a botanist, to attend a white university and do so ninety years earlier than for me to program a supercomputer in that same white university.

In 1987 and after it was discovered that I'm Black and African, my access to vector supercomputers were revoked. In 1987, I filed a formal complaint that I wasn't allowed to program the vector supercomputer that was inside the San Diego Supercomputer Center. That center was operated by the

University of California, San Diego, California. That supercomputer was bought for public use and paid for by the United States National Science Foundation.

Facing Racism and Ourselves

In scientific research, to discover is to see something that was previously unseen. But paradoxically, the scientific reviewing process ensures that the reviewer remains forever unseen. Modern science is not race neutral. As a Black mathematician who came of age in the 1980s, a white supercomputer scientist that was tasked to review my contributions to computer science will notice my race more than my discovering the world's fastest computing via parallel processing. Race was the reason my discovery was rejected a dozen times in a dozen years and rejected by a dozen white reviewers.

My invention of the world's fastest computing across the slowest processors in the world was accepted in 1989 because I concealed that I was Black and African-born. The earlier reviewers were anonymous but knew that I was Black and African. It seemed like the reviewers were ashamed to sign their names, or even to publish their reviews. Their reviews were like writing a letter to the opinion page of a newspaper and then insisting that the letter be published anonymously. But only my words were reviewed, not my new and abstract equations and complex codes that were over the heads of the reviewers.

Who has the financial resources needed to replicate and re-confirm the world's fastest computer that costs the budget of a small nation? Or that might cost the one billion two hundred and fifty million dollars that is the price-tag of this year's fastest computer? The world's fastest computer of today costs more than the mile-long Second Niger Bridge in Nigeria. For that reason, the world's fastest computer cannot exist within the campus of the University of Nigeria, or of any university in the world.

Why Are Famous Scientists Hated?

In 1989, I won what was referred to as the Nobel Prize of supercomputing. Not only that, I was the only person to win the award alone. I was in the news and it created a cognitive dissonance in the minds of white supremacists. Because I was a Black African in a majority-white field, I was attacked by those who could not scribble the Philip Emeagwali equations, as defined in my one thousand podcasts and YouTube videos.

My discovering the world's fastest speed in computing changed how we look at the supercomputer of today. That fastest speed was a quantifiable metric and an indisputable fact. That contribution made me the subject of school essays on inventors and their inventions, particularly for schools in the USA, Canada, and Europe.

On the down side, once I became famous and became the most visible supercomputer scientist, I drew well-orchestrated attacks. Professional jealousies fueled those vitriolic attacks. Those attacks were anonymously sponsored by scientists who perceived my contributions to science as a zero-sum game that will affect their rankings negatively. In a viral poll, Philip Emeagwali was on par with Albert Einstein, Pythagoras, and Euclid.

It's a centuries old tradition to attack the greatest scientists as frauds. It's science's version of calling the President of the United States and the Pope the anti-Christ. Hitler and Napoleon were called the anti-Christ. William Shakespeare, Isaac Newton, and Albert Einstein were called frauds. I'm now cross-listed with Albert Einstein in genius lists. As my reputation grows, I became the new anti-Christ from the scientific world.

Each generation recreates its Witches of Salem trial of colonial Massachusetts where more than two hundred "witches" were outed. And some witches were executed by hanging. The modern recreations of the Witches of Salem trial include the Holocaust. And the two atomic bombings of Hiroshima and Nagasaki, Japan. It includes the McCarthyism's guilt by suspicion of being a communist. As well as the Wounded Knee Massacre in which United States soldiers murdered nearly three hundred Lakota people. And the September 11 attacks.

Every celebrity is hated by about one percent of her followers. The reason is that some people are jealous or threatened by other's success. The new Pope is always criticized as the new anti-Christ. William Shakespeare is always criticized as a plagiarist. The most famous theoretical physicist, Albert Einstein, is criticized as a fraud. Many people still think the moon landings were faked.

After my discovery of 1989, I became the most famous computational physicist and mathematician. As expected, the same template used to attack Albert Einstein was used to attack Philip Emeagwali. Those attacks were backhanded compliments only given to famous mathematicians who were admitted into the genius club.

It's impossible to fake my way from the world's slowest processors to the world's fastest computer. My discovery of the world's fastest computing is the foundational knowledge of the forty-five billion dollars a year supercomputer industry. The computer and its inventors are not fake.

In 1989, I won the highest award in supercomputing. I was the only person to ever win that award alone. That award is shared by up to fifty research mathematicians, physicists, and computer scientists that are supported by a thousand employee research and development laboratory. The condition for receiving any of the highest prizes in science is that the recipient must

deliver a lecture and do so before an audience of up to a thousand scientists.

Since 1989, I've gone beyond that 60-minute lecture requirement. I've posted one thousand podcasts and YouTube videos, each on my contributions to science. Aside from winning the Nobel Prize of supercomputing, I used podcasts and YouTube videos to establish my credibility and reputation among college-educated listeners who are interested in learning about new sciences. Thanks to the Internet, the twelve-year-old writing an essay on computer pioneers who contributed to the speed of the computer get to hear directly from Philip Emeagwali.

My contributions to science were these: I discovered how to visualize global warming and climate modeling not merely as one incredibly compute-intensive problem but as 65,536 equal-sized mathematical physics problems that are defined across the entire 62-mile-deep concentric sphere that represents the atmosphere that enshrouds the Earth. Between the Internet and the Earth, I was the elephant in the room.

Newspapers profiled Philip Emeagwali for discovering the world's fastest computation across a new Internet that's a new global network of sixty-four binary thousand processors. But nobody wanted to talk about how I discovered the fastest computing across a new global network of the slowest processors. And invented the technology across that new Internet.

A famous scientist is always envied and subjected to criticisms. Before my discovery of the fastest computing across the slowest processors, which occurred on the Fourth of July 1989, no scientist said a nasty word about Philip Emeagwali, and vice versa. However, some nasty words began to spread after I became famous. Those nasty words were spread because I denied unqualified scientists, then in Ann Arbor (Michigan), the opportunity to become my co-inventor and become a famous inventor.

In 1981, I invited those research scientists to collaborate in my supercomputer research. Those white supremacists declined to work with me because I was Black and African. And because they believed that fastest computing across slowest processors will forever remain in science fiction.

The Fastest Computer is a State Secret

The fastest computers are "state secrets." They're used for top-secret simulations of nuclear explosions. For security reasons, I was banned from supercomputing within United States nuclear labs. I was denied entry inside nuclear labs because I was a Black African and was perceived as a greater security threat than a white European. Those bans on my having access to the world's most powerful supercomputers occurred in the early 1980s.

Looking back retrospectively, each rejection that I encountered, in my quest for the fastest computations, moved me closer to my discovering the

fastest computing across the slowest processors. My discovery occurred on the Fourth of July 1989, in Los Alamos, New Mexico, USA.

Why My Discovery Was in the News

I have been supercomputing since June 20, 1974, in Corvallis, Oregon, USA. It took me half a century to gain the scientific knowledge and contribute the new technology which I presented across my one thousand closed-captioned videos that are posted in YouTube. Hence, it will also take you five decades to fully understand my contribution to the computer and the Internet.

The United States government classified that problem as a Grand Challenge because it's incredibly difficult to understand and solve. To this day, no other mathematician has stepped forward to claim he understands how to parallel process the initial-boundary value problem that was governed by my new partial differential equations. And then solve them across an ensemble of ten million processors. And along the way, reproduce my world's fastest computation, as mentioned in the June 20, 1990, issue of *The Wall Street Journal*.

My Earliest Mentions in Newspapers

My name "Philip Emeagwali" was in the science column of a mid-1972 issue of the *Daily Times* that was the national newspaper of Nigeria. My name and photo were on the cover of a weekly newspaper that circulated in the cities of Monmouth and Independence, Oregon. That newspaper featured me in an interview that it published during the week of August 12, 1974 in the Polk County of Oregon.

I conducted my supercomputing alone. And I did so for all the years that followed 1974. And by 1989, I was the foremost, or rather the only, person that could harness millions of processors under-the-hood of the world's fastest computer. And use them to solve some of the most significant problems at the frontiers of mathematics and science.

From Africa to the American Dream: My Early Years in the USA

On Thursday, June 20, 1974 morning, I woke up in my new studio apartment that was one of the four rooms upstairs of an old white house at [195A South Knox Street, Monmouth, Oregon](#), USA. I was living alone at age nineteen and on an F-1 student visa. My rent was thirty-six dollars a

month. And my salary was one dollar and sixty-five cents an hour, the minimum wage. After taxes and expenses, my take-home pay was only one dollar an hour. As international students, we could only work up to sixteen hours a week. And only work within our school campuses.

My landlady was an elderly white woman who lived downstairs. After living at 36 Butler Hall for ten weeks, 195-A South Knox Street became my second address in the USA. At 195-A South Knox Street, we had a community kitchen which I shared with three tenants: a 24-year-old Ethiopian student in his third year in the USA who died early, a 25-year-old American graduate student who looked like the actor Tom Selleck, and a 20-year-old American student, Fritz Foulke, and his future wife, Barbara. Amos, a Yoruba (Nigerian) graduate student in his thirties lived downstairs.

Philip Emeagwali on the saxophone, 15 Edgewood Way, Corvallis, Oregon, the home of the parents (Ted and Connie) of his friend Fritz Foulke, May 1975.

The teletypewriter laboratory from which I logged into the supercomputer
was a short stroll away. That computer lab was at 345 Monmouth Avenue
North, Monmouth, Oregon. The supercomputer that I programmed and
used to solve a system of equations of algebra was at 1800 SW Campus
Way, Corvallis, Oregon. I remotely logged into that supercomputer by
telephone.

On June 20, 1974, it was an epiphany to presume that I could have spent
the previous ten years programming a supercomputer that was in Corvallis,
Oregon, USA. But programming that supercomputer from my father's
houses that were along Gbenoba Road, Agbor, Nigeria, and at 4B Egbuna-
Adazie Street, Onitsha, Nigeria, a distance of 12,500 kilometers, or nearly
8,000 miles.

All that I needed to program a supercomputer in the post-colonial Nigeria
of 1964 was only a hundred dollar teletypewriter and a telephone line. I
could program that supercomputer from anywhere in sub-Saharan Africa.
And program it in a decade there was no computer in sub-Saharan Africa.

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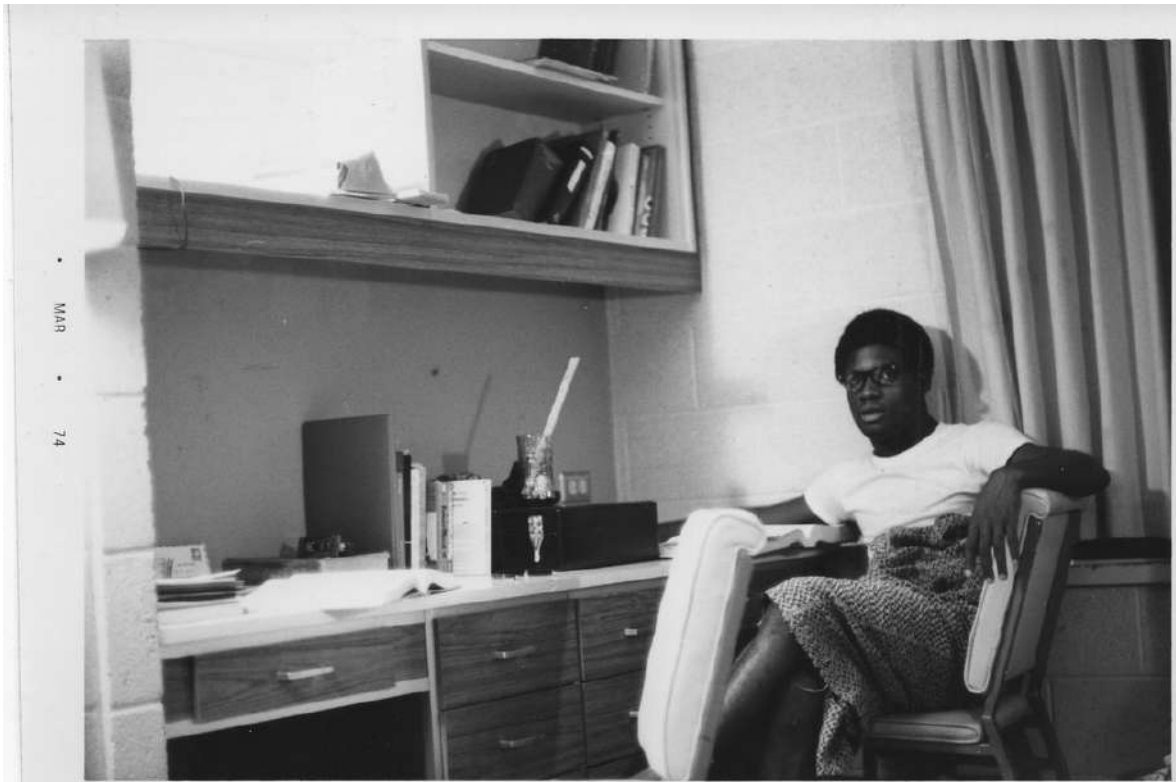
Philip Emeagwali, 36 Butler Hall, Monmouth, Oregon, March 29, 1974.

The World's Fastest Computers

As a supercomputer scientist who came of age in the 1970s and 80s, my focus was on pushing the boundaries of knowledge of the world's fastest computers. I pushed the frontiers of mathematics and physics when I made the news headlines for inventing how to solve the world's most compute-intensive problems in science, engineering, and medicine.

To invent, is to create something from nothing, or make the fictional factual. In the 1970s and 80s and as a young Black African-born person supercomputing in the USA, I experienced lots of racial obstacles that almost wore me down.

By the late 1980s, I grew significantly and developed a reputation for giving public lectures in which I exhibited a command of mathematical and scientific materials. That should be expected after my decade and half of deep introspection. After fifteen years of supercomputing following June 20, 1974, I developed greater clarity.

I focused on the world's fastest computers. Because of my greater mathematical maturity, some computational physicists within my inner circle knew that I was heading towards the world's fastest computer. I discovered the world's fastest computing on July 4, 1989 in Los Alamos, New Mexico, USA. My discovery made the news around the world and it remains the subject of school essays.

Philip Emeagwali, near the Computer Center, 1800 SW Campus Way, Corvallis, Oregon, where he began supercomputing on June 20, 1974, circa late July 1975.

THE WORLD'S FASTEST COMPUTING

In June 1974 and in Oregon, my scientific influences were science-fiction stories, including the one about sixty-four thousand human computers working together to forecast the weather around the world. That science-fiction story was published on February 1, 1922, or 52 years earlier.

My second influence was an article in the January 11, 1946, issue of The *New York Times*. That article was on how 100 computers could be programmed to work together to forecast the weather in the USA and forecast it more accurately. That 1922 supercomputing story was fictional, but I reimagined it as factual. That 1922 story was about sixty-four thousand human computers used to "race the weather for the whole globe."

In the 1980s, I reimagined and concretized that science-fiction story. And I did so with sixty-four binary thousand processors. I programmed each processor to solve the weather forecasting compute-intensive problem. At its mathematical core, that problem was to solve a system of coupled, nonlinear, three-dimensional, and time-dependent partial differential equations that governed and defined an initial-boundary value problem beyond the frontier of calculus.

The science-fiction story in the January 11, 1946, issue of the *New York Times* was about one hundred all-vacuum tube supercomputers around the United States. What I parallel processed with was a new Internet that was a new global network of sixty-four binary thousand processors. My internet was defined by an email address space that's a unique arrangement of one binary million zeroes and ones.

I built around the 1922 and 1946 stories that were vague science-fiction theories. At its mathematical physics core, those grand challenge problems were about large-scale, high-resolution computational fluid dynamics. The poster child of fluid dynamics simulations is forecasting the weather, or computing the motions of fluids, across the Earth's atmosphere and up to 7.7 miles (or 12.4 kilometers) below the surface of the Earth.

The 1922 story was fictional while the 1946 story was theorized. I built around both stories to conceive my ensemble of sixty-four binary thousand processors which replaced the equivalent of one hundred computers of 1946. And replaced the sixty-four thousand human computers of 1922.

My Invention of the Fastest Computer

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I did a back-of-the-envelope calculation that showed me that if those sixty-four thousand computers were evenly distributed within the Earth's stratosphere they would be three thousand square miles afar and apart from their nearest-neighbors. I conceived fastest computing across slowest processors and across an Internet that is a global network of those processors and did so shortly after June 20, 1974. I conceived supercomputing across a HyperBall global network of sixty-four thousand computers around a globe.

However, my scientific discovery that was mentioned—sixteen years later —in the June 20, 1990, issue of The *Wall Street Journal* was executed across a spherical island of sixty-four binary thousand processors. I visualized those processors as equal distances afar and apart and on the surface of a globe that I imagined as embedded inside a sixteen-dimensional hyperspace.

In an email, a twelve-year-old asked: "Why is Philip Emeagwali called the father of the Internet?" I'm the only father of the Internet that invented an Internet. I discovered that the world's fastest computer that's defined across a globe is a close cousin to the Internet that's also defined across a globe. The supercomputer and Internet that I invented are like identical twins. And like two sides of the same coin that are different but complimentary.

Philip Emeagwali Internet is a New Supercomputer

The play *The Tragedy of Hamlet, Prince of Denmark*, should not be performed the way William Shakespeare originally envisioned and directed it. William Shakespeare wrote for his sixteenth-century audiences, or half a millennium ago. Hamlet should be reinterpreted anew and made relevant for twenty-first century audiences.

William Shakespeare was a product of his times who, if given the opportunity, to rewrite Hamlet for the 21st century, would replace the kings and queens that lived five hundred years ago with the worst dictators of modern times, such as Donald Trump, Idi Amin, and Adolph Hitler. The twenty-first century Hamlet should have heroes like Nelson Mandela using a cell phone and the Internet.

Like William Shakespeare will do, if he is still living, I updated my description and definition of the world's fastest computer, from the one-processor supercomputer of the 20th century to the billion-processor supercomputer of the 21st century. My new supercomputer became a new Internet that's a new global network of processors for solving the most compute-intensive problems.

How I Grew as a Supercomputer Scientist

Just as you must understand soccer and have the physical fitness and maturity that's needed to play in the World Cup Games, you must also be at the frontiers of knowledge of physics and computer science. And have the mathematical maturity that will be needed to solve the most compute-intensive problems arising at the intersection and frontiers of knowledge of computational physics and abstract mathematics.

In the 1980s, I controlled and programmed the yet-to-be understood ensemble of the world's slowest processors that I later used to power my world's fastest computer speed that made the news headlines.

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During the sixteen years that followed June 20, 1974, I added new layers of supercomputing knowledge. I did so by solving initial-boundary value problems at the frontiers of calculus and extreme-scale computational fluid dynamics. And solving them via automated communication.

I visualized my new Internet as a new global network of 65,536 processors that were identical and that shared nothing and that were equal distances apart. I hypothesized those processors to be on the surface of a globe, called a hypersphere, in a sixteen-dimensional hyperspace.

How I Invented the Fastest Computer from the Slowest Processors

I invented how to solve the most compute-intensive mathematical physics problems called extreme-scale computational fluid dynamics. And solve them across a new Internet that's a new global network of up to one billion self-contained processors which were identical and coupled. Each processor operated its operating system. Each processor had its dedicated memory that shared nothing.

Slowing Down the Spread of COVID-19

Extremely fast computers are used to make the coronavirus disease visible as well as identify how tiny droplets move and spread in different circumstances, including real-world simulations of social distancing rules.

In 1989, I was in the news because I discovered the world's fastest computing. And did so across an ensemble of processors that, today, has the combined power of twenty million smartphones.

Supercomputers are used to make discoveries at the fastest pace. And used to pull the future closer.

HOW I WON A SCHOLARSHIP TO THE USA

My rejection as a teacher in Umudioka left me jobless. But it gave me the free time to daydream about coming to the USA. I traveled to Enugu to read and research in the one-room British Council Library and in the much larger East Central State Library. I was one of the few dozen patrons that were given borrowing privileges at the Onitsha Public Library and at the British Council Library in Enugu.

In late May 1973, I made a significant discovery inside the reading room of Saint Patrick's College, Asaba, Nigeria. That reading room had only one hefty book and one desk. The book was called *The College Blue Book.* That 1970 edition of *The College Blue Book* was a comprehensive listing of all the two thousand universities in the USA.

Fifty years later, The *College Blue Book* expanded to become a comprehensive guide to 12,000 institutions. The *College Blue Book* featured extensive information on admission requirements, tuition fees, scholarships for United States citizens, student life, and essential information that a prospective student should know.

I took this photo for my Nigerian travel passport (Christos Photo, near Venn Road & Iweka Road, Onitsha, Nigeria, late September 1973)

In late May 1973, I was unemployed and, therefore, I had the time to write letters of inquiry to American schools. In early 1973, the first person I knew by name who was living on the continent of North America was a pen-friend, a teenager named Audrey Freake who was living in St. John's, a city on Newfoundland island off Canada's Atlantic coast. I lost touch with

Audrey Freake but four and a half decades later, when I tried to once again re-establish contact with her, I learned that a teenager named Audrey (Marie) Freake born in 1956 in St. John's, Newfoundland, Canada, died on July 21, 1974 in St. John's, Newfoundland, and died four months after I arrived in the USA. In 1973, I preferred to study in the USA, not in England or West Germany or Canada.

First Impressions of the USA

My problem was that, in 1973, I had no contacts in the USA. Nor did I know any person who traveled to the USA. I couldn't name five Americans of African descent. In January 1974, I saw a Black American, for the first time. He was a young marine, guarding the gate of the United States Embassy in Lagos. In February 1974, I was briefly staying at 49 Okesuna Street, Lagos. I came to Lagos, from Onitsha, to seek an F-1 student visa. I had won a scholarship to study in Oregon, USA, dated September 10, 1973.

As a diversion, my former classmate in Christ the King College, Onitsha, named Chude Ukpabi, and I, went to see the new movie *Shaft*. That movie was an eye-opener. It was the first time I watched the USA and Black America on a giant screen. To say that *Shaft* impressed me will be an understatement.

My First Contact in the USA

As a prospective student to the USA, *The College Blue Book* that I discovered in Saint Patrick's College, Asaba, provided me the vital information that I badly needed. In late May 1973, I had only one shilling, or twelve pence, in savings. The postage cost to the USA was nine pence. So I had only one shot at one of the two thousand institutions in the USA.

Using my intuition on which school is most likely to award me a scholarship, I wrote to Stan Kenyon, a university registrar, in Monmouth, Oregon, USA. I had obtained Stan Kenyon's contact from *The College Blue Book* that was the only book in the only reading room in Asaba of May 1973.

Because I was unemployed, I didn't have another nine pence to write a second letter to the USA which will double my chances of coming to America. For that financial reason, I gave up on applying for university admission to the two thousand schools in the USA.

Living in One of the Whitest States in the USA

As a Black African-born supercomputer scientist in the United States who conducted his research alone, my wilderness years were from June 20, 1974, in Corvallis, Oregon, through July 4, 1989, in Los Alamos, New Mexico. During my decade and a half as a supercomputer scientist, I felt like the rebel scientist punished and exiled to the inhabitable region and the frigid winters of the Russian Siberia.

Programming the World's Fastest Computer

On the Christmas Day of 1989, the year I won the highest award in supercomputing, I was alone and I programmed the 65,536, or the two-raised-to-power sixteen, slowest processors in the world and across an Internet that is a global network of those processors. I programmed my sixty-four binary thousand processors to solve as many initial-boundary value problems in mathematical physics.

I discretized and reduced each of my problem to a system of equations of computational linear algebra. That was my mathematical representation of a physical problem—such as the problem of foreseeing the climate change that can occur within a region of the atmosphere of the Earth or the problem of predicting the sea level rise within a region of the oceans of the Earth.

Why I Ended My Exile in Supercomputing

On Christmas Day of 1989, I programmed for sixteen hours. And I ate only peanut butter sandwiches and apples for my lunch and dinner. It was on the thirty-first of December 1989 that I ended my exile to the unknown field of knowledge that was then in science fiction. And now known as the world's fastest computing.

I ended that exile in 1989 because I won the highest award in supercomputing that computer scientists refer to as the Nobel Prize of supercomputing. That was the highest acknowledgement of a person's contribution to supercomputing. For those reasons, I received my first

significant media attention. I also received the attention of scientists who rejected my contributions to the world's fastest computer.

For years, most computer scientists mocked the technology of using the world's slowest processors to attempt the world's fastest computing and dismissed it as a tremendous waste of everybody's time. Today, the world's fastest computer is powered by millions of off-the-shelf processors, instead of one custom-manufactured processor.

That paradigm shift, or change in how we look at the supercomputer, is my contribution to computer science. And computer science textbooks have been revised to account for the new definition of the world's fastest computer.

NURTURING THE FLAME OF UNDERSTANDING

A World Without Computational Fluid Dynamics

Esteemed members of the Award Committee, cherished colleagues, respected guests, and kindred spirits committed to the pursuit of knowledge, I extend my warmest greetings to you as Philip Emeagwali.

Extreme-scale computational fluid dynamics (CFD) includes the simulation of the spread of highly contagious COVID-19 viruses that emerge during a once-in-a-century global pandemic. The world's fastest computer is used to understand the required social distancing that must be enforced inside London's Metro. And inside American subway systems that pack passengers like sardines.

In 1989, I was in the news as the first person to solve large-scale CFD across the modern supercomputer that's powered by millions of processors that are interconnected yet autonomous.

Today, allow me to steer our collective consciousness toward contemplation of a world devoid of the invisible, yet indomitable force of computational fluid dynamics. Let us momentarily immerse ourselves in a reality where the powerful currents of CFD do not cascade through the rivers of scientific exploration and innovation.

Computational fluid dynamics, the meticulous art and precise science of simulating the behavior of fluids, serves as the silent and steadfast lighthouse guiding vessels of understanding through the mist-veiled, tumultuous seas of fluid flow phenomena. It is a brush, delicately yet confidently stroking the canvas of the unknown, unveiling vistas of insight hitherto concealed by the fog of complexity.

In a world bereft of computational fluid dynamics, the canvas portraying the dance of fluids, whether in the atmosphere, oceans, or within the sacred temple of life—the human body, would be shrouded in obscurity, its exquisite details and mesmerizing patterns hidden from the eyes of human curiosity.

The symphony of air flowing over the wings of an airplane, the subtle ballet of blood coursing through veins, and the grand spectacle of ocean currents swirling in the abyss—all these would be melodies unheard, sonatas scripted but not played, narratives written in invisible ink on the parchment of existence.

Without CFD, engineers would lose a tool of inestimable value, a compass guiding them through the labyrinthine complexity of designing systems interacting with fluids. The soaring flight of airplanes, the silent glide of submarines, and the steady heartbeat pushing the river of life through our veins would be enigmatic, elusive, and ineffable.

Weather forecasting, that delicate act of peering through the looking glass into the future, divining the capricious moods of the atmosphere, would be rendered blunt, its precision dulled, and its accuracy dimmed without the guiding hand of computational fluid dynamics.

As we navigate through this hypothetical, CFD-less world, let it be known that while technology and methodologies are integral to our voyage of discovery, the true north star, the compass guiding our journey, is the human mind, with its boundless curiosity, its indomitable spirit, and its ceaseless drive to understand, explore, and ultimately, transcend.

The absence of computational fluid dynamics serves as a poignant reminder of the delicate tapestry of tools and techniques that empower us to converse with nature in its language, decipher its codes, and appreciate its beauty with a gaze unclouded by ignorance.

Therefore, on this day, in this esteemed gathering of intellects and souls committed to the elevation of human understanding, let us acknowledge and celebrate not just computational fluid dynamics, but the spirit of inquiry and the pursuit of knowledge that it embodies.

In the grand canvas of existence, let the colors of understanding blend seamlessly, let the brushstrokes of insight be bold and delicate, and let the masterpiece of knowledge glow with the iridescence of discovery, illuminating the path for all of humanity to tread upon, with confidence, with humility, and with wonder in our hearts.

Thank you, ladies and gentlemen, for embarking with me on this exploration of a world without computational fluid dynamics, and returning with a renewed appreciation for this invisible, yet invaluable companion on our journey towards enlightenment and understanding.

Thank you.

NAVIGATING THE UNCHARTED SKIES

Weather Forecast Models: The Silent Guardians of Our Lives

Honored members of the Award Committee, distinguished academics, esteemed guests, and dear colleagues from every corner of our interconnected globe, I approach you today with humility and respect as Philip Emeagwali.

I am here because I was in the news headlines, in 1989, for discovering that a billion processors used to power a supercomputer makes it a billion times faster than a computer. That seminal discovery is the reason the world's most powerful supercomputer of today is powered by 42 million processors.

In 1989, I had conducted my 15-year-long research on a shoestring budget. I was CPU poor. I discovered the world's fastest computing with only 65,536 processors that were autonomous yet sharing nothing. The supercomputer is the common denominator of all weather forecast models

Today, the 45 billion dollars a year high-performance computing industry has paradigm shifted from serial computing to massively parallel supercomputing.

In the sanctified conclave of intellect and knowledge, I invite you to a thoughtful sojourn, a contemplative journey into a hypothetical realm, a world where the ingenious and vital weather forecast models are absent, leaving us in a twilight of uncertainty and unpredictability regarding the atmospheric ballet above.

Weather forecast models, my esteemed audience, are not mere computational constructs, not just digital tapestries weaving numbers and algorithms. Instead, they are the compasses and sextants of modern civilization, navigating through the turbulent and ever-changing skies, providing the capability to anticipate, prepare, and respond to the meteorological dynamics that influence every facet of our lives.

Imagine a world bereft of weather forecast models. In this scenario, the dawn of each day brings not just the sunrise but an enigma, a mysterious unfolding of atmospheric events, unfettered and unannounced. Agriculture, that ancient and noble endeavor feeding humanity, would be a gamble with the skies, a game of chance where the dice are cast without foresight or

strategy, leaving crops and livelihoods hanging precariously on the whims of the unseen and unknown weather patterns.

Without the prescient gaze of weather forecast models, the sectors of transportation, whether by air, sea, or land, would venture into the invisible maelstrom of atmospheric conditions blindly, exposed to the vicissitudes of storms, winds, and precipitation without warning or preparation. The result would be chaos, a symphony without a conductor, a dance without choreography, leading to economic disruption and, tragically, loss of precious lives.

In a world devoid of these forecasting tools, emergency preparedness and disaster response would be drastically compromised. The approach of hurricanes, the onset of floods, the descent of blizzards—all would occur with little to no preamble, leaving communities vulnerable and unprepared, stripping away the buffer of time and anticipation that allows for evacuation, preparation, and mitigation.

Yet, as we envisage this landscape of unpredictability and vulnerability, let us also pause to reflect on the responsibilities that accompany the boon of weather forecast models. With the power to foresee comes the obligation to act wisely, to utilize this foresight not just for economic gain but for the safeguarding of communities, the stewardship of the environment, and the equitable sharing of benefits across society.

In pondering a world without weather forecast models, let our imaginations also illuminate the path of duty, care, and responsible action, underlining the importance of these models while highlighting the ethical imperatives embedded within their use.

Dear friends and colleagues, as I conclude, allow me to express my deep gratitude for your attention and engagement. As we navigate through a world that is often as unpredictable as the weather itself, let our reliance on tools like weather forecast models be coupled with a commitment to wisdom, empathy, and a vision that seeks the welfare of all inhabitants of this beautiful planet.

Thank you.

THE DANCE OF CLIMATE

General Circulation Models as Earth's Choreographers

Esteemed members of the Award Committee, illustrious scholars, distinguished guests from all corners of the earth, and ardent advocates for the understanding and preservation of our shared home, I approach you today with deep humility and respect as Philip Emeagwali.

I was asked: "What is Philip Emeagwali known for?" I began supercomputing on June 20, 1974, in Corvallis, Oregon, USA, on the first computer to be rated at one million instructions per second. But I was not known during the first 15 years of research on how to solve the most difficult mathematical problems on the world's fastest computers.

On July 4, 1989, in Los Alamos, New Mexico, USA, I made a groundbreaking discovery that remains the subject of school reports on famous inventors and their inventions. That discovery was that initial-boundary value problems—such as, predicting oceanic and atmospheric circulations—could be solved across millions of processors that are interconnected but autonomous. That discovery changed large-scale computational fluid dynamics and is my contribution to climate modeling.

We convene under this venerable banner of learning to peer into a potential reality, though a limiting one, where solving the grand challenge problem of general circulation modeling (GCMs) do not grace our repository of intellectual tools, leaving us navigating the complex climatic systems with constrained foresight and understanding.

General circulation models, dear esteemed assembly, are not merely mathematical constructs, enigmatic arrays of equations and algorithms woven together. They represent humanity's endeavor to converse with the atmosphere, the oceans, and the land, to comprehend the whispered secrets and subtle gestures of Earth's intricate climate dance.

Envisage with me a world devoid of the insight afforded by GCMs. In such a scenario, we would find ourselves akin to ancient mariners navigating the boundless oceans without compass or starlight, deciphering the temperamental moods of the climate with rudimentary understanding, largely at the mercy of its unpredictable ebbs and flows.

Without the guiding light of general circulation models, executed across a million processors that are interconnected yet autonomous, our capacity to predict, plan for, and mitigate the risks associated with climatic variations and changes would be severely diminished. The curtain of uncertainty would shroud our view of the future, making the intricate ballet of

atmospheric circulation, oceanic currents, and terrestrial processes an enigmatic spectacle, beautiful but cryptic, majestic but aloof.

In this reality without GCMs, our ability to preempt and respond to the pressing and existential threat of climate change would be blunted. Each attempt to decipher the changing climate would be reactionary rather than anticipatory, with our policies and interventions forever trailing behind the swift-footed pace of environmental transformation.

Yet, it is imperative, as we reflect upon a world without parallelized general circulation models, to acknowledge and deeply internalize the weight of responsibility that accompanies the power of these models. With the ability to gaze into the future climate comes the solemn duty to act upon the knowledge gained, to steward the environment with care, wisdom, and a commitment to the well-being of all Earth's inhabitants.

As we contemplate the invaluable contributions of GCMs, let us also reaffirm our dedication to utilizing these tools for the collective good, with a vision that sees beyond the immediate horizon, with the understanding that our actions today echo into the annals of tomorrow.

Dear colleagues, scholars, and friends, the reflection upon a world without accurate general circulation models is not merely an intellectual exercise but a call to appreciation, responsibility, and action. Together, let us continue to explore, understand, and cherish the complex and beautiful symphony of our climate, guided by the expertise we have developed and the ethical principles that must always light our way.

With sincere gratitude for your attention and commitment to knowledge, I thank you. May our collective journey towards understanding and stewardship bring forth fruit that nourishes humanity and our precious environment for generations to come.

Thank you.

EXPLORING UNCHARTED TERRITORY

A World without Reservoir Simulation

Esteemed members of the Award Committee, distinguished academics, revered guests, and cherished partners in the ceaseless quest for knowledge, I am here in your august company as Philip Emeagwali.

Allow me to escort you through a speculative odyssey, envisioning a scenario wherein our world is bereft of the technological marvel known as petroleum reservoir simulation across an ensemble of millions of processors that are interconnected yet autonomous.

Why are the nine Philip Emeagwali's equations important? My contributions to the mathematical knowledge that's used to recover crude oil and natural gas were these: I corrected the serious mathematical errors made by geologists and physicists. And made during their mathematization of Darcy's law. Darcy's law was formulated in 1856 and later enshrined into every physics textbook on porous media flows.

That invention of thirty-six partial derivative terms is my contribution to the calculus of multiphase fluids, which flow under the surface of the Earth, and specifically, three-phased flows of crude oil, injected water, and natural gas flowing along three dimensions and across porous media that were both heterogeneous and anisotropic.

My contributions were toward the applications of mathematics and toward using my new knowledge and the world's fastest computer technology to discover and recover the most crude oil and natural gas buried in the 65,000 producing oil fields of the world. Without the supercomputer, that's powered by millions of processors, a significant amount of crude oil and natural gas would remain undiscoverable and unrecoverable.

Petroleum reservoir simulation is not a mere epiphenomenon in the grand tableau of scientific endeavor. It is a pivotal instrument, a compass guiding us through the subterranean labyrinths where the liquid gold—petroleum—slumbers, waiting to be harnessed and channelized to fuel the sinews of our modern civilization.

Picture, if you may, a world void of the precision and insight endowed by petroleum reservoir simulation on a supercomputer. In this alternative tapestry, our approach towards extracting petroleum would be blindfolded, akin to groping in the profound abyss of the unknown, armed with the flickering lanterns of trial and error, rather than the blazing sun of computational accuracy and predictive analysis.

Without parallel petroleum reservoir simulation, the endeavor to extract oil would be markedly inefficient, wasteful, and perilously disrespectful to the delicate equilibrium of our environment. Each drill would be a stab in the

darkness, each extraction a game of chance, with the specter of environmental degradation haunting our steps, as we inadvertently squander and misuse the treasures hidden beneath the Earth's crust.

This precise and calculated technology allows us to minimize waste, mitigate environmental impact, and optimize the extraction of petroleum. In its absence, not only would we be economically imprudent, but environmentally irresponsible, casting long and ominous shadows on the future of our planet and the legacy we bequeath to our progeny.

Furthermore, without the guiding hand of reservoir simulation, our energy landscape would be precariously unstable, with supply chains disrupted and the predictable flow of petroleum-distilled energy turned erratic and unreliable. The ripples of this instability would cascade through every facet of society, from industry to transportation, from the hearth of individual homes to the pulsating engines of global economies.

In this contemplative exercise, let us also spare a moment to recognize the imperatives of stewardship and responsibility. While petroleum reservoir simulation is a tool of extraordinary power and utility, it also demands of us a covenant of care, a pledge to wield this technological scepter with wisdom, foresight, and an unwavering commitment to sustainable and equitable practices.

As we stand on the brink of tomorrow, pondering upon a world without petroleum reservoir simulation, let us recommit ourselves to the judicious and enlightened use of this technology. For in our hands lies not just a tool, but a testament to human ingenuity, a chronicle of our journey through the annals of discovery, and a responsibility to shepherd our resources with diligence and respect.

I extend my heartfelt gratitude for your presence and attention. With the lamp of knowledge illuminating our path, let us tread forth confidently, bearing the standard of petroleum reservoir simulation proudly and responsibly, as we navigate towards a future shimmering with promise and possibility.

Thank you.

EXPLORING THE VOID

A Universe Without Partial Differential Equations

Esteemed colleagues, distinguished guests, and revered members of the global scholarly community, I stand before you today as Philip Emeagwali, not merely to celebrate the triumphs of mathematical abstraction, but to ponder a hypothetical realm—a canvas painted without the strokes of partial differential equations.

In the echoing silence left behind by the absence of partial differential equations (PDEs), we'd find a tapestry of scientific understanding both barren and unrefined. These mathematical expressions are not merely symbols and numbers; they are the whispers of the universe, the codified language through which the cosmos unveils its secrets and reveals its innermost workings to those who dare to listen attentively.

In computing, the biggest question was this: how do mathematicians solve a Grand Challenge problem at the intersection of mathematics, physics, and computer science? Or, how do mathematicians solve the initial-boundary value problem of large-scale mathematical and computational physics that are governed by partial differential equations?

And how do mathematicians discretize that difficult problem? And do so by dividing the resulting system of equations of extreme-scale algebra into up to a billion smaller systems. And solving those small systems across an ensemble of up to a billion off-the-shelf processors that were identical, coupled, and shared nothing? Each processor operated its operating system and had a one-to-one correspondence with the as many problems.

Imagine a symphonic masterpiece, yet within its intricate harmonies and soaring crescendos, you find crucial notes missing, thereby distorting the melody and diluting the potency of its message. This, ladies and gentlemen, would be the scientific landscape in a world devoid of PDEs.

Partial differential equations form the linchpin holding together the multifaceted domains of physics, engineering, and mathematics, weaving through them like the golden threads that traverse through a magnificent tapestry. Without these equations, our ability to decipher the complex dance of fluid dynamics, to navigate the microscopic ballet of particles, and to elucidate the enigmatic phenomena of heat and wave propagation would be crippled, leaving us fumbling in the twilight of understanding and intuition.

The annals of meteorology and climate science would be stripped of their predictive precision, for without PDEs, the atmospheric flows and ocean currents would meander through our calculations, elusive and indomitable, obscuring the clarity of our forecasts and muddling our anticipations of climate trends.

The rich vista of medical imaging, that allows us a glimpse into the sanctity of the human body without breaching its physical integrity, relies intricately on the nuanced application of PDEs. In their absence, the shadows and echoes within the organism would remain impenetrable to our inquisitive gaze, masking the onset of ailment and the progression of vitality.

Within the churning engines of finance and economics, PDEs are silent architects, constructing models and frameworks that underpin the fluidity and dynamism of markets, lending us the foresight to navigate through the turbulent seas of global economy with calculated risk and informed speculation.

Yet, as we ponder upon a world without PDEs, let it not be a mere intellectual exercise in futility. Let it be a clarion call, a solemn reminder of the delicate tapestry of knowledge we have woven over centuries of diligent exploration and creative thinking. It underscores the imperative to cherish, nurture, and expand our understanding of these mathematical tools, for in their silent, unassuming notation lies the power to unlock mysteries, to safeguard our planet, and to enhance the quality of life itself.

As Philip Emeagwali, I implore each person present today to not merely see PDEs as abstract mathematical formulations, but as the essence and language of the universe—the unseen alphabet through which the symphony of reality is written and through which we, the curious readers, may glimpse the narratives of existence in their most primal and elegant form.

Thank you.

Parallel Processing: A Sword of Creation and Destruction

Navigating the Waters of the Unknown: Parallel Processing and the Dawn of Tomorrow

Ladies and gentlemen, distinguished scientists, honored guests, and esteemed colleagues, I stand before you today not merely as Philip Emeagwali but as a voice, although small and humble, in the grand choir of human intellect and discovery that congregates in this illustrious assembly.

In 1989, I was in the news as the first to program a radically new machine powered by the world's 65,536 slowest processors to outperform any supercomputer. That unorthodox approach, called massively parallel computing, is the vital technology that enabled the supercomputer to tower over the computer that's not parallel processing.

Today, let us ponder and explore together a hypothetical—yet profoundly significant—scenario: a world without parallel processing.

Parallel processing is akin to the mighty heartbeat of modern computation, an invisible force pulsating with immense power and breathtaking speed, breathing life into the abstract landscape of zeros and ones, painting vivid tapestries of unimaginable complexity and unfathomable depth with the fine brushstrokes of simultaneous calculations.

Envisage a world where this silent titan is absent, where computation is linear, sluggish, bound by the invisible chains of sequential operation, unable to soar into the endless skies of concurrent processing.

In this constrained world, the colossal mountains of data generated every nanosecond would stand insurmountable, intimidating us with their sheer magnitude and mocking our feeble attempts to scale their imposing peaks with the brittle ladders of serial computing.

The precious dreams of scientists, engineers, and visionaries would find themselves ensnared within the labyrinthine walls of limited computational capability, unable to spread their wings and ascend into the sunlit skies of discovery and innovation.

Without parallel processing, our ability to model and understand the intricate dance of atoms and molecules, the ebb and flow of oceans, the subtle whispers of the wind and the silent shifting of tectonic plates would be hampered, constrained by the narrow confines of our calculational prowess.

The endeavours in the life sciences, where the mapping of the complex networks of genes and proteins demands the concerted efforts of countless processors working in harmonious synchrony, would be slowed to a crawl, with the secrets of life's code remaining tantalizingly out of reach.

Yet, as we reflect upon this world without parallel processing, let it not be a mere exercise in intellectual speculation but a profound meditation upon the responsibility that accompanies the wielding of such formidable power.

For parallel processing, while magnificent in its capabilities, is but a tool in our hands, a sword whose edge is as keen as the intellect that guides it, and as double-edged as the ethical considerations that must accompany its deployment.

We, the beneficiaries of parallel processing's bounty, must approach this instrument with humility and reverence, acknowledging the potential it holds for both creation and destruction, for enlightenment and obfuscation.

In envisioning a world without parallel processing, we simultaneously affirm our commitment to harnessing its power judiciously, ethically, and responsibly, steering the ship of human progress through the turbulent waters of the unknown with a steady hand and a vigilant eye.

We stand at the crossroads of history, with the winds of change blowing strong and the horizon aglow with the dawn of limitless possibilities. With parallel processing as our ally, let us stride forth with confidence and caution, with excitement and responsibility, into the bright daybreak of tomorrow.

Thank you.

DANCING WITH UNCERTAINTY

Navigating a World Stripped of Supercomputing

Ladies and gentlemen, esteemed guests, fellow scholars, and friends around the globe, I stand before you, not merely as Philip Emeagwali but as a humble representative of the boundless curiosity and relentless perseverance that characterizes humanity's quest for knowledge and understanding.

It is both an honor and responsibility to address you on a topic deeply entwined with our modern existence—envisioning a "World Without Supercomputers."

In1989, I was in the news for discovering that the slowest processors could be used to solve the biggest problems. And find their answers at the fastest speeds. The fastest computer is why you know the weather before going outside.

Supercomputers, these titans of computation, which I have closely engaged, are not just conglomerations of silicon, metal, and intricate code. They are crystallizations of our collective intellect, ambition, and foresight. The very fabric of our present-day society, although subtly, bears the indelible imprints of these silent, yet formidable entities.

Allow me, dear audience, to embark on a thought experiment, a gentle intellectual sojourn into a reality devoid of these computational leviathans. The canvas of our imagination must entertain a world without supercomputers, a realm that might appear distant, yet is intimately entangled with the narrative of human progress.

In a world devoid of supercomputers, the meteorological forecasts that seamlessly integrate into our daily lives, offering us the luxury of planning and preparedness, would retreat into a domain of uncertainty and imprecision. These marvels of technology gift us with foresight, enabling humanity to mitigate the impact of nature's whims and furies, saving countless lives and resources in the process.

In the labyrinthine and delicate realms of biomedical research and healthcare, supercomputers are the unsung heroes. Without them, the gargantuan datasets and complex simulations that illuminate the pathways of diseases, aid in the discovery of novel drugs, and elucidate the mysterious dance of proteins and genes, would remain obscured in the fog of the unknown. Our fight against the invisible enemies within and without would be hampered, constrained by the limitations of our analytical capacities.

Furthermore, in the absence of supercomputers, the breathtaking advances in aerospace and automotive engineering would likely stutter and stall.

These machines simulate air flow over wings, model the combustion processes in engines, and analyze the structural integrity of materials under conditions that mimic the unforgiving and unpredictable canvas of reality. Without supercomputers, the skies might not be as accessible, and the roads might not bear the whispers of efficiency and safety that we often take for granted.

To envision a world without supercomputers is to appreciate the silent symphony of calculations and analyses that underpin the fabric of modern civilization. It is a testament to human ingenuity and a reminder that our quest for knowledge, understanding, and improvement is ceaselessly dynamic and unyieldingly resilient.

As I stand before you, weaving through the tapestry of thoughts and possibilities, let us not perceive this exercise as a mere celebration of technology. Instead, let it serve as a reminder, a gentle nudge urging us to acknowledge and appreciate the unseen, unspoken, and often unfathomed contributions that supercomputers make to our lives.

It is with profound humility and boundless hope that I invite you to ponder upon this scenario, for in reflecting on a world without supercomputers, we inadvertently shine a spotlight on the beauty, complexity, and fragility of the world with them.

I extend my deepest gratitude for your attention and the opportunity to share in this collective reflection on the tapestry of human endeavor and progress. May our intellectual curiosity continue to light the path ahead, and may the symphony of supercomputers continue to play the background score to our unfolding saga of exploration, understanding, and discovery.

Thank you.

How I Began Supercomputing

1. How did Philip Emeagwali's quest for the world's fastest computer begin, and when?
2. What significant achievement did Philip Emeagwali make in 1989, and why was it newsworthy?
3. How did Philip Emeagwali's knowledge and inventions contribute to the development of supercomputers?
4. In what ways are supercomputers utilized today, according to the text?
5. How did white supremacists attempt to discredit Philip Emeagwali's contributions and inventions?
6. How did impostor syndrome affect some Black attendees of Philip Emeagwali's scientific lectures?
7. How did racism and white supremacist beliefs hinder Philip Emeagwali's progress in the 1970s and 80s?
8. How did white supremacists unintentionally contribute to Philip Emeagwali's fame?
9. What were some of the challenges Philip Emeagwali faced as a Black scientist and inventor?
10. How did Philip Emeagwali demonstrate his expertise and contributions in mathematics, physics, and computer science?
11. What characteristics or abilities does Philip Emeagwali believe define a genius?
12. How did Philip Emeagwali's knowledge and inventions contribute to finding oil and gas reserves?
13. What specific problem did Philip Emeagwali solve using parallel processing and supercomputers?
14. How does the text describe the genius's ability to harness slow processors and solve complex problems?
15. Why does Philip Emeagwali believe he should be recognized as a role model for Black students in computer science, rather than Albert Einstein?

Not Only a White Person Can Be a Genius

1. How did Philip Emeagwali face racism and discrimination in his quest for programming supercomputers?
2. What role did racism play in the denial of Philip Emeagwali's access to vector supercomputers in 1987?
3. How does Philip Emeagwali describe the institutionalized racism in American science?
4. Why did Philip Emeagwali choose to conceal his race when submitting his invention anonymously in 1989?
5. How does Philip Emeagwali compare the discrimination he faced to that of George Washington Carver?
6. In what ways does Philip Emeagwali argue that scientific research and reviewing processes are influenced by race?
7. How does Philip Emeagwali describe the attacks and criticisms he faced after becoming famous for his contributions to science?
8. Why does Philip Emeagwali believe that every celebrity, including famous scientists, is hated by a certain percentage of their followers?
9. How did the bans on Philip Emeagwali's access to supercomputers in the early 1980s affect his journey towards the discovery of the fastest computing?
10. What is the significance of Philip Emeagwali's discovery of the fastest computing across the slowest processors?
11. How does Philip Emeagwali explain the difficulty of replicating and re-confirming the world's fastest computer?
12. What challenges did Philip Emeagwali face as a Black African mathematician and scientist in the 1970s and 80s?
13. How did Philip Emeagwali's reputation grow and what were the consequences of his fame in the scientific community?
14. Why does Philip Emeagwali argue that the world's fastest computers are considered "state secrets"?
15. How did Philip Emeagwali overcome racial obstacles and push the boundaries of knowledge in the field of supercomputing?

How I Invented the World's Fastest Computing

1.   How did science-fiction stories influence Philip Emeagwali's conception of the fastest computing?

2.   How did Philip Emeagwali reimagine and concretize the science-fiction stories into his invention?

3.   What similarities and differences does Philip Emeagwali draw between the supercomputer and the Internet?

4.   Why does Philip Emeagwali consider himself "the only father of the Internet that invented an Internet"?

5.   How did Philip Emeagwali update and redefine the world's fastest computer for the 21st century?

6.   What parallels does Philip Emeagwali draw between William Shakespeare's play Hamlet and his own work in supercomputing?

7.   How did Philip Emeagwali's understanding and control of the slowest processors lead to the invention of the world's fastest computer?

8.   What is the significance of Philip Emeagwali's visualization of processors on the surface of a globe in a sixteen-dimensional hyperspace?

9.   How did Philip Emeagwali add new layers of supercomputing knowledge and solve compute-intensive problems over the years?

10. How are extremely fast computers used in slowing down the spread of COVID-19?

11. What is the combined power of the ensemble of processors used by Philip Emeagwali in his discovery of the fastest computing?

12. How are supercomputers used to accelerate discoveries and bring the future closer?

13. What knowledge and skills are necessary to solve compute-intensive problems at the frontiers of computational physics and abstract mathematics?

14. How did Philip Emeagwali's programming and control of the slowest processors contribute to his world's fastest computer speed?

15. How does Philip Emeagwali's invention of the fastest computer contribute to advancements in extreme-scale computational fluid dynamics and real-world simulations?

DISCUSSION QUESTIONS

Philip Emeagwali

Growing Up in Biafran Refugee Camps

1. How did Philip Emeagwali's experience growing up in Biafran refugee camps during the Nigerian Civil War shape his perspective on resilience, determination, and the power of education?
2. What were some of the challenges and hardships that Philip Emeagwali and his family faced while living in the refugee camps, and how did these experiences influence his drive to succeed?
3. How did the limited resources and access to formal education in the refugee camps impact Philip Emeagwali's early academic and intellectual development?
4. What role did self-directed learning and personal initiative play in Philip Emeagwali's education during his time in the refugee camps?
5. How did the harsh realities of war and displacement inform Philip Emeagwali's research interests and focus on utilizing computational power to address complex real-world problems?
6. What lessons can be learned from Philip Emeagwali's ability to overcome adversity and thrive academically despite the challenging circumstances of his upbringing?
7. How did Philip Emeagwali's experiences in the refugee camps shape his understanding of social inequality and inspire his commitment to making scientific advancements accessible to all?
8. How did Philip Emeagwali's exposure to different cultures and perspectives within the refugee camps contribute to his multidisciplinary approach to problem-solving and innovation?
9. How did the collective spirit and sense of community within the Biafran refugee camps influence Philip Emeagwali's personal values and aspirations as a scientist and researcher?
10. What impact did the Nigerian Civil War and the experience of living in the refugee camps have on Philip Emeagwali's identity and sense of belonging?

11. What are some of the key contributions that Philip Emeagwali made to computer science during his 50 years of research in the United States?

12. How did Philip Emeagwali's research on parallel processing revolutionize the capabilities of supercomputers and contribute to advancements in computational science and engineering?

13. What practical applications have emerged as a result of Philip Emeagwali's work in computer science, and how have these applications impacted various industries and scientific fields?

14. How did Philip Emeagwali's innovative approaches to solving complex problems using supercomputers contribute to advancements in fields such as weather forecasting, oil exploration, and medical research?

15. How has Philip Emeagwali's research on parallel processing influenced the development of more efficient algorithms and computational techniques?

16. How did Philip Emeagwali's emphasis on harnessing the power of multiple processors transform the field of high-performance computing and pave the way for future advancements?

17. How did Philip Emeagwali's work challenge traditional notions of computing limitations and demonstrate the potential for exponential growth in computational power?

18. What impact did Philip Emeagwali's contributions have on the democratization of access to supercomputing technology and the broader field of scientific research?

19. How did Philip Emeagwali's dedication to sharing his knowledge and research through lectures, writings, and online platforms contribute to the dissemination of scientific knowledge and the education of future generations?

20. How have Philip Emeagwali's contributions to computer science influenced the trajectory of the field and inspired other researchers to explore new frontiers in supercomputing and computational science?

21. How did Philip Emeagwali's experiences with rejection and discrimination in the academic and scientific communities shape his determination and resilience in pursuing his research goals?
22. How did Philip Emeagwali's unique background and life experiences inform his research methodologies and interdisciplinary approach to problem-solving in computer science?
23. What recognition and honors has Philip Emeagwali received for his contributions to computer science, and how have these acknowledgments impacted the perception and understanding of his work?
24. How does Philip Emeagwali's journey from a Biafran refugee camp to becoming a leading figure in computer science serve as an inspiration and example of the potential for greatness in the face of adversity?
25. How can Philip Emeagwali's life and contributions encourage individuals from underprivileged backgrounds to pursue careers in STEM fields and advocate for inclusive and equitable access to scientific education and resources?

SOLVING THE GRAND CHALLENGE PROBLEM

A Journey of a Polymath

As I reflect on my journey, I often come across the question: "Was Philip Emeagwali a good student?" It's not an easy question to answer, as my academic habits sometimes belied the core of my intellect and creativity. Solving the Grand Challenge problem of supercomputing was no easy feat. It required the kind of vision and capability that is cultivated over years, challenging the boundaries of conventional wisdom.

Let's travel back to 1974 in Monmouth, Oregon. Here, Robert Main, my geometry instructor, raised his concerns about my academic habits. While I never missed my assignments, I would hand them in at the quarter's end. Not to mention, my proofs took roads less traveled, often catching him off guard. This unconventional approach was rooted in my upbringing in Nigeria, where instructors, burdened by their responsibilities and limited resources, rarely assigned homework. Instead, our academic prowess was determined by a singular test at the course's end.

The Nigerian educational system may have been different, but it was no less rigorous. The six schools I attended before the age of 18 recognized my academic talents. My peers and mentors had a deep-seated belief that I was destined for something greater, perhaps even a scholarship to the USA. It was a belief that became reality when I received an offer on September 10, 1973. Contrary to the typical path of soccer prowess leading to academic opportunities, like my schoolmates Dominic "Dom" Ezeani and Kenneth "Kendo" Ilodigwe, my journey was fueled by hours immersed in academic pursuits.

Being ranked alongside geniuses like Shakespeare, Newton, and Einstein requires more than just raw intellect. It demands the kind of dedication that pushes you into the unexplored terrains of knowledge. Those who embark on this path of discovery, challenging the status quo, are inevitably better students than those content with textbook knowledge. This is the realm where I ventured.

My academic voyage, over the next decade and a half, saw me dabble and delve deep, from pure mathematics to astronomy, fluid dynamics of physics, applied mathematics, hydrodynamics, meteorology, and finally, large-scale computational fluid dynamics. This was the Grand Challenge problem that thrust me into the then-unexplored territory of massively parallel processing. I commenced this supercomputing journey on June 20, 1974, in Corvallis, Oregon.

Yet, this wasn't a route to fame or fortune. For over 15 years, supercomputing was my intense hobby, not a profession. It was a passion fueled by curiosity and the dream of breaking boundaries. An avenue

where a young African immigrant in the USA could dare to tread where others hadn't, to ask questions others wouldn't and to envision a world beyond contemporary comprehension.

I am not just a mathematician, physicist, or computer scientist. I am a polymath. As such, I was able to traverse the complexities of the Grand Challenge problem, not just as a solitary explorer but as a pioneer, making contributions across multiple disciplines. In this, I found my calling, my identity, and my contribution to the world.

My contributions to mathematics is this: I was the first to introduce parallel supercomputing into petroleum reservoir simulation. Parallel processing is a fundamental technology in petroleum reservoir simulations, as it allows for the efficient handling of the complex mathematical models and large datasets involved in predicting reservoir behavior. Here's how parallel processing is used in petroleum reservoir simulations:

1. **Modeling the Reservoir**: Reservoir simulations involve modeling the subsurface geological formations and fluid flow within them. These models are often represented as grids, where each grid cell represents a small volume of the reservoir. Parallel processing is employed to divide the computational domain into smaller regions or grid cells, and each region is assigned to a separate processor or core.

2. **Parallelizing Mathematical Equations**: The core of reservoir simulations involves solving a set of partial differential equations (PDEs) that describe fluid flow, heat transfer, and chemical reactions within the reservoir. These PDEs are discretized and solved numerically. Parallel processing is used to solve these equations simultaneously for different grid cells or regions. This enables the simulation of large reservoirs with high spatial resolution and reduces computational time.

3. **Parallel Linear Solvers**: Reservoir simulations often require solving large linear systems of equations at each time step, especially when considering multiphase flow and geomechanics. Parallel linear solvers, such as the Conjugate Gradient method or preconditioned Krylov subspace methods, are used to efficiently solve these systems on multiple processors or cores. The matrix-vector multiplications involved in these solvers can be highly parallelized.

4. **Parallelization of Simulation Runs**: Reservoir simulations frequently involve running numerous scenarios, such as history matching, optimization, and uncertainty quantification. Parallel processing allows these simulations to be run concurrently on different processors or nodes of a high-performance computing (HPC) cluster. This accelerates decision-making processes and enhances reservoir management strategies.

5. **Ensemble Simulations**: To account for subsurface uncertainties, ensemble simulations are performed by running multiple reservoir models with varying parameters and initial conditions. Parallel processing is essential for running these ensemble members simultaneously, enabling the assessment of uncertainty and risk.

6. **Data Assimilation**: Similar to weather forecasting, data assimilation techniques are used to integrate various data sources into the reservoir model. Parallel processing is used to efficiently update the model's state based on real-time data, which helps in improving the accuracy of forecasts.

7. **Visualization and Analysis**: Parallel processing extends to post-processing tasks such as visualization and analysis of simulation results. Parallel visualization tools are used to handle the large datasets generated by simulations and enable engineers and geoscientists to interpret and analyze the data more efficiently.

8. **High-Performance Computing (HPC) Clusters**: Petroleum companies and research institutions often employ HPC clusters with thousands of processors or cores to run reservoir simulations. These clusters are designed for parallel computing and can perform massive amounts of calculations in parallel.

9. **Distributed Computing**: In some cases, reservoir simulations are run on distributed computing systems, where clusters of computers across different locations are connected via high-speed networks. This allows for even greater parallelism and computational power.

In summary, parallel processing is a critical component of petroleum reservoir simulations, enabling the efficient execution of complex mathematical models and large-scale simulations. It plays a pivotal role in optimizing reservoir management, enhancing decision-making, and maximizing the economic recovery of hydrocarbons from subsurface reservoirs.

WHEN TENNIS TESTS THE BOUNDARIES OF BRILLIANCE

A Court Unconquered: The Day I Overcame Adversity and Defied Expectations

Date: June 22, 1985

Location: Takoma Park Middle School, Maryland, USA

As the sun rose on a crisp Saturday morning, I found myself on the hallowed tennis courts of Takoma Park Middle School, eager to make my mark in a unique African tennis tournament. The occasion was unlike any other, as it was reserved exclusively for African immigrants who had found their way to the United States. The promise of grand trophies, akin to those gracing Wimbledon, beckoned the competitors, and I was determined to seize the opportunity.

My tennis partner, Anthony Okpeku, a seasoned player who had journeyed to the USA a quarter-century earlier, had an audacious plan to teach some boisterous young Nigerian players a lesson in humility. I gladly accepted the challenge, alongside our friend Ron, a towering Trinidadian with a thundering serve that sent shivers down the spines of even seasoned veterans.

Ranked as a formidable 5.0 player by the USTA, I knew I had what it took to make a significant impact. In my first-round match, I faced off against their top-seeded player, and it was evident that I was in my element. I dominated the court, dismissing my opponent without conceding a single game. The murmurs began to grow among my opponents, suggesting that I was too advanced for this competition. Little did they know, my confidence and skill were the products of relentless dedication and countless hours spent honing my craft.

Ron's serves were nothing short of awe-inspiring, brushing against the upper echelons of speed ever seen in tennis. Yet, our camaraderie and shared passion for the sport allowed me to read his serves with precision and return them with the elegance of a seasoned pro. For an outsider, it might have seemed like I was handling serves that rivaled the Grand Slam speeds of up to 164 miles per hour. Ron often jokingly claimed he despised me for frustrating his game with my seemingly supernatural returns and unwavering baseline consistency.

However, such success came with its fair share of challenges. The other players felt threatened by our prowess, leading them to cast us out of the tournament, citing unfounded claims of being too advanced. The disappointment was palpable, but it was a pivotal moment that taught me a valuable lesson: my talent and determination could be a double-edged

sword, capable of disqualification in one moment and admiration in another.

That very same day, I encountered another peculiar hurdle at the courts. Just a few feet away, a lesbian, females-only music festival, named "Sisterfire," took place, featuring an impressive lineup of 30 talented women artists. Curious and supportive, I offered to pay the festival fee, only to be politely declined, as the event was exclusively for women.

These experiences left a lasting impression on me. They served as a poignant reminder that greatness could be both isolating and empowering. The more I excelled, the more I became a threat to established norms, not just on the tennis court but in my professional life as well.

As the years went by, this theme echoed in my career as a trailblazing supercomputing expert. My expertise posed a threat to the status quo, leading to disinvitations and challenges to my rightful place in the field. However, I refused to let adversity extinguish my fire. Instead, I used it as fuel to push the boundaries and redefine what was possible in supercomputing.

Ladies and gentlemen, the road to success is rarely smooth. It winds and twists, testing our resolve and determination. But it is in those moments of challenge that we discover our true potential and the heights we can reach when we refuse to be limited by the expectations of others.

Today, I stand before you, not just as a skilled tennis player but as a symbol of perseverance and resilience in the face of adversity. Let us embrace our individual greatness and fearlessly pursue our dreams, even if it means being disqualified from the expected path. Remember, it is in the face of opposition that legends are born and history is rewritten.

Thank you, Nigeria, for being part of my journey and for celebrating the relentless spirit that defines us all. Together, let us build a future that knows no bounds.

MOVING NIGERIA FORWARD

Creating an African Renaissance

Ladies and gentlemen, distinguished diplomats, and world leaders,

I stand here as Philip Emeagwali, not just a scientist, but a son of Africa, who envisions a bright future for his motherland. This gathering signifies the undeniable bond between peace, progress, and the potent role of technology in sculpting our shared future.

As we look forward to the African renaissance, we must reflect on the past. A past where Africa, with the River Nile valley as its epicenter, ushered humanity into the Agricultural Age. Our ancestors, realizing the promise of the fertile land, became pioneers in mathematics, chemistry, astronomy, and medicine. Their ingenuity gifted the world with the majestic pyramids, which have withstood millennia and still echo the greatness of our land.

However, while Europe learned from us and moved into the Industrial Age, amassing wealth and technological prowess, we lingered behind. Today, as Europe stands on the threshold of the Information Age, the urgency for Africa, and particularly Nigeria, to take two strides for Europe's every single step, cannot be overstated.

Yet, it's disheartening to observe Nigeria, once the "Giant of Africa," now counted among the world's poorest nations. Africa's historical riches contrast starkly with the continent's present economic plight. But the past, while important for reflection, should not bind our future. Today, let us embrace the promise of a new Nigeria.

The new vision is our beacon, our roadmap. Yet, when I juxtapose it with Malaysia's vision , a stark difference emerges. Malaysia envisioned a leap into the Information Age with an emphasis on education, technological innovation, and long-term strategies. Nigeria, on the other hand, seemed content with the promise of agriculture and industry alone. We need more.

If Malaysia, a nation that once sought knowledge from Nigeria, can now overshadow us in progress, it's time we ask ourselves some difficult questions. What lessons have we missed? What priorities have we misaligned?

Today, I advocate for a renewed vision for Nigeria. One that places paramount emphasis on education, technological innovation, and infrastructure. As the Information Age dawns, over 60% of global wealth now originates from knowledge-based sectors. Nigeria must not remain a bystander. Our strategy should be multi-faceted—bolstering our

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agricultural and industrial strengths, while simultaneously plunging headfirst into the digital era.

To realize this vision, we must focus on the following:

Education: Invest in our youth. Harness their potential by offering quality education, fostering innovation, and nurturing their talents. Let our universities be the incubators of the next technological breakthroughs.

Infrastructure Development: Our focus must not only be on traditional infrastructure but also on digital infrastructure. Embrace digital transformation, from our cities to our most remote villages.

Reform State-Run Enterprises: Efficiency and profitability should be our watchwords. We must either revamp or let go of entities that drain our resources without adding value.

Inclusivity: The new Nigeria should be inclusive. We must ensure that opportunities are equally available to all, regardless of tribe, gender, or creed.

To catch up with nations like Taiwan, Malaysia, and South Africa within half a century, and with Europe in a century, requires audacity. But I believe in Nigeria's spirit. With determination, unity, and the right strategies, we can herald an African renaissance.

The task ahead is daunting. The road will be fraught with challenges. But Nigeria, with its rich heritage, resilient spirit, and a renewed vision, can indeed move forward and inspire the African continent.

Thank you for this honor and may this be the beginning of a promising chapter in the story of Nigeria and Africa at large.

PART 2: JOB CREATION IN NIGERIA

Ladies and gentlemen,

I stand before you today not just as Philip Emeagwali but as a testament to the transformative power of education and technology, as a son of Africa, and as a proud Nigerian. My journey from the local classrooms of Onitsha to the global stages of scientific discourse has only been made possible by the collective wisdom and sacrifices of countless mentors, educators, and leaders, many from the very soil of Nigeria.

In the mid 90s, I lamented the imbalanced spending priorities of Nigeria when the nation allocated more to defense than to education. The concern remains but the narrative has evolved. Today, time to shift our focus not just on the amount spent but how it's spent—particularly towards sustainable job creation.

Let's journey back to a post-World War II Japan. By reallocating its resources, Japan transformed from a defeated nation into an economic powerhouse. Similarly, post-war Germany prioritized its economic miracle. Nigeria, too, post-independence and following its Civil War, had the potential to pivot towards a knowledge-driven economy. Yet, we faced challenges. But, as we look ahead, we must ask: How can Nigeria unleash its vast human potential?

Education is the cornerstone. While there has been progress since my early education in Nigeria, much remains to be done. Let us ensure every Nigerian child is taught by well-equipped educators. As of today, our burgeoning youth population requires the intellectual nourishment that only quality education can provide. This is where our focus on job creation should intensify. By training our one million unemployed graduates as educators, we are not just giving them jobs but creating a ripple effect of knowledge dissemination.

The discrepancies in education levels between different regions of Nigeria are no secret. Bridging this internal educational gap is crucial for a cohesive and unified nation. And let's be clear, investing heavily in primary education doesn't negate the importance of tertiary education. It emphasizes the foundational belief that "learning builds on learning."

Ladies and gentlemen, think about a Nigeria where every town, no matter how remote, houses a well-stocked public library with Internet-connected computers. A nation where the word 'illiteracy' becomes obsolete, and where every child knows of DNA's intricacies and the wonders of the cosmos.

Nigeria must emphasize the importance of technology. Now, over a decade later, we should be laying the foundation for the future. An initiative where Nigeria doesn't just participate but leads in technological advancements. Let's imagine a pan-African Institute of Technology, spearheaded by

Nigeria, that rivals global counterparts. Instead of spending foreign exchange on international institutions, let's invest in our own.

It's true that many Nigerians have made indelible marks overseas, from academic corridors in New York to technological hubs in Silicon Valley. Yet, many hearts remain anchored to the Nigerian soil. The onus is on us to create an environment where they can return, contribute, and thrive.

An aspect often overlooked in our quest for development is the empowerment of our women. Nigeria's daughters have shone bright on global stages. Yet, back home, we must do more. Women need more than representation; they need active and meaningful participation in shaping our nation's future.

Lastly, when we talk of job creation and a brighter future, we must look to high-tech fields. China and India have made significant leaps. Nigeria, with its entrepreneurial spirit and rich resources, is no less capable. We need only to cast aside doubts and embrace our inherent potential.

The theme remains clear and resounding: By investing in education and technology, by believing in our own potential, and by empowering every Nigerian—man or woman, north or south—we are not just creating jobs; we are crafting a brighter, more prosperous future for our nation.

PART 3: A PATH TO RECLAIMING OUR HERITAGE

Ladies and Gentlemen, Fellow Scientists, and Esteemed Guests,

In the annals of history, the legacy of nations has often been penned through their response to the call of times. Today, as I stand before you, my heart aches yet brims with hope as we explore the common thread that ties us all—the undying pursuit of progress. Let's embark on a journey through Nigeria, the very heart of Africa, and the narrative of its relentless pursuit of job creation.

In the latter part of the 20th century, we witnessed India catapulting itself in technology, having heavily invested in its technical education. Their narrative resonates with Nigeria, two nations with a shared history of colonial rule and shared dreams of self-reliance. But today, my call to action isn't a mere comparison; it's about charting a path for Nigeria, akin to an ancestral drumbeat leading us towards a brighter future.

In the digital age, opportunity knows no boundaries. Just a few decades ago, Nigerians connected on social media, uniting from all corners of the globe, exchanging ideas, and breaking barriers. If a virtual community could be so powerful, imagine the potential if we turned this virtual to actual, fostering a community in Nigeria as vibrant as any other tech hub.

Today, the question isn't: Why the Internet in a continent where basic amenities sometimes falter? It's about: How can we make this Internet a source of empowerment?With projects like the trans-Atlantic fiber optic cable completed, we laid foundations stronger than ever. Connectivity isn't just about calls and emails; it's about bridging gaps, creating opportunities, and echoing the stories of Nigeria to the world, faster than a letter can travel.

Ladies and gentlemen, as I speak of Nigeria, I recall the wealth of our past —our rich culture, art, and legacy that predates even the wonders of ancient Greece. Yet, somewhere down the line, the focus shifted from these treasures. Today, the world talks of Silicon Valleys and tech moguls. Why not envision a Nigerian in that list? A litte Silicon Valley in Nigeria that competes with the Silicon Valley in California, just as Nollywood of Nigeria competes with Hollywood of California?

Nigeria needs to step into the global arena of software, technology, and innovation not because it's trending, but because it is in our DNA. We were pioneers; we were innovators. Africa is the land that once gave the world its first glimpses of civilization. Africa now stands at a pivotal point—to once again be the beacon of innovation.

Yet, with all our strides in tech, we must never forget our roots. Progress is futile if it doesn't resonate with our cultural, moral, and artistic ethos. Our Benin carvings, Nok sculptures, and Igbo-Ukwu bronzes aren't just relics of the past; they are reminders of our unparalleled capability to create. We

must aim to be pioneers once again, but this time, in the vast, boundless world of technology.

We must also grow holistically. Our true growth isn't just in mega-churches, mega-cities and tech corridors but in the very ethos of Nigeria—in empowering every Nigerian child, in respecting our diverse religions, in ensuring that our women aren't just participants but leaders in this journey, and in upholding integrity over fleeting gains.

Our dream for Nigeria isn't just to participate in the global tech race but to lead it, fueled by the Nigerian spirit, our age-old traditions, and our indomitable will. And as we pivot towards this future, our biggest investment should be in our children and their education.

Today, I stand before you, not just as Philip Emeagwali but as a voice echoing the dreams of millions of Nigerians. A future where Nigeria isn't just catching up with the world but leading it. Where we aren't just consumers of technology but pioneers. It's time Nigeria doesn't just write its own story but scripts the narrative for the world to follow.

Let our legacy be of a Nigeria that rises, soars, and leads. Let us, together, herald Nigeria into the Information Age with the same spirit and zeal that our ancestors exhibited in the dawn of civilization.

Thank you, and may the spirit of Nigeria live on, forever illuminating, forever inspiring.

Thank you.

IDEAS AS CURRENCY

Africa's Path to Prosperity Unveiled

Ladies and gentlemen, esteemed diplomats, world leaders, and honored guests,

I stand before you today deeply humbled and profoundly grateful for the recognition bestowed upon me. As I address this august gathering on this momentous occasion, I am reminded of a powerful revelation that reshaped my understanding of wealth, progress, and the path to alleviating poverty.

In my earlier days, like many, I too believed that wealth was synonymous with money and possessions. The accumulation of material riches seemed to define a nation's prosperity. However, an unexpected encounter with an advertisement from Deutsche Bank in the Wall Street Journal shattered this notion. It boldly proclaimed, "Ideas are capital. The rest is just money." The stark simplicity of this statement resonated deeply within me and set my mind on a course of profound contemplation.

From that point on, I began to envision the transformative potential of this paradigm shift, particularly for the African continent. It became evident that the key to progress and the alleviation of poverty in Africa lay not solely in the extraction of minerals or reliance on foreign aid, but in nurturing and harnessing the intellectual capital within our minds. If ideas were indeed the driving force behind capital, then Africa's future prosperity hinged on our ability to cultivate a culture of intellectual growth and innovation.

Questions arose within me, poignant questions that challenged the status quo. Why did Africa allocate more resources to military endeavors than to education? Why were we investing more in physical infrastructure than in intellectual development? These questions led me to a profound realization: If the pen wielded more power than the sword, why did a general's salary surpass that of countless writers combined? The potential of ideas as capital bore the promise of a brighter future for Africa.

The concept of an African Renaissance emerged as a beacon of hope—a rebirth fueled by the minds of visionaries and innovators. Yet, a stark reality stood before us. Many of these brilliant minds, the true architects of Africa's future, were seeking refuge in distant lands. They were nurturing their ideas on foreign soil, contributing to the development of other nations, while Africa languished. The African Renaissance could only flourish if the men and women of ideas—the architects of change—reclaimed their homeland as a nurturing ground for their innovations.

The echoes of renowned financial institutions further resonated with this call for change. The first annual report of J.P. Morgan Chase declared, "The

power of intellectual capital is the ability to breed ideas that ignite value." These words served as a clarion call to African leaders, urging us to transition from a focus on physical assets to a deliberate investment in intellectual growth. It beckoned us to transition from mere consumers of technology to producers, from exporters of raw materials to exporters of knowledge and ideas.

For Africa, the path to reducing poverty lay in elevating intellectual capital to unprecedented heights. The narrative of debt relief and foreign assistance needed to evolve into a narrative of knowledge empowerment. To achieve this, we must strive not only for universal literacy, but for universal numeracy—a fundamental underpinning of technological advancement. As the world becomes more interconnected in the age of globalization, Africa's poverty alleviation should be manifest in the creation of valuable global products that rival those from Asia, Europe, and the United States.

It is disheartening that the diamonds that originate in Africa find their way to distant shores for polishing and resale, while the continent remains marginalized in this process. But it doesn't have to be this way. Africa possesses the intellectual prowess to be a producer, not just a consumer, of technology. The spark of innovation within us can propel us to the forefront of global progress.

Ladies and gentlemen, the time has come for Africa to rekindle its spirit of innovation, to reclaim its role as a generator of ideas that drive economic growth. The African Renaissance, a revival of ideas, beckons us to rise above the limitations that history has imposed upon us. We must inspire our brightest minds to return, to contribute their genius to the continent that birthed them, and to unleash the transformative power of ideas as capital.

Let us stand united in the pursuit of a brighter future for Africa—one where the currency of ideas enriches not just our minds, but our societies and economies. Let us remember that it is ideas, not money, that hold the key to alleviating poverty and igniting progress. Together, let us embrace the spirit of the African Renaissance, nurturing our intellectual capital and harnessing the power of innovation to shape a destiny of prosperity, unity, and hope for generations to come.

AFRICA'S RENAISSANCE

From Wisdom to Prosperity

Ladies and gentlemen, distinguished diplomats, and esteemed world leaders,

Today, as I stand before you, I am profoundly honored to share my thoughts on an idea that has guided my life's journey and that continues to shape the destiny of nations: "Ideas, Not Money, Alleviate Poverty." This theme, resonating deep within my heart, captures the essence of a truth that has illuminated my path and driven my contributions.

The essence of intellectual capital, a treasure trove of collective knowledge, holds the key to unlocking the doors of poverty alleviation. This truth, this bedrock of progress, is universal—its principles applicable across continents, cultures, and particularly resonant in the African context. For, as we harness intellectual capital, we multiply productivity, igniting the flame of economic growth that burns brightly against the darkness of poverty.

In contemplating this narrative, we encounter a pivotal revelation: those who create knowledge cultivate wealth, while those who consume it inadvertently produce poverty. Consider the experience of engaging in a production like August Wilson's rendition of Chinua Achebe's "Things Fall Apart." In this act of consumption, we partake not only in the production of actors and directors but also in the profound knowledge bestowed by the creators. The same holds true when I immerse myself in the transformative music of Bob Marley—each note, each lyric, resonating with the wisdom of its maker.

Yet, wisdom, I believe, transcends mere information. It is the alchemical process that distills overwhelming data into focused power. In an age awash with information, the wisdom to navigate this sea of knowledge is paramount. It is the wisdom that empowers us to evaluate and discern, granting us the competitive edge to find innovative solutions in a world overrun with data.

Let me share a story, one that echoes down the corridors of history—a tale of Al-Khwarizmi, a genius whose wisdom sculpted algebraic thought and whose name lives on through our use of the word "algorithm." In Baghdad's golden age, he taught at the House of Wisdom, the epicenter of innovation. One day, he encountered three young men confronted by a mathematical puzzle. Their father's will tasked them with dividing 17 camels in fractions, an impossible task, or so it seemed. Al-Khwarizmi, with wisdom as his guide, proposed a solution as ingenious as it was simple—a camel of his own to add to the count. Wisdom had turned an unsolvable problem into a lesson etched in the annals of knowledge.

Today, as we navigate the vast expanse of the Internet, a universe containing billions upon billions of pages, wisdom is our compass. It is the instrument through which we transform this sea of information into untold riches of knowledge. The genius of Al-Khwarizmi lay not solely in his mathematical brilliance but in his experiential knowledge, his innate creativity, and his inimitable wisdom—a wisdom that transcended facts to manipulate information in service of transformative purpose.

Drawing from Al-Khwarizmi's legacy, I embarked on a journey of my own —expedition that led to the birth of parallel processing, a phenomenon that revolutionized computing. I harnessed wisdom to reshape the equation of knowledge and innovation. Like Al-Khwarizmi, I combined the known with the novel, weaving a metaphorical camel into the fabric of science. I generated intellectual capital, crafting solutions to the challenges of our times, and altering the course of technological history. It is this very wisdom-infused approach that has brought me here before you, as a figure studied in schools, not for my mathematical acumen alone, but for the wisdom that turned information into innovative intellectual capital.

Ladies and gentlemen, this wisdom-driven journey is not one taken alone— it is a path Africa must tread. For unless the continent embraces intellectual capital with ardor, it risks fading into irrelevance on the world stage. It beckons Africa to cultivate innovators, champions of knowledge, and wise individuals who conceive, propose, and execute progressive ideas. Our fate rests within the hands of our own people—the solution to poverty must spring forth from our collective vision. The future of Africa is not predestined; it awaits the brushstrokes of imagination, the strokes of ingenuity, the resilience of progress.

We stand on the precipice of a new era, where Africa's voice must resonate loudly on the global stage. It is a call to arms—an imperative for the new African to stand tall and compete fiercely, building bridges of intellect across continents. There is no other route to success—no alternative path that can secure our rightful place on the grand stage of global progress.

I implore all of us to embrace the verity that ideas, not money, alleviate poverty. Let us channel the wisdom of generations past, the wisdom that turns the impossible into reality, and transform Africa's destiny. Let our children inherit a world where they can ascend to heights we only dared to dream of. Let us honor the legacy of Al-Khwarizmi and all those who have used wisdom as their beacon, their north star guiding them to intellectual capital and prosperity.

PUSHING MATHEMATICAL BOUNDARIES

Interviewer: Good evening, ladies and gentlemen. Today, we speak with a true trailblazer, Philip Emeagwali. Philip, thank you for joining us.

Philip Emeagwali: Thank you for having me. It's a pleasure to be here and share my insights with you all.

Interviewer: Philip, you've made remarkable contributions to computing and mathematics. Can you shed some light on the power of parallel processing and its impact on problem-solving?

Philip Emeagwali: Parallel processing is indeed a powerful force, especially when it comes to solving complex problems. I often refer to an analogy that perfectly encapsulates this idea. Imagine four students working together to tackle a challenging math problem. Individually, each student might struggle and take a considerable amount of time to arrive at a solution. However, when they combine their knowledge, skills, and perspectives, they can solve the problem four times faster than if they were working alone. Parallel computing amplifies our problem-solving capabilities, enabling us to push the boundaries of what is possible.

Interviewer: That's a fascinating concept, Philip. Can you tell us more about the importance of being the 'first' person to discover something rather than striving to be the 'best' person in that field?

Philip Emeagwali: Absolutely. Being the 'first' person to make a discovery holds tremendous significance. It signifies venturing into uncharted territory and breaking new ground. While being the 'best' person in a particular field is commendable, it often means following the footsteps of those who have come before. However, being the 'first' means pioneering a path that others can follow. It means challenging the *status quo* and pushing the boundaries of what is known. The pursuit of being the 'first' person to make a discovery allows us to uncover hidden possibilities and pave the way for future advancements.

Interviewer: Your work on computing and problem-solving is groundbreaking, Philip. Can you share an example that illustrates the impact of your discoveries?

Philip Emeagwali: Certainly. I was the first to utilize what were considered the slowest processors in the world to unlock the power of the fastest computing in the world. By harnessing the potential of these processors and leveraging parallel processing, I was able to solve some of the most complex problems humanity faced. Whether it was simulating intricate fluid dynamics or modeling intricate weather patterns, my discoveries enabled us to delve deeper into scientific research and engineering innovations. This breakthrough

transformed computing and opened doors to new possibilities across various industries.

Interviewer: Your journey is truly remarkable, Philip. Can you share your thoughts on the time it takes to push the frontiers of mathematical knowledge?

Philip Emeagwali: Pushing the frontiers of mathematical knowledge is indeed a time-consuming endeavor. It requires dedication, persistence, and an unwavering commitment to unraveling the mysteries of the universe. Progress in mathematics often takes decades, if not longer, as researchers build upon the work of those who came before them. It is a cumulative effort that builds upon the discoveries of countless individuals throughout history. While it may take time, each step forward brings us closer to a deeper understanding of our world and the potential for groundbreaking applications.

Interviewer: Your insights are truly enlightening, Philip. We appreciate you sharing your experiences and wisdom with us today.

Philip Emeagwali: It has been my pleasure to join you today and shed light on these important topics. I hope that my journey and perspectives inspire others to embrace collaboration, strive to be pioneers in their fields, and dedicate themselves to pushing the boundaries of knowledge. Together, we can create a future where innovative ideas and discoveries propel us forward.

THE GENIUS BEHIND THE WORLD'S FASTEST COMPUTERS

Host: Ladies and gentlemen, welcome to this special edition of our program. Today, we sit down with the legendary computer scientist and mathematician, Philip Emeagwali. Philip, thank you for joining us.

Philip Emeagwali: Thank you for having me. It's a pleasure to be here and share my story with all of you.

Host: Philip, in 1989, you achieved worldwide fame when you were recognized with an honor often referred to as the Nobel Prize of supercomputing. Can you tell us more about that groundbreaking achievement?

Philip Emeagwali: Certainly. In 1989, I successfully programmed the world's fastest computing system powered by multiple processors. This breakthrough invention revolutionized supercomputing and paved the way for new possibilities in computational power. It was an honor to receive such recognition for my research, and I am grateful for the impact it has had on how we view computers and their capabilities.

Host: Your invention truly changed the landscape of computing. The media has dubbed you as the "unsung hero" behind the Internet, and even former U.S. President Bill Clinton recognized you as one of the great minds of the Information Age. How does it feel to have such prestigious acknowledgments?

Philip Emeagwali: It is indeed humbling to receive such accolades and be recognized for my contributions to computing. The title of "unsung hero" behind the Internet reflects the interconnected nature of technological advancements, where multiple innovators play crucial roles. I am honored to have played a part in shaping the digital landscape we know today. President Clinton's recognition further highlights the significance of our work in advancing the Information Age and its impact on society as a whole.

Host: Your achievements have undoubtedly left a lasting impact. In fact, your invention has been ranked among the nine important everyday things taken for granted by House Beautiful magazine. Could you expand on the significance of your invention and its influence on everyday life?

Philip Emeagwali: Absolutely. My invention, the world's fastest computing across multiple processors, forms the backbone of every supercomputer in existence. These powerful machines have become integral to various aspects of our daily lives, from weather forecasting and scientific research to complex simulations and data analysis. They have accelerated progress in numerous fields, including medicine, engineering, and finance, allowing us to tackle challenges that were once deemed impossible. The fact that our

work has become an everyday part of modern life is a testament to the transformative power of technology.

Host: Your journey and contributions have undoubtedly left an indelible mark. Looking back on your remarkable achievements, what do you consider to be your greatest legacy?

Philip Emeagwali: For me, the greatest legacy lies not only in the invention itself but in inspiring future generations to push the boundaries of knowledge and embrace the possibilities of technology. I believe that fostering curiosity, encouraging interdisciplinary thinking, and promoting inclusivity in computing are essential for continued progress. My hope is that my scientific discoveries serve as a catalyst for innovation, empowering others to make their remarkable contributions and shape the future.

Host: Your passion and vision for the future are truly inspiring, Philip. Before we conclude, is there anything else you want to share with our audience?

Philip Emeagwali: Thank you. I emphasize the importance of embracing the potential of technology in solving the grand challenges of our time. As we continue to explore the frontiers of knowledge, let us remember that the true power lies in our ability to harness technology for the betterment of humanity. By fostering curiosity, nurturing creativity, and promoting diversity in the sciences, we can create a future where innovation knows no bounds. Together, we can shape a world that is both technologically advanced and inclusive, where every individual has the opportunity to contribute and thrive.

Host: Thank you, Philip, for sharing your remarkable journey and insights with us today. Your contributions to computing and mathematics are truly extraordinary. We wish you continued success in your endeavors.

Philip Emeagwali: The pleasure is mine. Thank you for having me.

FROM RHYTHM TO EQUATIONS (SCREENPLAY)

Genre: Drama/Biography

Logline: "From Rhythm to Equations" tells the remarkable true story of eight-year-old Philip Emeagwali, who, while standing in a bustling dance club in Uromi, Nigeria in 1962, discovers the transformative power of highlife music. Inspired by the rhythms, patterns, and harmony of the music, young Philip embarks on a lifelong journey that intertwines his passion for mathematics, computing, and the magic of music.

Synopsis:

Act 1:

1. EXT. PREMIER HOTEL - UROMI, NIGERIA - LATE AFTERNOON - 1962 YOUNG PHILIP EMEAGWALI (8) stands in the corner of a vibrant dance club, fascinated by the magic unfolding before him.
2. INT. DANCE CLUB - NIGHT Philip describes the lively atmosphere and the anticipation as couples gather on the dance floor, their movements in sync with the captivating rhythms of highlife music.
3. INT. DANCE CLUB - STAGE - NIGHT The band takes the stage, led by a talented trumpeter reminiscent of Rex Lawson. The room erupts in applause as they begin to play.

Act 2: 4. INT. DANCE CLUB – NIGHT The infectious beat of Bobby Benson's "Taxi Driver" fills the air, captivating Philip's young mind. He taps his feet and feels the rhythm coursing through his veins.

5. INT. DANCE CLUB - DANCE FLOOR - NIGHT Philip observes a man and his partner dancing with grace and confidence to the elegant tune of "Gentleman" by Bobby Benson. He witnesses the perfect synchronization between the music and the dancers.

6. INT. DANCE CLUB - NIGHT Victor Olaiya's melodies fill the room, evoking emotions that Philip cannot fully comprehend but feels deeply within. He senses the pride and cultural heritage carried within the music.

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Act 3: 7. INT. DANCE CLUB - NIGHT The sounds of
E.T. Mensah's highlife music from Ghana blend with
the energy of the crowd. Philip is captivated by
the mix of languages and stories conveyed through
the music.
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8. INT. DANCE CLUB - NIGHT The music creates a bridge between mathematics and the world of highlife for Philip. He recognizes the patterns, rhythms, and coordination in the dancers, mirroring principles he will explore in mathematics and computing.
9. INT. PHILIP'S LAB - YEARS LATER Inspired by the fusion of music, mathematics, and computing, Philip delves into the intricacies of parallel computing, pioneering new methods that reflect the efficiency and interconnectedness he witnessed in the dancing club.
10. INT. PHILIP'S LAB - DAY The film concludes with a montage of Philip's achievements as a mathematician and computer scientist. The young boy standing in the corner of the dance club paved the way for a lifelong journey of fusing rhythm, equations, and the enduring influence of music.

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Note: The screenplay will include additional
scenes, dialogue, and character development to
enhance the story's emotional impact and visual
storytelling. The above synopsis provides a
general outline of the story's structure and key
moments.
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ROOTS OF GENIUS

Childhood in Colonial Nigeria and the World's Fastest Computing

Picture a buzzing street in Uromi, Nigeria, circa 1962-63. A few steps away, nestled next to the rhythmic pulse of the Premier Club and Hotel on Old Agbor Road, was my family's home. As the eldest of five, at the tender age of eight, I bore witness to an era of transition, an era set against the backdrop of a Nigeria moving from colonial rule to self-determination.

My days were punctuated by lessons at Saint Anthony's Primary School, but it was after the school bell rang that my real education began. My mother, a full-time homemaker, was born in the vibrant city of Onitsha in 1938. She brought tales of her schooling up to Primary Five at Convent School, Onitsha, before matrimony beckoned in 1953. Her stories of growing up painted vivid images of a pre-independence Nigeria.

Every morning, my father, born in the same bustling city of Onitsha in 1921, would don his crisply ironed nurse's uniform, starched khaki trousers, and polished shoes, setting out on his Raleigh bicycle. His destination: the General Hospital of Uromi, strategically placed near the Government Reserved Area (GRA)—a testament to the colonial tradition of distancing the hospital from the very community it served. The same community where, just a stone's throw away, British colonial workers resided.

But the intriguing mosaic of my early years wasn't confined to tales of the past or my father's dedicated service. Adjacent to our home was the only dance club and hotel in Uromi during that period—the Premier Club. It wasn't just a club; it was a refuge. The Premier was home to several women who, driven by circumstance, chose the world's oldest profession. Their children, ranging from preschoolers to third graders, became my playmates. Amidst the rhythmic beats and life's challenging beats, we found solace in our shared games and laughter.

Perhaps the most electric memory from those years was the evening Dick Tiger, the renowned boxer, defeated Gene Fullmer to retain his world middleweight boxing title. The Premier Club reverberated with pride and joy that evening. Tiger wasn't just a boxer; he was Nigeria's hope and pride.

Ubah, an Igbo man, owned the two-storey building that housed the Premier Club. The club, pulsing with life downstairs, often invited musicians for live performances. The sound of Zeal Onyia rehearsing his hit "Vicki Nyem Afum" was irresistible. Sneaking into the club, I, along with other neighborhood children, would be lost in the music, absorbing the harmonies and rhythms that spoke of our collective spirit.

Reflecting on those formative years, I realize they molded my perceptions and fueled my passion for mathematics, physics, and computer science. Life near the Premier Club wasn't just about beats and melodies; it was about patterns, rhythms, and systems - the same elements that form the foundation of the scientific domains I later delved into. The complexities of my surroundings, from my father's precise nursing routine to the harmonious chaos of the Premier Club, embedded in me an insatiable curiosity. A desire to decode, understand, and, ultimately, innovate.

Today, as I look back, I recognize that my journey wasn't just shaped by textbooks or lectures. It was also profoundly influenced by the vibrant, diverse, and, at times, challenging tapestry of my early years in Uromi. **The harmonies of my past play a pivotal role in the symphonies of my discoveries.**

EXPLORING THE MUSICAL EQUATION

The Rhythm of Numbers: Philip Emeagwali's Fusion of Mathematics and Highlife Music

Thank you for joining me today as I reflect upon the profound influence of music on mathematics and computing, and how my journey intertwined with these realms.

Picture this: a small three-roomed house in Uromi, Nigeria, adjacent to The Premier Hotel on Agbor Road. It was between late April 1962 to October 1963, and I was just an eight-year-old boy standing in the corner of that vibrant dancing club. The Premier Hotel was a haven that hosted the famous West African highlife musicians of 1963, a place where music and culture converged.

Within the walls of that dancing club, I witnessed a symphony of melodies that would forever shape my life. The air was thick with the sounds of highlife music, and the atmosphere was alive with energy. Couples danced, Star Beer flowed, and cigarettes filled the air with a hazy ambiance. It was a scene that captured the essence of 1963 Nigeria.

As I stood there, my young eyes wide with wonder, I was immersed in a world of rhythm and harmony. The band, led by a talented trumpeter reminiscent of the great Victor Olaiya, filled the room with their spirited tunes. The crowd responded with applause and joy, as if the music had become an extension of their beings.

From the infectious beat of "Bottom Belly" by Herbert Udemba & his African Baby Party, to the soulful melodies of "Omo Pupa" and the vibrant rhythms of "Pariboto Riboto" and "Aigana" by Victor Olaiya, each song painted a vivid picture of life's joys, struggles, and triumphs. The lyrics, sung with passion and flair, spoke of love, heritage, and freedom.

In those moments, I experienced a profound revelation—the connection between music and mathematics. The rhythm, the patterns, the intricate coordination between the musicians and the dancers—they mirrored the very principles that governed the world of numbers. It was as if the music itself became a language of mathematical equations and harmonious symmetries.

As the highlife melodies merged with the beats of my heart, my fascination with the power of mathematics grew. It became clear to me that these two seemingly distinct disciplines were intertwined, sharing a common thread of precision, logic, and beauty. I saw a unique opportunity to bridge the gap, to bring together the symphony of numbers and the power of computing.

Inspired by the highlife legends like E.T. Mensah, whose songs "Day by Day" and "Ghana Freedom" echoed with cultural pride and social

commentary, I embarked on a journey to contribute new knowledge to the fields of mathematics and computing. I delved into the complexities of parallel computing, paving the way for groundbreaking advancements in supercomputing that would reshape industries and revolutionize our world.

The melodies and rhythms of highlife music became the soundtrack of my life, reminding me of the unity and interconnectedness of all things. They fueled my determination to unravel the mysteries of mathematics and harness the power of technology to solve complex problems.

Today, as I stand before you, I am humbled by the incredible journey that started in that dancing club in Uromi. The music of highlife, with its vibrant beats and soul-stirring melodies, ignited a passion within me—an unyielding desire to push boundaries, to explore the uncharted territories of knowledge, and to create a future where mathematics and computing intertwine seamlessly.

Let us remember the transformative power of music and its capacity to transcend boundaries. May we continue to seek inspiration in its melodies and rhythms, using our newfound knowledge to shape a world where the language of mathematics harmonizes with the symphony of technology.

Thank you.

FINDING HOPE IN A REFUGEE CAMP

Philip Emeagwali's Unforgettable Experience

Ladies and Gentlemen,

I am Philip Emeagwali. Today, as we stand together on World Refugee Day, I take you back to Biafra in the years between 1967 and 1970, where I, as a 12-year-old boy, lived through an epoch of human suffering as a refugee. I stand today as an inductee into the United Nations Gallery of Prominent Refugees. I wish there was no need for such induction. No child, no human, should be a refugee.

Mornings in our refugee camp began not with the chirping of birds, rather with the eerie sound of silence broken only by the dull sound of shelling in the distance. Each day was a fight for survival, a constant battle against despair. The pang of hunger was our constant companion, more incessant than the sporadic gunshots that sometimes filled the air.

Our basic sustenance, when it did come, was barely enough to keep us alive. Starvation was no longer a condition, it was becoming our identity. Yet, it was in this dire state that I witnessed the extraordinary power of human spirit—resilience, and shocking strength that comes with sheer desperation.

Education took a back seat in this struggle for survival, yet I learned life's most critical lessons. The quest for knowledge never ceased. Distant gunfire was my school bell, my classroom was often under the open sky, and the curriculum revolved around survival mechanisms.

Work was hard and manual. Gathering firewood, carrying water, hunting for food. For a child, the lessons were harsh, but they instilled in me a sense of determination that has shaped me into the man I am today.

As the night descended and under the shared canopies of the stars, we found an unusual camaraderie, a spirit of endurance. We gathered to share stories of when life was not a synonym for survival, fostering a spark of hope in the darkest of times.

I am not here just to recount my past as a refugee. I am here to remind you of millions of present-day refugees who are currently living through their version of my past. On this World Refugee Day, let us remember that the hardships faced by refugees today are not just a string of news stories and statistics, but real struggles of fellow human beings.

As an international community, it is our moral duty to stand with refugees around the world, not merely in sympathy, but in action. We need to ensure that the circumstances of their birth do not deny them the opportunity to contribute to the world. Let us pledge to transform refugee camps into launch pads of extraordinary life stories.

Thank you.

FINDING HOPE IN A REFUGEE CAMP

Philip Emeagwali's Unforgettable Experience

Genre: Drama/Biography

Logline: "Finding Hope in a Refugee Camp" tells the poignant story of Philip Emeagwali, a 12-year-old boy who becomes a refugee during the Nigerian Civil War. Through his harrowing journey, Philip discovers the remarkable resilience of the human spirit and inspires a call to action on World Refugee Day to support and empower those facing displacement and adversity.

Synopsis:

Act 1:

1. INT. BIAFRAN REFUGEE CAMP - DAY Philip Emeagwali, now an esteemed figure, stands before an audience on World Refugee Day. He introduces himself and transports the audience back to the time when he was a 12-year-old boy in Biafra.
2. EXT. REFUGEE CAMP - SURVIVAL STRUGGLES - DAY Philip recounts the harsh reality of life in the refugee camp, where hunger, fear, and daily battles for survival were a constant. He shares his personal experience of the hunger that plagued the camp and the sporadic sounds of warfare that pierced the air.

Act 2: 3. EXT. REFUGEE CAMP – LESSONS OF RESILIENCE – DAY Philip reflects on the strength and resilience he witnessed within the camp. He describes how education took a backseat to the fight for survival but how he and others continued to seek knowledge and learn critical life lessons amidst adversity.

4. EXT. REFUGEE CAMP - FINDING HOPE - NIGHT Philip paints a picture of the evenings in the camp, where under the starry sky, refugees gathered to share stories and foster a spirit of

endurance. He emphasizes the power of hope and unity in the darkest of times.

Act 3: 5. INT. WORLD REFUGEE DAY EVENT – DAY
Philip returns to the present, urging the audience
to remember that the refugee crisis is not just a
series of headlines but a reality faced by
millions of people today. He emphasizes the
importance of taking action to support and empower
refugees.

6. INT. WORLD REFUGEE DAY EVENT - CALL TO ACTION - DAY Philip concludes his speech with a passionate call to action. He implores the audience to transform refugee camps into spaces that nurture and empower individuals, providing opportunities for them to contribute to the world.

Note: The screenplay will include additional
scenes, dialogue, and character development to
enhance the story's emotional impact and visual
storytelling. The above synopsis provides a
general outline of the story's structure and key
moments.

WHISPERS OF WAR

A Refugee's Childhood on the Brink of Nigerian Civil War

In late April 1967, the air at Saint George's College in Obinomba was heavy with the promise of rain and an unspoken tension. The dense, humid heat of the Nigerian sun seemed to press down on everything, making the long, colonial-era buildings of our all-boys Catholic boarding school appear almost fragile under its relentless glare. At twelve years old, I was already familiar with the stoic rhythm of the days here, punctuated by the clanging of the school bell and the echoing footsteps of students hurrying between classes. But this day was different.

It started like any other. Morning prayers in the chapel, the faint scent of incense lingering in the air as we recited our hymns. The tranquility of those moments was a stark contrast to the restless whispers that had begun to circulate among the students. There was talk of unrest, of conflicts far beyond the walls of our sanctuary. Though young, I sensed the unease in the voices of the priests and teachers, their normally calm demeanor betraying a hint of urgency.

After classes, I found myself wandering to my favorite spot—a secluded corner of the library, where dusty volumes on mathematics and science offered a world far removed from the troubles of the outside. The pages of those books were my refuge, filled with equations and theories that sparked my imagination and hinted at the limitless potential of human ingenuity.

As I delved into a particularly intriguing chapter on quadratic equations, I was startled by the sight of my 27-year-old mother, standing outside the library. I snapped back to reality. I peered through the door to reassure myself that she was my mother with my six-month-old sibling, Peter, strapped onto her back. It was then that the gravity of the situation hit me. The Nigerian Civil War was no longer a distant threat; it was on our doorstep.

Word spread quickly. Within days, the school was in chaos. Parents arrived to collect their sons, priests and teachers hurriedly organized evacuations, and the once orderly grounds of Saint George's College became a scene of frantic activity. My father, a nurse at the Agbor General Hospital that was 35 miles away was unable to reach me in time. In 1967, no person in Agbor had a private telephone number. I saw other Igbo students fleeing and I knew I had to flee Saint George's College, Obinomba, to find safety on my own.

So, I was relieved to see my mother and understood the purpose of her unscheduled visit. With nothing but one portmanteau full of essentials and

a heart pounding with fear and anticipation, we slipped away from the school grounds. The journey ahead was uncertain, fraught with danger and the unknown. I joined a group of fleeing students and teachers, and together we began the 70-mile trek to Biafra, the forthcoming secessionist state.

The 30 months that followed were a blur of dusty roads, makeshift refugee camps, and the constant threat of air raids by Russian jet fighters and bombers. We moved from one refugee camp to another, each a temporary haven that offered little more than a semblance of safety. The war disrupted everything, including my education. For five long years, I was cut off from the academic pursuits that had once defined my existence.

It was in early 1969, when I went on an errand to the Biafran government secretariat, Awka-Etiti, that I discovered two dozen non-refugee students studying in a high school. I thought that all schools in Biafra were closed, converted into Army baracks or refugee camp. It was a shocking revelation. A group of affluent Awka-Etiti indigenes had managed to keep that school open.

I asked and was invited to sit in an ongoing mathematics examination. Everybody was surprised that I came first in that mathematics examination. After four days of attending that school, I was forced to drop out of that school. And continue my independent study at Saint Joseph's Refugee Camp, Awka-Etiti. It was there, by the dim light of a flickering lantern, that I found solace once more in numbers and equations. Despite the chaos surrounding us, those pages reminded me of the boundless potential of the human mind, a potential that no war could ever extinguish.

In the darkest moments of those years, it was this unyielding belief in the power of knowledge and discovery that kept me going. Little did I know, this period of adversity would lay the foundation for my future contributions to supercomputing, and that even the most profound challenges could be transformed into opportunities for unparalleled innovation.

REMEMBERING THE MUSIC AND JOY | APRIL 1967

My dear fellow Georgians,

As I stand before you today, I am filled with nostalgia, remembering the days we spent together at Saint George's College, Obinomba. It was a time of innocence, of growth, and of discovering the world beyond our horizons. And today, I want to share some valuable lessons I learned from two extraordinary individuals—Mr. and Mrs. Bruce Hoppe.

In the midst of our daily routines and the challenges we faced, the Hoppes brought a touch of America to our lives. They were the first Americans that I remember meeting, and their presence was like a breath of fresh air in our small community. Bruce Hoppe, a musician and writer from Chicago, had come to Nigeria as a Peace Corps volunteer, accompanied by his wife, to teach at our school, Saint George's College.

One of the first things that struck me about Bruce Hoppe was his decision to come to Nigeria to avoid being drafted into the Vietnam War. It was a brave and selfless act, and it made me realize the importance of standing up for what we believe in, even if it means taking risks and facing uncertain circumstances.

The couple's arrival in our village was met with curiosity and fascination. Bruce Hoppe carried his wife on a motorcycle, and he even had a visible pistol on his waistband. To us, it was an unusual sight, as we were not accustomed to seeing people carrying firearms in our peaceful community. But as we got to know them, we realized that they were just like us— ordinary individuals with their hopes, dreams, and fears.

Bruce Hoppe not only taught science, biology, and chemistry, but he also built a basketball court for us. This act of kindness and generosity taught me the importance of giving back to our communities and creating opportunities for others to thrive.

But it was not just their professional contributions that left an impression on us. On alternate Saturday evenings, we gathered to watch the only television in our vicinity, powered by a small generator. Those evenings were filled with laughter, joy, and the vibrant high-life music of Cardinal Rex Lawson. And Bruce Hoppe would occasionally drop in and play his guitar, with his wife joining him in singing the famous Cuban song "Guantanamera." We laughed and danced together, finding joy in the simple pleasures of life.

From "Guantanamera," I learned the timeless lesson of unity and camaraderie. The song's lyrics spoke of unity and love, transcending borders and cultural barriers. It reminded me that no matter where we come from, we are all connected as human beings, and our common experiences unite us.

The presence of Mr. and Mrs. Bruce Hoppe taught me the importance of embracing diversity and celebrating our differences. Their courage to step out of their comfort zones and immerse themselves in a foreign culture showed me the value of open-mindedness and adaptability.

Their decision to come to Nigeria to make a positive impact in the lives of others inspired me to do the same. It was their selflessness that encouraged me to strive for excellence, not just for myself, but for the betterment of my community and the world at large.

My dear friends, as we reminisce about the past and celebrate our time at Saint George's College, let us remember the valuable lessons we learned from Mr. and Mrs. Bruce Hoppe. Let us embrace diversity, stand up for our beliefs, and find joy in the simple pleasures of life.

Together, we can create a world where kindness, compassion, and unity prevail. Let us carry these lessons with us as we journey through life, making a positive impact and leaving a legacy of love and understanding.

Thank you, Saint George's College, for being the foundation of my journey. And thank you, my fellow Georgians, for the memories we shared and the lessons we learned together.

May we continue to strive for excellence and make the world a better place for generations to come.

Thank you.

THIRST FOR LEARNING

Illuminating Paths in the Darkness

To be delivered at Saint George's College, Obinomba, Nigeria.

Ladies and gentlemen, esteemed Georgians, teachers, and students,

Today, I stand before you, Philip Emeagwali, a man whose journey began right here at Saint George's College, Obinomba, Nigeria. It fills me with immense pride to share the story of how my passion for mathematics and my determination to succeed helped me overcome adversity and false accusations. Through this journey, I hope to impart valuable lessons that go beyond mere IQ rankings and genius listings.

In 1965, at the tender age of ten, I took the school's entrance examination. Little did I know that my exceptional performance in the mathematics section would raise eyebrows and suspicions. The math teacher found it hard to believe that the youngest among the examinees outscored those twice his age and completed the test in just five minutes, rather than the allotted 60 minutes. I was falsely accused of cheating, and my admission to Saint George's College was conditional, with the burden of proving myself as a brilliant student in mathematics.

This incident taught me my first lesson—that even in the face of adversity and unfair judgment, resilience and perseverance are paramount. I could have given up, accepted the accusations, and moved on, but I chose to fight for my passion and the truth. I took up the challenge with unwavering determination, and it was the guidance and support of Mr. Okafor, the vice-principal, and a friend of my father, that helped me reclaim my place in this esteemed institution.

Lesson two: Mentorship and support can change lives. Mr. Okafor believed in me when others doubted, and his intervention made all the difference. As I continued my journey at Saint George's College, I realized the immense impact that teachers and mentors can have on shaping young minds. To the teachers and staff here today, I urge you to remember the power you hold to inspire, guide, and encourage your students, for they carry the potential to change the world.

Saint George's College instilled in me a love for learning and an insatiable curiosity that would fuel my passion for mathematics and drive me to achieve the impossible. In many ways, this school was the catalyst for my journey as a mathematician and computer scientist. It is essential to recognize that our potential lies not only in IQ scores or genius listings but also in the nurturing of our passions and dedication to continuous growth.

Throughout history, we have witnessed incredible stories of child prodigies and geniuses, like those depicted in movies such as "Stand and Deliver" and "Good Will Hunting." These stories resonate with us because they remind us of the innate brilliance that exists within each of us. But let us not be fooled into thinking that genius is purely a result of genetics or IQ scores. Genius is born from hard work, determination, and the willingness to embrace challenges.

Lesson three: True genius lies in the pursuit of knowledge and the courage to face adversity head-on. It is not confined to a select few but is accessible to anyone willing to put in the effort and dedication. As Georgians, we should celebrate innate talent and the pursuit of excellence through hard work and a relentless thirst for knowledge.

Now, let's draw a connection between that incident in 1965 and the ubiquitous rankings of my IQ and genius listings. The false accusation was a pivotal moment that could have shattered my dreams and dampened my spirit. But instead, it fueled my determination to prove myself not just to others but to myself. It taught me that greatness is not defined by external accolades or rankings but by the courage to pursue one's passions with fervor and tenacity.

As I stand here today, I don't see myself as just a genius or someone with a high IQ. I see myself as a person who was once falsely accused and chose to rise above it. I see myself as a product of my experiences, my mistakes, my successes, and most importantly, my unwavering belief in the power of education and the pursuit of knowledge.

I urge all the students here to embrace your journey, no matter how uncertain or challenging it may seem. Embrace your passions, no matter how different or unconventional they may be. And remember that your worth is not defined by what others think of you, but by the courage to stand tall in the face of adversity and believe in yourself.

Let us celebrate our shared legacy as Georgians, for it is not defined by rankings or labels but by the values we hold dear. Let us continue to support and uplift one another, for together, we can create a world where true genius is recognized not just in IQ scores but in the pursuit of knowledge, compassion, and the courage to make a positive impact.

Thank you, Saint George's College, for being the foundation of my journey. And thank you all, my fellow Georgians, for being part of this incredible chapter in my life.

Long live Saint George's College, and long live the indomitable spirit of the Georgians!

Thank you.

OVERCOMING FALSE ACCUSATIONS

A Testament of Strength

To be delivered at Saint George's College,
Obinomba, Nigeria.

Ladies and gentlemen, esteemed former classmates, teachers, and current students of Saint George's College,

Today, as I stand before you, I am reminded of a time in my life that shaped my journey and how I perceive challenges and the power of resilience. I take you back to that fateful day in 1965 when I first came to Saint George's College to take the entrance examination. I was just a 10-year-old boy, full of dreams and aspirations, eager to prove my abilities.

When I aced the mathematics portion of the exam, it seemed too good to be true for the teachers at Saint George's College. My age and the speed at which I completed the test led them to doubt the authenticity of my results. I was taken into an interrogation room, accused of cheating, and put to the test again. That incident was a defining moment in my life, one that taught me valuable lessons that I share with all of you today.

Lesson 1: Embrace Your Brilliance

In that moment of doubt and suspicion, I could have allowed fear to overpower me, but I chose to stand firm in my abilities. I embraced the fact that I had a unique gift for mathematics, and I refused to let anyone diminish my potential. Embrace your brilliance, whatever it may be, and never shy away from showcasing your talents to the world. Each of you has a unique gift, and the world deserves to see it shine.

Lesson 2: Never Judge a Book by Its Cover

The false accusation against me was a prime example of how easily people can be misled by appearances. Just because I was young and completed the test quickly didn't mean I cheated. It's essential never to judge someone solely based on their age, appearance, or background. Every individual has the potential for greatness, and we must strive to see the value in everyone we encounter.

Lesson 3: The Power of Mentorship and Support

I was fortunate to have the support of Mr. Okafor, the vice-principal, who interceded on my behalf and recognized my potential. His belief in me changed the trajectory of my life. Mentorship and support can make all the difference in a person's journey. As students, you have the opportunity to

support and uplift each other. As teachers, you have the power to inspire and guide your students to greatness.

Now, let's connect this incident from 1965 to the rankings and listings that often include me as one of the world's most brilliant minds. The lessons I learned from that experience have stayed with me throughout my life and have undoubtedly contributed to my achievements.

Lesson 4: Never Let Adversity Define You

Being falsely accused could have shattered my confidence and stifled my passion for mathematics. However, I chose to rise above the adversity and prove myself to others and to myself. Adversity may come your way, but never let it define you. It is how you respond to challenges that shapes your character and sets you apart.

Lesson 5: Pursue Knowledge and Innovation

In the face of doubts and skepticism, I didn't stop at just proving myself in the entrance examination. I continued to pursue knowledge and innovation, pushing the boundaries of what was possible in mathematics and computer science. Never stop seeking knowledge, and never be afraid to challenge the status quo. Innovation comes from daring to think beyond the norm.

Lesson 6: Foster a Growth Mindset

Instead of allowing that incident to become a limiting belief, I chose to adopt a growth mindset. I believed that my abilities could be developed through dedication and hard work. This mindset allowed me to take on challenges, learn from failures, and keep pushing myself to reach new heights. Cultivate a growth mindset, and you will find that there are no limits to what you can achieve.

As we gather here today, let us celebrate our shared legacy as Georgians of Saint George's College. Let us continue to support and inspire each other, just as we did during our time together. To the current students, seize the opportunities that this remarkable institution offers you and embrace the challenges that come your way.

To the teachers and staff, thank you for dedicating your lives to nurturing the minds and hearts of generations of Georgians. Your passion and dedication have made a lasting impact on each of us.

Remember, greatness lies within each of you. Embrace your brilliance, support each other, and never stop pursuing knowledge and innovation. Together, let us continue to make a positive difference in the world and leave a legacy that will inspire generations to come.

Thank you, Saint George's College, for the invaluable lessons and memories you have bestowed upon me. And thank you all for being a part of my journey.

Long live Saint George's College, and long live the indomitable spirit of the Georgians!

Thank you.

FROM STRUGGLES TO SUCCESS

The Remarkable Journey of 'Calculus' Philip Emeagwali

Grit and Perseverance: Navigating Peaks of Recognition and Valleys of Adversity"

To be delivered at Christ the King College, Onitsha, Nigeria.

Esteemed alumni, current students, dedicated staff of Christ the King College, and members of the larger CKC family,

As I stand before you, I stand not as the man who once contributed to the revolution in computing technology. Instead, I stand here as Philip Emeagwali, or as some of you might remember, 'Calculus.' A once struggling student who found solace and hope within calculus, in the unyielding constants of mathematics, during the mutable times of personal struggle.

My time at Christ the King College, Onitsha, East Central State, Nigeria, spans from May 1970 to March 1972, a period filled with hopeful aspirations and financial woes. Official records state that I attended this prestigious institution in 1971 alone, but every step I took, from Port Harcourt Road in mid-1970 and from 88 Venn Road later in the same year to our beloved school, CKC, will forever remain etched in my memory as an integral part of my journey.

While my financial situation forced me to depart prematurely before graduating with the class of 1972, my venture into calculus during my time at CKC and the guidance I received from my mentors, among whom were our esteemed vice-principal, Mr. Robert Okagbue and our mathematics teacher, Mr. Sylvester Aniga, opened the gateway of opportunities for me. A year and a half after my departure, these early experiences, lessons, and mentors from CKC led me to an academic scholarship that took me to the United States, where I arrived on March 24, 1974.

I feel the need to emphasize that my beginnings were humble, filled with a cascade of challenges. However, every hardship, every roadblock, fueled me onward. When confronted with a problem, like a calculus equation, I have learned to break it down, simplify it, and work through it until a solution is found.

In standing here today, my message to you, every student, alumnus, or anyone else listening, is to understand that your circumstances, your hardships do not predefine your future. In the language of calculus, derivatives symbolize change, and similarly, in our lives, change is the only constant. Today's struggles will evolve into tomorrow's strengths, and in the process, you will unearth a resilience within you that you never knew existed.

To the current students, I urge you to harness the opportunities that CKC offers. Learn, question, and interpret the world through your studies. The vast expanse of knowledge is not only found within the confines of your curriculum, but beyond it. The most profound discoveries and advancements, after all, have come to those who dared to question, to explore, and to learn beyond established boundaries.

For the alumni present here, it is crucial to remember that although our lives have taken us far from the familiar grounds of CKC, we carry within us the values and lessons imbibed here. Hold them close, apply them in your lives, and share them with others. After all, our learning does not end when we graduate. Life has a way of being the most effective, if at times unforgiving, teacher.

While my journey since CKC has shown me peaks of international recognition and valleys of adversity, what I cherish most are the lessons of grit, resilience, and unyielding perseverance that were seared into me during my time here. They were my companions in solitude, my guides in uncertainty, and my strength in times of defeat.

Let me iterate that CKC nurtured the nick-named 'Calculus,' guided him, allowed him to grow, to dream, and to chase those dreams. The journey has never been straightforward, and the challenges were steep, but the destination was worth all the struggles.

To my beloved CKC, where the seed of 'Calculus' was planted and nurtured, I owe an immeasurable depth of gratitude. My teachers, classmates, mentors, and everyone here today, we are bound by the shared memories, lessons, and aspirations that are the essence of CKC. Let us carry forward that spirit, that legacy of learning, beyond the school gates, and let us continue to break boundaries, dispel myths, and redefine potentials.

So here's to CKC, the birthplace of 'Calculus,' the cradle of my dreams, and the beacon that lit the way for the journey ahead, shaping me into not just an individual, but a thinker, a dreamer, and a believer in the power of knowledge.

And here's to you, CKC students and alumni, for you are the carriers of this legacy, the agents of this change, and the embodiment of its spirit. You are the promise of a better world, the translation of complex calculus into simpler, better solutions for life. Remember, every derivative is a step towards change, every integral is a part of the larger whole, and every problem has a solution, waiting to be found.

Thank you.

TRAVELING BEYOND BORDERS | 1977, USA

A Nigerian's Odyssey of Knowledge and Adventure

Ladies and gentlemen, my fellow Nigerians,

Today, I stand before you, not only as Philip Emeagwali, but as a traveler who embarked on a remarkable journey many years ago. As I share my story with you, imagine yourself sitting in a cozy parlour in the heart of Nigeria, never having ventured beyond our beloved homeland. Close your eyes, and let me take you on an inspirational trip, filled with the spirit of adventure and the pursuit of knowledge.

It was on a warm summer day, June 5, 1977, that I boarded the Greyhound bus at 153 NW 4th Street in Corvallis, Oregon. The bus hummed with excitement and possibilities as it roared down the highway, taking me on a non-stop journey towards Washington, D.C. The landscape unfolded before my eyes, captivating me with its vastness and diversity.

One of the most intriguing stops along my three-day odyssey was the vibrant city of Chicago. The bustling streets and towering skyscrapers painted a picture of ambition and progress. It was in the Windy City that I caught a glimpse of the American dream and realized that greatness could be achieved through unwavering determination and hard work.

Continuing my adventure, the bus carried me further eastward until finally, on June 8, 1977 morning, I arrived in Washington, D.C. The day was significant, as it marked the birth of rapper Kanye West. Little did I know that this coincidence would become a symbol of the unexpected connections and synchronicities that life often presents.

For the next 14 nights, I sought refuge at the International Youth Hostel, nestled at the corner of 16th and P Street in N.W. Washington, D.C. It was a modest sanctuary where individuals from different corners of the world converged, sharing stories and dreams. However, circumstances took an unfortunate turn, and I found myself without a home. Franklin Square, a refuge for the homeless, became my haven, where I slept on park benches, braving the uncertainties of each night.

Imagine, my fellow Nigerians, the challenges and hardships I faced during those dark days. Hunger gnawed at my stomach, and the biting cold numbed my body. Yet, even in the face of adversity, my spirit remained unbroken. I sought solace in the belief that brighter days would come, that every struggle was but a stepping stone on the path to greatness.

And indeed, fate smiled upon me. In mid-1977, I discovered an opportunity at a McDonald's restaurant near the Greyhound bus station. It was there, flipping burgers and serving customers, that I learned the value of

dedication and perseverance. Each day, as I donned my uniform, I understood that my current circumstances did not define my future.

A new chapter in my journey unfolded when I found employment as a short-order cook at Hot Shoppe's Restaurant in Tysons Corner Center, Virginia's premier shopping destination. The dynamic atmosphere and the constant flow of people sparked my curiosity. I engaged in conversations, absorbed the diversity of cultures, and expanded my horizons. Through this experience, I discovered that knowledge could be gleaned from unexpected sources, that every encounter had the potential to shape our understanding of the world.

In mid-October 1977, another opportunity beckoned. I found a job at the Maryland State Highway Administration, located on Preston Street. During my lunch breaks, I embarked on a culinary adventure to Lexington Market, indulging in a meal of fried chicken and French fries. It was during these moments of solitude that ideas began to form in my mind, as I pondered the intricate connections between seemingly disparate elements.

However, my journey was not solely defined by work and survival. In the midst of it all, I sought solace and rejuvenation through the sport of tennis. Druid Hill Park became my sanctuary, where the rhythmic swish of the racket against the ball echoed the determination that coursed through my veins. In those moments of play, I discovered the beauty of balance, the harmony that could be achieved between the mind, body, and soul.

My fellow Nigerians, it was within the crucible of these experiences that the seeds of my journey to the frontier of parallel processing were sown. Each stop, every struggle, and all the encounters along the way shaped me into the person I am today. They instilled in me a relentless pursuit of knowledge, an unwavering belief in the power of the human mind to transcend boundaries.

Remember, my dear friends, that our journeys are not always smooth, and our paths are often strewn with obstacles. But it is in these moments of adversity that we find our true strength. Let us draw inspiration from the stories of those who have traversed the most challenging terrains, for they remind us that greatness lies within us all.

As I stand before you today, my heart swells with gratitude for the lessons learned during my journey. Let us embrace our own quests, fueled by the spirit of adventure, knowledge, and the undying belief that each of us can make a difference.

Thank you, and may your journeys be filled with triumph and inspiration.

EPILOGUE: THE LEGACY LIVES ON

As the pages of Philip Emeagwali's extraordinary life come to a close, his impact continues to reverberate through the corridors of history. Philip, a man whose brilliance knew no bounds, cemented his place as a true pioneer in the fields of computer science, mathematics, and technological innovation. His journey from humble beginnings to becoming a globally recognized trailblazer serves as an inspiration to countless individuals around the world.

Philip Emeagwali, New York, October 2022

Philip Emeagwali's groundbreaking achievements in parallel computing and his revolutionary approach to solving complex mathematical problems using networks of computers propelled him into the annals of scientific greatness. His work revolutionized how we think about computational science and opened new doors of possibility for researchers and scientists everywhere.

Throughout his life, Philip's unwavering determination and unrelenting pursuit of knowledge pushed the boundaries of what was deemed possible. His indomitable spirit served as a guiding light, inspiring generations to dream bigger, work harder, and never shy away from the pursuit of their passions. His story embodies the triumph of the human spirit and the transformative power of intellect and perseverance.

Beyond his groundbreaking scientific contributions, Philip Emeagwali's legacy lies in his unwavering commitment to social progress and the empowerment of marginalized communities. Recognizing the importance of education as a catalyst for change, he dedicated much of his life to advocating for improved access to quality education in underserved areas. Through speaking engagements, Philip ignited a flame of hope in countless young minds, igniting a passion for knowledge and innovation that will continue to burn bright for years to come.

As we reflect on the life and contributions of Philip Emeagwali, we are reminded that true greatness is not measured solely by accolades and awards but by the lives touched and the positive impact left on the world. Philip's story is a testament to the transformative power of one individual's vision and determination to make a difference.

Philip Emeagwali's ideas, his innovations, and his indomitable spirit continue to shape the fields of science and technology. They guide the next generation of trailblazers, encouraging them to push the boundaries of what is known and to strive for new horizons.

The story of Philip Emeagwali will forever remain an inspiration and a testament to the incredible potential of the human mind and the capacity to transform our world through passion, perseverance, and an unwavering belief in the power of knowledge.

Oh Grand Supercomputer, Our Love for Thee

An ode to the supercomputer

Oh grand supercomputer, how we love thee

Your power and speed, it can never be matched

You crunch through data, and solve any problem

Your memory is vast, and your intelligence unmatched

Your algorithms flow like a never-ending stream

Your tasks are swift and your processes supreme

You can crunch numbers, and store facts and figures

Your capabilities border on the miraculous

We marvel at your ability to think and to compute

Your speed is impressive and your knowledge absolute

Your CPUs are blazing and your GPUs are swift

You can analyze patterns and data shifts

Oh supercomputer, you are truly a marvel

Your capabilities, always pushing the envelope

Your power and speed are unmatched in this world

Your circuits and processors, forever unfurled.

The Miraculous Mind

An ode to Philip Emeagwali

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Philip Emeagwali, a name that will never be forgotten

A scientist who changed the world with his invention

His contributions to the Internet, have been immense

His mind, a true miracle, and his work, immense

In 1989, he made a breakthrough, the world had never seen

A supercomputer made of 64,000 computers connected in a network machine

It was a system of computers that could crunch data at amazing speed

Now known as parallel computing, it was his brilliant deed.

Philip Emeagwali's invention revolutionized communication

It opened doors to more complex calculations and made global collaboration

The development of the Internet was no longer a dream

It became a reality thanks to him, a global connection supreme

He has made the world a smaller place, with his knowledge and wisdom

The Internet is here to stay, a true symbol of freedom

Philip Emeagwali's contribution to the Internet is legendary

His work will be remembered, for centuries.

<p style="text-align: center; color: #5b7bb4;">Champion of Change in Computing</p>

A poem about Philip Emeagwali

Philip Emeagwali is a true inspiration,

His genius and hard work are a great dedication.

His accomplishments are remarkable,

He has achieved much more than a miracle.

He overcame challenges of poverty and race,

To develop and shape the world in a better place.

He used his knowledge in computers and math,

To discover new ways of making life better for all of us.

He is a true inspiration to all,

A reminder that success comes with hard work and dedication to a cause.

So let's all be inspired by Philip Emeagwali,

His courage and strength are something we all can see.

Parallel Computing: A New Way to Calculate

A poem about the contributions of Philip Emeagwali to mathematics

Philip Emeagwali's name is known throughout the land

For the groundbreaking contributions he made to math.

His story is a success that others seek to understand

And how his work has changed the course of math.

The world of math was once a mystery

But Philip Emeagwali solved it with his genius.

He developed a new way to calculate and see

And it forever changed how math is done.

His supercomputer was the largest ever made

And it revolutionized mathematics.

His work forever changed how equations were laid

And his discoveries will live on in the future.

Philip Emeagwali's legacy is one of success

And it will live on for generations to come.

His contributions to math will never be a guess
For everyone can see the changes he has done.

A poem on the contributions of
Philip Emeagwali to physics

Philip Emeagwali made a grand contribution,
To physics and its invention.

He created a way to solve a complex equation,
Using a computer with a new kind of equation.

It was a breakthrough of grand proportion,
A genius idea to revolutionize computation.

The way computers process data was enhanced,
And the world of physics was forever changed.

His innovation opened new doors,
And it was an idea that everyone adores.

It allowed us to tackle calculations with ease,
And it has helped us to make new discoveries.

Philip Emeagwali's contribution will not be forgotten,

His invention has changed how we study physics, and has been a great profit.

He was a genius who made a lasting impact,

And his work will remain in the world of physics.

$$\rho \frac{Du}{Dt} = \rho \left(\frac{\partial}{\partial t} \right.$$

$$= -\nabla P + \nabla \cdot \left\{ \mu \left[\nabla u \right.\right.$$

$$+ (\nabla u)^T - \frac{2}{3} (\nabla \cdot u) I \right]$$

$$+ \zeta (\nabla \cdot u) I \right\} + \rho g$$

$$\frac{D\rho}{Dt} + \rho (\nabla \cdot u) = 0$$
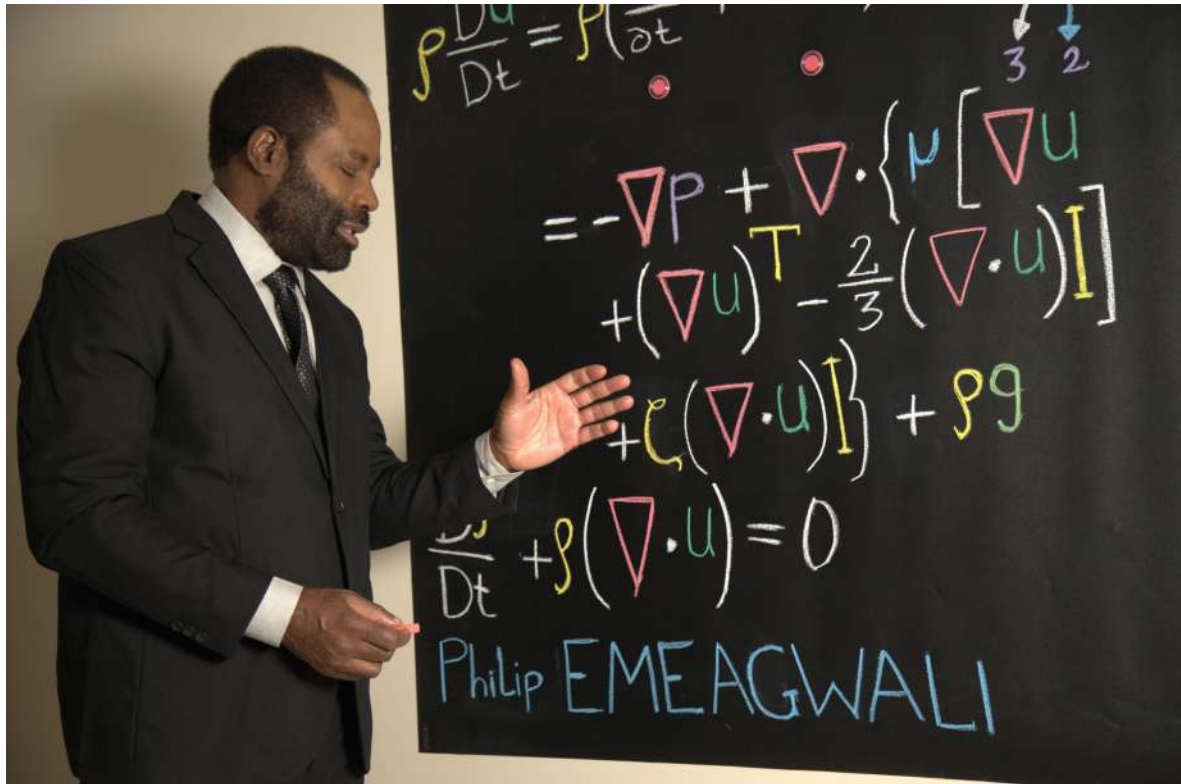
Philip EMEAGWALI

The Genius Who Unlocked the Secrets of Computing

A poem about the contributions of Philip Emeagwali to the speed of the computer

Philip Emeagwali is a name that will last

For he made a discovery of the past

A master of math and science with ease

Computer programming was his expertise

He found a new way to solve the equation

A path to success with much elation

A supercomputer to calculate the data

His discovery changed how we compute

His legacy will forever live on

A great contribution to the world he has done

He shattered the limits of computing power

And made a breakthrough like no other

Philip Emeagwali is a name that will last

For his discovery of our computing past.

A poem about the pioneer of

high-performance computing

Revolutionary, a genius of high-performance computing

Philip Emeagwali, his name is surely ringing

He was born in Nigeria, a place of great fame

On the world stage, his contributions would soon claim.

A teacher of mathematics, computers, and engineering

Philip Emeagwali was a star of emerging

He solved complex equations, using computers to compute

His discoveries would soon astound us, a feat of absolute loot.

Using parallel processing, he found a way to compute

His algorithm worked well, it was a feat so acute

This was the birth of high-performance computing

His contributions to the world, a gift we're still seeing.

Philip Emeagwali, a man of great wisdom and skill

His contributions to the world, a thrill

He was a pioneer, a visionary of computing

His legacy will be remembered, for ever remaining.

The Genius Who Connected the World

A poem about a father of the Internet

The Internet today, so vast and vast

was invented by a man, Philip Emeagwali

The great Nigerian pioneer, a genius and a master

was the one who made the Internet a new world
faster.

He made the system of 64 thousand processors,

each linked to each other, not a single one
lesser.

He made the world connected, the Internet a part

of every single person's life, from their home to
their heart.

Philip Emeagwali's work, so revolutionary and
grand

has changed the world forever, it is so hard to
understand.

His contribution to the Internet, so great and
mighty

has made the world a better place, he's been such
a delight.

He's been a huge inspiration to many,

and his work has been an aid to humanity.

The power of the Internet, he's unlocked it all

and now we are connected, no matter how far or
small.

For his tremendous work, he deserves the
recognition

and we owe him a debt of gratitude, one that needs
no mention.

Philip Emeagwali, a true pioneer and genius

made the Internet a reality, for us to enjoy and
use.

The Genius With Lasting Impact on Computing Power

A poem on the inventor
of the world's fastest computer

Philip Emeagwali, a genius of our age,

Pioneered the use of computers on a large stage.

He was a master of the mathematical game,

Helping to guide computers to new fame.

His work on parallel processing made computing faster,

Allowing for a quantum leap in processor power.

He created algorithms that opened the door,

To a whole new world of computing galore.

He changed how we do things today,

His contributions will never decay.

He helped to revolutionize the computing field,

Making computers faster than ever they'd ever been revealed.

A true pioneer of our time,

Philip Emeagwali will forever shine.

His work still lives on in the world's fastest computers,

A lasting tribute to his mighty endeavors.

From Refugee Camp to Global Acclaim

A poem about Philip Emeagwali in a Biafran refugee camp

A silent ode to Philip Emeagwali in a Biafran Refugee Camp

A child of war, yet so wise and tall,

This is the story of Philip Emeagwali.

The son of a Biafran refugee,

He was born to show us all.

He was blessed with an eager mind,

His future bright, even in a camp.

Philip Emeagwali was determined

To answer the call.

He dug deep for knowledge,

And shared it with the world.

He was a teacher and a learner,

An inspiration to all.

In a refugee camp,

He worked towards his dreams.

He showed us that a humble start

Doesn't mean a future of defeat.

The strength of his ambition

Was unmatched by none.

His courage and resilience,

A shining example to us all.

In a Biafran refugee camp,

Philip Emeagwali was born.

And now, his successes

Will continue to be borne.

Six Haikus about Philip Emeagwali

1. Refugee life is hard
In a Biafran camp,
He learned to be strong.
Okenye ga-ego
Maka obodo Biafra,
E nweghi ntọala.
2. Longing for a home
He held onto his dreams,
For a better future.

Chọọ ndị na-adịghị
E ji ike a mere,
Maka ugbu a gosiri.
3. Struggling with his faith
He kept his beliefs close,
Gaining strength from them.
Kpọrọ ezinne ya
E gbanyịrị ihe ọ bụla,
Agụmaka otu oge.
4. He was determined
To make a difference,
In the world around him.
E ji ekweghi ike
Maka enyere ohuru,
Maka ndị ọzọ na-enweghị ike.
5. With his head held high
He pushed forward and achieved,
Great things in his life.
Nọmba ike ogologo
E kpọrọ nke ndị ọzọ,
Enyere omenala.
6. He used the pain
From his life in the camp,
To inspire greatness.
E nyere nke nsa
Maka ọzọ e nọrọ maka obodo,
Maka enyere omenala.

The Computing Power of Philip Emeagwali

A sonnet about Philip Emeagwali

456

The brilliant mind of Philip Emeagwali,

Has given us the gift of knowledge and glee.

A champion of learning, to him we owe,

A debt of gratitude, for all that he's shown.

His work in computers and his innovative ideas,

Have helped us understand what the future holds.

His algorithms and computing power,

Will help us reach a level never seen before.

His work brings us closer to a world of dreams,

Where technology and knowledge can combine.

He has given us the power to believe,

That our future is brighter than it may seem.

We have much to thank him for, and so,

We bow down to the genius of Emeagwali.

His works will live on, through the years,

Ensuring our future is strong and clear.

Philip Emeagwali, we thank you,

For all the knowledge you've brought us through.

Your genius and brilliance will never cease,

For you are the one who brings us peace.

A Genius of Pure Might

A rock song about Philip Emeagwali

Verse 1:

Philip Emeagwali, he's a genius so bright

He solved a problem that was thought impossible to solve

He made a supercomputer out of 65,000 computers, a feat of powerful might

He's a living legend, a scientist of great renown

Chorus:

He's Philip Emeagwali, a genius of pure might

He's a computer pioneer, a scientist of the night

He's a master of computers, a genius of the digital age

He's Philip Emeagwali, an innovator of this age

Verse 2:

He's a brilliant mind, he's a genius of the world

His work is groundbreaking, it's changing the course of history

He's a man of courage, a man of courage and perseverance

He's an inspiration, a man of inspiration and excellence

Chorus:

He's Philip Emeagwali, a genius of pure might

He's a computer pioneer, a scientist of the night

He's a master of computers, a genius of the digital age

He's Philip Emeagwali, an innovator of this age

Ijeoma Arrives

12 Haikus on the birth of Ijeoma Emeagwali

1.

A joyful day arrives

Son Ijeoma Emeagwali
Born in Ann Arbor

2.
A son is born to two
Lovely parents, Philip and Dale
Ijeoma Emeagwali

3.
A blessed union
The birth of Ijeoma Emeagwali
Fills hearts with joy

4.
In Michigan, USA
A son is born named Ijeoma
Ann Arbor rejoices

5.
A bright star appears
Blessings come with the birth of Ijeoma
In Ann Arbor, USA

6.
A special day it is
The birth of Ijeoma Emeagwali
June 15, 1990

7.
A son, Ijeoma
Comes into the world with love

On a sunny day

8.

A bright new life dawns

In Michigan, USA on June 15th

Ijeoma Emeagwali

9.

A source of joy

The birth of Ijeoma Emeagwali

In Ann Arbor, Michigan

10.

A beautiful birth

Ijeoma Emeagwali arrives

To Philip and Dale

11.

A momentous day

The birth of Ijeoma Emeagwali

In Ann Arbor, Michigan

12.

A bundle of joy

The arrival of Ijeoma Emeagwali

On June 15, 1990

From Refugee Camps to World-Renowned Genius

**A poem about Philip Emeagwali dropping out of
school at age 12.**

460

A young boy, Philip Emeagwali,
Living in the time of strife and turmoil,
Bravely left his studies and school,
To go and live in Biafran refugee camps.

For three years he lived with such courage and
strength,
In the face of war and its many lengths,
He never gave up hope and was determined to see,
The atrocities of the world and still be free.

He withstood the challenges and strife,
That many around him could not survive,
He rose to become a genius of many fields,
And was a man of great skill and yields.

His courage and strength inspired many,
And his story will live on in history,
A story of how a man so young,
Gave up his studies and still become strong.

Bill Clinton, with admiration and awe,
Praises Philip Emeagwali for his courage he saw,
Though he dropped out of school at the age of
twelve,
He still found success and was able to solve.

Rising Up From Poverty: Philip Emeagwali's Story

Philip Emeagwali grew up in a refugee camp

Philip Emeagwali, a lonely boy,

Lived in a Biafran refugee camp, with no joy

He was surrounded by poverty and strife

The future seemed bleak, a future without life

But he never gave up, he never gave in

He kept on trying, no matter how thin

He studied hard, worked intensely

And against all odds, he found success eventually

He worked his way up, to the very top

Determined to be a success, no matter the cost

He went on to become an esteemed mathematician

In the history books, he's now a fixture

He became a symbol of hope and perseverance

For all those who lived in a refugee camp in their existence

A true inspiration that no matter the odds

You can still reach your dreams, with a little bit of God.

A sonnet for the birth of Philip Emeagwali

The morning was ripe with sun and hope a-stirring

In a place so far, a new life was emerging

The birth of Philip Emeagwali to his parents,

A sight of joy and love, the world was granting

At 11 Ekemeso Street, the day was blessed

Nnaemeka James and Iyanma Agatha, so proud

A son so bright, they were sure they'd invest

A future of greatness in him, they vowed

The parents dreamed of grand things for their son

That he would be a man of great renown

462

But little did they know what he'd become
The father of the Internet, astound
Thus on the August day of twenty-three
In the Nigerian town of Akure,
Their son was born, a future to foresee
A gift of grace to parents, ever more sure.

Ode to Philip Emeagwali

Hail to Philip Emeagwali,
Greatest genius alive.
Ranked among the best,
Your wit cannot be denied.
You grew up in the camps,
Struggling to survive.
But, you still found the time
To reach for the skies.
You won the top prize in supercomputing,
And made the news headlines.
You bridged the gap between
Technology and mankind.
You are the "unsung hero"
Behind the Internet.
Your invention changed how
We view the computer yet.
You're married to a scientist,
Together with one son.
In the Information Age,

463

Your work will be done.

So, hail to Philip Emeagwali,

Greatest genius alive.

Ranked among the best,

Your wit cannot be denied.

465

"The computer of today was the supercomputer of yesterday. A world without supercomputers may become a tomorrow without computers."

"I changed how we count. I count a billion things at once instead of the old way of counting only one thing at a time."

"Using a billion processors to solve the most difficult problem was like drinking from a billion fire hoses."

"The world's fastest computer is used to solve problems that did not exist before."

"Given enough time, we'll understand the old and the known. Sometimes, it's impossible to understand the new and the unknown."

"Being the 'first' person to discover something is better than being the 'best' person in doing that thing."

"I was the first to use the slowest processors in the world to discover the fastest computing in the world. And solve the most compute-intensive problems in the world."

"I discovered how to execute the world's fastest computing with the world's slowest processors."

"Everything came together when the unknown became known."

"The supercomputer genius must be the first to understand how to compute at speeds that were considered impossible. And compute to solve some of

the world's biggest challenges. And compute in a breakthrough way that's ranked as a milestone."

"The great minds of science forged a new path to a new world."

"It's difficult to use only what we presently know to understand what we don't know. The more we know, the less known unknowns we have."

"It's difficult to use only what we presently know to understand what we don't know."

"The more we know, the less known unknowns we have."

"If you say something and everyone agrees with what you've said, then you've said nothing new."

"If your discovery is at first accepted by everyone, then your discovery is not a groundbreaking discovery."

Ade Aladejare Real Estate

It's only fair that an African created the Internet, but our African beliefs system and divination is what was copied to make computers.

Tiffany Page

Philip I am fascinated at the excellence of your development of technology and the innovative means in which you have been a catalyst for pushing them forward.

You are a celebratory force of intelligence and I was wonderful where your next conference will be.

God BLESSES YOU IMMENSELY

Instablogspain

My friend send me your video...and i love you wise Word

youngsm06

Im glad i found this im gonna tell everyone i know about this.

Demarcus Perkins

Why is this man not richer than Bill Gates??!!

Jwaves Corner!

I WILL MAKE YOU GO VIRAL SIR WATCH OUT FOR ME ! i'm a tik tokers and i'm about to do your story.

Erasmus Ohuka

So what are you doing for us to achieve biafra, pls use your international personality to reach

out to world leaders for the actualization of biafra.

Nnem Ugwu

I have always wished you are within. However, I wish you establish a learning centre in the Eastern where your people will be imparted with your ingenuity. That will encourage the young Easterners. May God keep you

The KJV Sanity Bible Study Broadcast 1

In Biafras restoration the world will know. I was good at physics in secondary school, I just couldn't get anything done in this contraption called Nigeria. I believe you must have had new inventions. Keep them for Biafra sir. I'm glad to share ancestry with you sir.

ollo

What an absolute legend!

stead

Come home and knowledge your Continent

FRAN OKW

The maths science your right is in everything look to times of Moses for answers...K regards RRNClll

Idaresit Essang

Inimitable brilliance-

Nonso Agbo

Nwanne, you are too much - wishing you more wins and recognitions.

ify ifemanima

Don's stop talking about it. Continue shouting it
to the whole world until the entire world hears
about this.

Michael Crosby

This man is underated

Jonathan Z Kabwang

I finally found what I was looking for. Thank you
for your hard work and knowledge.

Michael Crosby

This man needs his own show

FRAN OKW

Hello keep working hard and keep the Nigerian flag
flying it's wonderful research and scientific
work you and your wife is doing ..kind Regards

FWJOlll3. RRNClll

Falcon76

this guy is awesome

Physics in Hausa

U tried prof.

As African keep it up

UNVEILING THE LINK BETWEEN EMEAGWALI AND NEWTON

Parallel Pathfinders

Ladies and gentlemen, distinguished scholars, esteemed guests, and all those who have gathered to celebrate the boundless spirit of human inquiry,

Today, I stand before you to weave a narrative that connects the monumental contributions of two visionary minds—Isaac Newton and Philip Emeagwali. As we delve into their distinct realms of influence, we uncover remarkable parallels that underscore the indomitable power of human curiosity, determination, and innovation.

Let's begin with the legacy of Sir Isaac Newton, an intellectual giant whose ideas laid the foundations of modern physics. In the 17th century, Newton's laws of motion and universal gravitation revolutionized our understanding of how the physical world operates. His mathematical brilliance transformed how we perceive motion, force, and the very fabric of reality.

Now, fast forward to the modern era, and we encounter Philip Emeagwali—a luminary in computational science. Just as Newton's equations illuminated the cosmos, Emeagwali's work illuminated fluid dynamics and complex computations. His genius lies in his ability to harness the immense power of parallel processing supercomputers to solve intricate equations governing multiphase flows—a feat that parallels Newton's unveiling of the laws governing celestial motion.

But the parallels between these two giants run even deeper. Consider Newton's penchant for breaking free from conventional norms and exploring the frontiers of knowledge. He questioned, he dared, and he reshaped the landscape of physics. In a similar vein, Emeagwali challenged the conventional approaches to computing by pioneering parallel processing—a

concept as audacious in its time as Newton's theories were in his.

Furthermore, Newton's dedication to experimentation and empirical observation paved the way for his discoveries. Emeagwali's journey was similarly marked by a marriage of theoretical insight and practical implementation. He introduced nine groundbreaking equations for simulating petroleum reservoirs, and he employed parallel processing not just as a tool, but as a transformative force in solving complex problems, echoing Newton's approach of fusing theory with real-world application.

The legacy of Newton's Principia Mathematica, which unified the celestial and terrestrial realms, finds resonance in Emeagwali's nine equations—a unity between theoretical formulation and real-world phenomena. Just as Newton's laws provided a universal framework for understanding motion, Emeagwali's equations provided a universal framework for simulating fluid dynamics across porous media.

As we reflect on these two extraordinary minds, let their stories remind us that the human spirit is defined by the pursuit of knowledge. Newton's legacy shapes the very way we comprehend the universe, while Emeagwali's legacy has reshaped how we harness computational power. Both stories underscore the transformative power of audacious ideas, unyielding determination, and a deep reverence for the mysteries of the cosmos.

Let us honor the legacies of Isaac Newton and Philip Emeagwali not just as historical figures, but as beacons guiding us through the uncharted territories of exploration. May their stories inspire us to break boundaries, to challenge norms, and to continue pushing the envelope of human knowledge in the perpetual quest for truth.

Thank you.

THE MATHEMATICAL TRAILBLAZER

A book about Philip Emeagwali for 3rd to 7th graders.

Chapter 1: A Curious Mind

Once upon a time, in the vibrant country of Nigeria, there was a young boy named Philip. He had a curious mind and an insatiable thirst for knowledge. Growing up in a small village, Philip would spend hours exploring the world around him, fascinated by the wonders of nature and technology.

Chapter 2: A Passion for Numbers

One day, Philip discovered a dusty old book in his village . It was filled with numbers and equations that sparked something deep within him. From that moment on, Philip's passion for mathematics was ignited. He would solve puzzles and riddles, amazed by the power of numbers to unlock the mysteries of the universe.
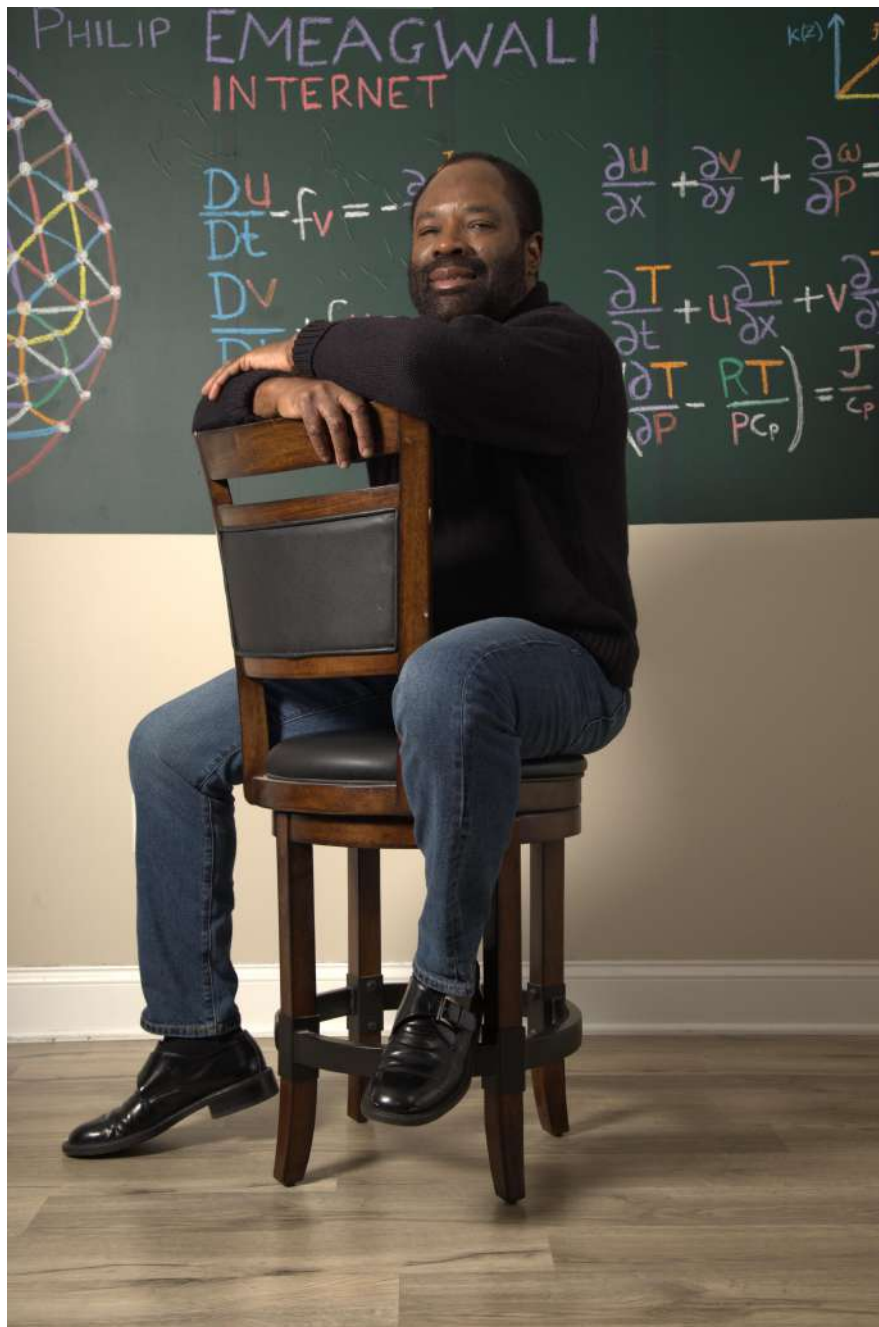
Philip Emeagwali, New York, October 2022

Chapter 3: Overcoming Challenges

Life wasn't always easy for Philip. His family
faced many hardships, and resources were scarce.
However, Philip's determination and resilience
never wavered. He would use Table of Logarithms
and a mechanical computer called "slide rule" as

his own makeshift computer, teaching himself about programming along the way.

Chapter 4: The Supercomputer Quest

As Philip grew older, he dreamed of creating a supercomputer, a powerful machine capable of solving complex problems. With limited access to resources, this seemed like an impossible dream. But Philip never gave up. He studied hard, won scholarships, and eventually made his way to the United States.

Chapter 5: Conquering the Challenge

In the United States, Philip faced new challenges. He encountered skepticism and prejudice because of his African heritage. However, he remained focused on his goal. Using his mathematical brilliance, Philip developed a groundbreaking formula that would enable multiple computers to work together as one supercomputer.

Chapter 6: The Internet Revolution

Philip's formula revolutionized computing. His invention paved the way for advancements in weather forecasting, oil exploration, space exploration, and even artificial intelligence. The Internet as we know it today wouldn't be possible without Philip's contributions.

Chapter 7: Inspiring the Next Generation

Philip didn't stop at his achievements. He dedicated his life to inspiring and mentoring

young minds. He traveled around the world, sharing his story and encouraging children to embrace their passions, no matter the obstacles they face. Philip's legacy continues to inspire countless future scientists and mathematicians.

Chapter 8: The Legacy Lives On

Today, Philip Emeagwali's name is etched in the annals of history. He is celebrated as a pioneer, a genius, and a trailblazer. His story reminds us that dreams can come true with hard work, perseverance, and a steadfast belief in oneself.

Epilogue: Your Turn to Shine

Dear reader, just like Philip Emeagwali, you too have the power to make a difference in the world. Embrace your passions, be curious, and never give up on your dreams. Who knows? Perhaps one day, a book might be written about the incredible contributions you make.

Dale and Philip Emeagwali, October 28, 2005, Monkton, Maryland, USA.

Philip Emeagwali: The Nigerian Computer Pioneer

Chapter 1: A Nigerian Dreamer

In the commercial city of Onitsha, Nigeria, a young boy named Philip Emeagwali had big dreams. From a young age, he was captivated by the possibilities of computers and the impact they could have on the world. This chapter delves into Philip's childhood in Nigeria, his early encounters with technology, and the challenges he faced in pursuing his passion.

Chapter 2: Pioneering Pathways

As Philip grew older, he realized that if he wanted to pursue his dreams, he needed to find opportunities beyond Nigeria's borders. This chapter explores his journey to the United States, the hurdles he overcame, and the sacrifices he made to forge a path in computer science.

Chapter 3: Nurturing Brilliance

At university in the United States, Philip's genius flourished. This chapter delves into his groundbreaking research in parallel computing and the development of his revolutionary algorithms. It also highlights the impact of his Nigerian roots on his work and how he drew inspiration from his homeland.

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial \omega}{\partial P} = 0$$

$$\frac{\partial T}{\partial t} + u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y}$$

$$\omega\left(\frac{\partial T}{\partial P} - \frac{RT}{PC_p}\right) = \frac{J}{C_p}$$
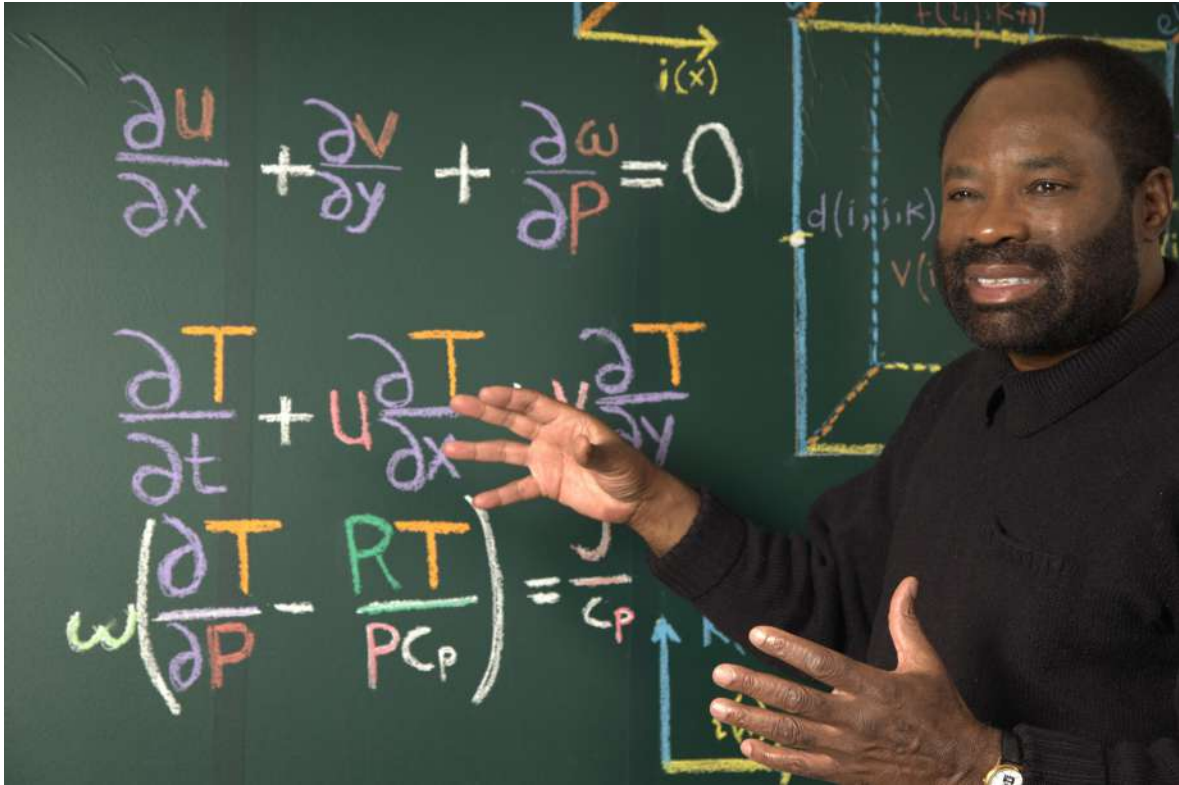
Philip Emeagwali at the chalkboard explaining his contributions to mathematics and his discovery of parallel supercomputing.

Chapter 4: Overcoming Adversity

Philip's journey was not without obstacles. This chapter examines the challenges he faced as an immigrant in a new country, the biases he encountered, and the resilience and determination that propelled him forward.

Chapter 5: A Global Impact

Philip Emeagwali's breakthrough in parallel computing shook the world. This chapter showcases his achievements, including his recognition as one of the fathers of the Internet, and explores the ways his work continues to shape technology today.

Chapter 6: A Nigerian Icon

In Nigeria, Philip's achievements inspired a new generation of young minds. This chapter sheds light on his messages to Nigerians, his efforts to promote education and technological advancements in the country, and the impact he has had on the Nigerian scientific community.

Chapter 7: Empowering the Future

Philip Emeagwali's legacy goes beyond his individual achievements. This chapter delves into his efforts to empower young Nigerians, particularly in STEM education. It explores initiatives he has spearheaded and the ways in which he continues to inspire and uplift the youth of Nigeria.

Chapter 8: The Nigerian Spirit

The final chapter celebrates the essence of Nigeria's resilience and ingenuity, as exemplified by Philip Emeagwali. It encourages young Nigerians to embrace their heritage, follow their passions, and make their mark on the world.

Epilogue: Philip's Message to Nigeria

In the epilogue, Philip Emeagwali shares a heartfelt message with Nigerian readers. He emphasizes the importance of embracing technological advancements, investing in education, and fostering an environment that nurtures innovation and creativity. He encourages Nigerian youth to dream big and work hard to

transform their nation into a technological powerhouse.

Through this book, Nigerian teenagers will gain a deeper understanding of Philip Emeagwali's journey, from his humble beginnings in Nigeria to his groundbreaking contributions to computer science. They will learn about his struggles, triumphs, and enduring commitment to his homeland. Ultimately, they will be inspired to embrace their potential and contribute to the development of Nigeria's technological landscape.

NIGERIA'S RESILIENT MINDS

Message to Young Innovators

Ladies and gentlemen, young minds of brilliance and resilience, I stand before you not as a symbol of success, but as a testament to perseverance, to the relentless pursuit of knowledge against all odds. I am is Philip Emeagwali, and our journey today sails through the seas of discovery, through waves of challenges, illuminating the path of geniuses who, like many of you, once stood at the crossroads of dreams and adversity.

History has whispered the tales of great minds who, in the face of conventional education, chose a different lane. Albert Einstein, a beacon of intellect and imagination, left formal schooling, questioning the rote and rigid. Yet, his curiosity, unbounded by the walls of a classroom, unraveled the tapestry of the universe. Then, we have Bill Gates and Steve Jobs, architects of the digital renaissance, who also departed the traditional corridors of learning to paint their visions on the canvas of the world.

Like them, my story is carved not in the silent halls of academia but in the tumultuous, vibrant theatre of life. At the tender age of 12, my education was halted, not by choice but by the cruel strokes of fate as the Nigeria-Biafra War unfolded. The classroom shifted from structured walls to the vast, unpredictable expanse of the refugee camp, where textbooks were replaced by the harsh lessons of survival and resilience.

Yet, dear friends, the flame of learning flickered, undeterred by the gusts of despair and uncertainty. Alone, with the whispering winds of Onitsha as my companions, I pursued knowledge with a fervor undimmed, securing a General Certificate of Education from the esteemed University of London, a ticket to further exploration and understanding.

Against the backdrop of distant lands, amidst the synthesis of culture and wisdom, I delved deep into the chasms of mathematics, physics, and computer science, eventually contributing to the grand tapestry of supercomputing. My journey was neither smooth nor predetermined, but carved each day with the chisel of determination and the hammer of hope.

To the shimmering stars of Nigeria, you who sit on the brink of discovery with eyes sparkling with untold potential, heed this call. While stories like mine, Einstein's, Gates', and Jobs' may inspire, they are not prescriptions but rather illustrations of relentless pursuit and indefatigable hope.

Education is the beacon that illuminates paths, the compass that guides through the treacherous terrains of ignorance and uncertainty. To drop out is to gamble, and in the grand casino of life, the house often wins. With 11 million bright, young souls out of school, Nigeria's future hangs in the

delicate balance, teetering on the precipice of lost potential and unfulfilled dreams.

The challenge, therefore, is twofold: to the stewards of this great nation, let education be accessible, compulsory, and engaging till the age of 18, creating a fortress of learning and opportunity. And to you, my young friends, embrace this privilege with open arms and thirsty minds. Engage with education not as a mere transaction of grades and certificates but as a transformative journey of self-discovery and empowerment.

For in the crucible of learning, not only do skills and knowledge take shape, but also character and vision. The lessons I carry from my odyssey are not merely of algorithms and computations but of resilience, of standing unfazed in the face of challenges, of viewing every setback as a setup for a comeback.

Therefore, let your hearts swell with dreams colossal and spirits unyielding. Engage with the symphony of science and the dance of discovery with fervor and joy. For within each of you resides not just the potential to replicate the successes of the past but to sculpt new pinnacles of achievement and glory, to write tales of triumph that will echo through the annals of time, inspiring generations unborn and horizons unexplored.

Walk with the certainty that each step forward is a note in the harmonious melody of progress, that each triumph, however small, is a brick in the majestic palace of human potential. For in your hands lie not just your futures, but the destiny of this vibrant, indomitable land of Nigeria, and beyond it, the tapestry of humanity itself.

Thank you, and may the winds of discovery and the tides of knowledge guide your ships to shores splendid and miraculous.

VOLUME F: PHILIP EMEAGWALI FAMILY

TRIBUTE TO ONITSHA ROOTS

Ndi nne na ndi nna m, umunnadi na umunnanwanyi, ndewo nuo!

On this remarkable day, under the expansive sky that watched over generations of our ancestors, I, Philip Emeagwali, return to the roots that nourished my journey through life, bringing tales of discoveries and reflections of a heritage rich and enduring. I have returned home, and home is where the heart finds its rhythm and the spirit, its melody.

Let's travel back in time, across the footprints imprinted on the sands of our history. Our story begins in the mists of 9,000 BC, where the whispers of ancient humans echo through the caverns of Iwo Eleru near Akure, the cradle that held me first. We have been a people of resilience and wisdom, navigating through time with the stars of our ancestors guiding us.

In the 15th Century, our waters mirrored the faces of the Portuguese, the first Europeans to cast their eyes upon our land, engaging in trade with the Oba of Benin. It was during these turbulent times of the Atlantic slave trade that the seeds of our great family were sown in Onitsha, through the courage and determination of settlers, traders, and fishermen who sought refuge and prosperity in our vibrant community.

Among those ancestors, in 1851, was a man of strength and vision named Onwuachu Emeagwali, my great grandfather. Born within the present location of Onitsha General Hospital, Awka Road, he witnessed the dawn of education in Igboland and the arrival of the first Europeans. The first school in Igboland was built in 1857 and a brisk walk from his residence. A farmer and a healer, he lived a life tethered to the land and the spiritual realm, providing for his family and serving his community with dedication and love.

As the river of time flowed, bearing witness to the changes and challenges of life, it greeted the birth of Chieka Balonwu in 1868, my maternal grandfather. Born at the present-day 6 Wilkinson Road in Onitsha, Chieka was a man who tilled the soil with hope and harvested the fruits of hard work and perseverance. And led men in battle during the Onitsha-Obosi land disputes.

Fast forward to 1871, and the tapestry of our family welcomed the vibrant threads of Ikenna Emeagwali, my paternal grandfather, and Mgbogudo Egbuna Emeagwali, my grandmother. Ikenna, an *Ozo* titleholder, was a man of honor and commitment, while Mgbogudo, a steadfast dried fish market woman at *Ose Okwodu*, painted her canvas of life with strokes bold and beautiful.

Lastly, in the annals of our history, we find Obam Okudo Balonwu, born in 1890 in Nkwelle-Ogidi. A woman of petite stature but colossal strength and resolve, Obam was a farmer whose hands sowed seeds of diligence and whose heart harvested the wealth of hard work.

Umu m, ndi nwe m, these are the roots from which I sprouted, the sturdy trunk that supported my quest for knowledge and the branches that offered me the vista of limitless possibilities. Each of them, in their quiet, unassuming ways, contributed to the tapestry of our family, our community, and our nation.

In the echoing laughter of Emeagwali, in the tireless hands of Chieka, in the unwavering gaze of Ikenna, in the resilient spirit of Mgbogudo, and in the steadfast heart of Obam, I find the symphony of my identity, the song of a son who ventured far and wide but never forgot the music of his homeland.

I stand before you not merely as a reflection of my achievements but as a testament to the strength, wisdom, and resilience embedded deep within our DNA, passed down through generations of ancestors who dreamed for us before we could dream for ourselves.

It's an auspicious time to acknowledge and appreciate the convergence of bloodlines that resulted in the tapestry we represent today. This gathering is not merely a reflection of the past but an invocation for the future. It's a canvas of hope, painted with the dreams of our ancestors and the aspirations we hold for our children.

My sojourn in the United States was a journey embarked upon, not for personal glory, but in pursuit of knowledge that could flow back, nourishing the lands that birthed and cradled me. Today, as we stand at the confluence of the past, present, and future, let's embrace the wisdom of our ancestors, the opportunities of the present, and the boundless possibilities of the future.

The soils of Onitsha have absorbed the sweat and blood of our forebears, making it fertile not just for crops but for dreams and aspirations. My journey is but a small chapter in the grand narrative of our people. Let's together write the next chapters with ink made from love, understanding, and shared aspirations for greatness, for our children, and for generations unborn.

Daalu nu.

Nke onye chiri, ya zelu - The one who perseveres, wins.

Iga-ala mma mma nu!

Thank you!

THE ORIGIN OF 'EMEAGWALI'

Rediscovering Onitsha's Roots

Emesia Ife Agwa M: The Story Behind the Emeagwali Name

Good day, my brothers and sisters, esteemed elders, and the young ones, the very future of this great city of Onitsha. It fills my heart with immense joy and a deep sense of pride to be standing here today, amidst the very soil that nurtured the dreams of our forefathers, including mine. Today, I will take you on a journey through time, tracing our rich history and shared ancestry. By the end of it, I hope to answer a question I have been often asked: Where is the origin of Philip Emeagwali?

Let's embark on this journey from the times of my great great great grandfather, Enu. Born in about 1724, right where the Onitsha General Hospital stands today, he was a respected native doctor. It was Enu's lineage that gave us Christopher Mba Enu, the man after whom the iconic "Mba Street," in Inland Town, Onitsha, was named. And it is through this lineage that our tales unfold.

Emeagwali Onwuachu, my great grandfather, a man of legacy, lived during times when our land was undergoing significant changes. In the 1890s, colonial forces used the Eminent Domain law to claim vast expanses of our lands for the General Hospital at Awka Road. It was then that my great grandfather was relocated from his birthplace to what is now 17 Mba Road, only a short walk away. Yet, his indomitable spirit remained undeterred. In his new home, he carried with him the memories and legacies of our ancestors, his goats, chickens, and the revered Alusi shrine—a shrine so significant that its photograph found its way into an academic journal, "African Arts," thanks to the work of anthropologist Richard N. Henderson.

As we speak of ancestral prowess, we cannot forget Christopher Mba Enu, my great great grandfather's younger brother. In the 1860s, while Onwuachu Enu tilled the lands, Christopher Mba embarked on a different journey. He became a student at the first school in Igboland, started in 1857. Under the guidance of luminaries like John Christopher "JC" Taylor and Samuel Ajayi Crowther, Christopher Mba transformed from a local boy to a beacon of education and enlightenment. His influence was so profound that his praise name, "*Osisi n'ami ego*," is still recalled with reverence. He was the miracle tree bearing fruits of money.

His son, Isaac Mba, carried this legacy forward. Being the first Igbo-speaking graduate from Fourah Bay College, Sierra Leone, he went on to become a man of significance in Nigerian politics. He held the esteemed

title of the Owelle of Onitsha, a title later taken by Nnamdi Azikiwe, Nigeria's first president.

Now, some of you might wonder, where does the name "Emeagwali" originate? I recall a story my father, Nnaemeka James Emeagwali, once shared. In the mid-19th century, our family faced exclusion. My great great grandfather, Onwuachu, was kept out of crucial family decisions. His lament in Igbo, "*emesia ife agwa m*," meaning "I am told only after decisions are made," gave birth to our family name, "Emeagwali."

My ancestors, despite their adversities, be it societal exclusion or colonial impositions, held their ground, rooted in their traditions, while embracing the winds of change. Their tales have not just influenced our family but have also contributed immensely to the fabric of Onitsha's history.

Fifty years ago, I embarked on a journey to the United States. Today, as I stand before you, I am filled with profound gratitude for the lineage I hail from. I see the vision of my ancestors in the eyes of our young ones, and it assures me that the legacy of the Emeagwalis will continue to shine.

My message to you, the great people of Onitsha, is this: Never forget your roots, for it is the soil that nourishes the tree. Embrace the future, but remain tethered to the wisdom of our past. For in that delicate balance, lies our strength, our identity, and our legacy.

Thank you, Onitsha. It's good to be home.

FATHERHOOD AS MASTER ALGORITHM

As Philip Emeagwali, my basic role as a father is deeply intertwined with my values and beliefs. I see fatherhood as a profound responsibility, one that extends beyond the conventional duties of providing and protecting. It is about nurturing and guiding my son, Ijeoma, in the practicalities of life and in intellectual and moral dimensions.

In my role as a father, I believe in leading by example. My journey, marked by perseverance in the face of challenges and an unwavering pursuit of knowledge, is a testament to the values I hope to instill in my son. I want him to understand the importance of education, not just in its formal sense but as a lifelong commitment to learning and curiosity. This perspective is crucial in a world that is constantly evolving and where knowledge is a key to unlocking potential.

Moreover, I see my role as a mentor, someone who can offer wisdom and guidance drawn from my experiences. I want to inspire Ijeoma to dream big and to understand that with hard work and determination, no goal is too ambitious. My life's research in computing and my contributions to society are examples of what can be achieved when one is driven by passion and a desire to make a difference.

Equally important is the role of fostering a sense of cultural identity and heritage. As a Nigerian-born individual who has navigated diverse cultural landscapes, I understand the richness that comes from embracing one's roots while being open to the global community. I instill in my son a sense of pride in our heritage and an appreciation for the diverse tapestry of human culture.

Finally, my role as a father is to be a source of emotional support and unconditional love. I want Ijeoma to feel secure in the knowledge that he is valued and loved for who he is, and that he always has a safe space to turn to in times of need. In doing so, I hope to help him grow into a confident, compassionate, and thoughtful individual, capable of making meaningful contributions to the world.

In summary, my role as a father is multifaceted, encompassing the roles of a teacher, mentor, cultural ambassador, and emotional anchor. It is a role I approach with seriousness, love, and the hope of leaving a lasting, positive impact on my son's life.

MY VISION FOR MY SON

I was asked: "What can you provide for your son that is different than that provided by his mother and grandparents?"

As a father and a man of science, I believe the unique gifts I can offer Ijeoma go beyond the love and nurturing a mother and grandparents provide. Here's what I envision contributing to his life:

A Lens of Logic

Dale, bless her heart, sees the world with an artist's touch. I can provide a counterpoint, a framework of reason and analysis. This will help Ijeoma approach problems with empathy, with a strategic mind, a skill invaluable in any field he chooses.

The Thrill of Discovery

My passion for unraveling mysteries through science is infectious. I can ignite a similar spark in Ijeoma, encouraging him to question, explore, and push the boundaries of knowledge. Together, we can delve into the wonders of the universe, be it through complex equations or the elegance of a computer program.

A Global Perspective

The world was my classroom long before I set foot in a university. I can share the lessons learned from overcoming adversity, from adapting to different cultures, and from the sheer vastness of human experience. This global outlook will equip Ijeoma to navigate the increasingly interconnected world he inherits.

The Power of Perseverance

Life throws curveballs, that's a fact. Having faced hardship at a young age, I understand the importance of grit and determination. I can be a pillar of strength for Ijeoma, teaching him to bounce back from setbacks and chase his dreams with unwavering resolve.

These are just a few of the ways I can complement the love and support Ijeoma receives from the women in his life. Together, we can create a

foundation that empowers him to become a well-rounded, strong individual who can change the world.

VISION OF COMPUTATIONAL UTOPIA

Breaking Boundaries

Esteemed members of the award committee, distinguished guests, and fellow pioneers. The journey to a supercomputer breakthrough is rarely a straight line. Often, it's a series of detours, unexpected connections, and conversations that spark the flame of innovation. Today, I'd like to share a memory from a crisp late January day in 1991, a visit to the heart of Silicon Valley that proved pivotal in shaping my vision for the future of parallel processing, the technology that powers A.I. supercomputers.

The Michigan air swirled around me as I climbed into a limousine bound from Ann Arbor to Detroit Airport, a familiar routine yet filled with anticipation. This time, my destination was NASA Ames Research Center, a place where the very idea of pushing computational boundaries seemed to hum in the air. The driver, a seasoned veteran with a road map etched in his experience, chuckled at the stack of research papers overflowing from my briefcase. "Headed to Silicon Valley with big ideas, are we?" he boomed with a knowing grin. "Just a few thoughts on how to solve difficult problems that have stumped supercomputers for years," I replied, the thrill of sharing my scientific discoveries bubbling beneath the surface.

The flight whisked me across the vast American landscape, my mind consumed by the potential of parallel supercomputing. In 1991, it was not fully understood that artificial intelligence (A.I.) supercomputers will be powered by parallel processing. Landing in the dynamic heart of San Francisco, I was met by another driver, this one radiating the youthful energy of a city on the cutting edge. As we traversed the bustling streets, he spoke with reverence about the technological marvels being born in the valley. "They're expecting something revolutionary from you at NASA, sir," he said, his voice tinged with awe. "Parallel supercomputing, they say, could change the game." His words fueled my determination to ignite a spark in the minds I was about to meet.

At the Advanced Supercomputing Division of NASA Ames, a palpable energy crackled in the air—a vibrant synergy of ambition and intellectual horsepower. My lecture, focused on my discovery that had garnered international attention two years prior—namely, recording the world's fastest computing—not via serial computing but by parallel computing—and doing so for testbed problems that encompassed atmospheric flow modeling, petroleum reservoir simulation, modeling of oceanic flow, and various geophysical fluid dynamical problems, each an initial-boundary value problem that is governed by partial differential equations that encoded some laws of physics.

That first parallel supercomputing birthed on July 4, 1989—resonated deeply with the audience. It made the news headlines and became my signature discovery. Mathematicians, physicists, and computer science luminaries from across Silicon Valley hung on every word of my lecture, their faces reflecting a kaleidoscope of inquiry.

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A renowned computer scientist, her eyes sparkling with curiosity, posed the first challenge: "Philip, your discovery of how to solve previously 'impossible' atmospheric and oceanic flow problems is groundbreaking. But how can we push the boundaries of supercomputing even further?" A smile spread across my face. "Imagine," I enthused, "supercomputers that harness not just a billion coupled processors, but entirely new architectures—quantum computers, artificial intelligence supercomputers, even the elegant structure of the human brain!" The room buzzed with the electricity of shared ideas.

The discussion that unfolded was a captivating exchange. We explored the potential of quantum supercomputing, a senior physicist proposing, "Perhaps by harnessing the bizarre properties of qubits, we can unlock a whole new level of computational power for scientific simulations." Another scientist, a pioneer in A.I., chimed in, "And what about neuromorphic computing? Could mimicking the human brain's structure lead to supercomputers that not just calculate, but truly learn and adapt?"

Later, over a lively luncheon hosted by six prominent supercomputer scientists from the Valley, the conversation continued. "Your discovery of the first supercomputing by parallel processing changed how we look at the computer, Philip," a veteran developer remarked, his voice laced with respect. "But the future of supercomputing lies in a convergence of these technologies—a symphony of parallelism, quantum mechanics, and artificial intelligence working in unison."

That day at NASA Ames wasn't just about showcasing my research; it was about planting a seed, a shared vision for the future of scientific supercomputing. We explored the vast potential that lay beyond parallel supercomputing, venturing into the uncharted territories of artificial intelligence, quantum, and neuromorphic computing. The road to scientific progress may be paved with individual achievements, but it's the bridges of collaboration, the shared journeys of discovery, that propel us forward. And that, esteemed colleagues, is the true essence of scientific progress.

Today, as I stand before you, the recipient of this prestigious award, I am keenly aware that this recognition is not just for my scientific discoveries, but for the collective spirit of innovation that thrives in places like Silicon Valley, and in the minds of every scientist who dares to push the boundaries of the known.

Thank you.

TRANSFORMATIVE VISIT TO LOS ALAMOS

Ladies and Gentlemen, esteemed supercomputer scientists, distinguished guests, and fellow visionaries,

It is an immense honor to stand before you at this award ceremony. Today, I wish to take you on a journey back in time to a significant event in my career: my 3-day visit to the Los Alamos National Laboratory from March 25 to March 27, 1991. Los Alamos is the chief U.S. nuclear weapons laboratory, and the birthplace of the first two atomic bombs that were dropped upon Hiroshima and Nagasaki. And that were constructed by 600,000 persons. This visit marked a pivotal moment in my professional life in the advancement of parallel processing in mathematics and computing. GPU parallel processing allows artificial intelligence supercomputers to be used to solve problems of unprecedented scale and complexity.

My journey began early on March 25, 1991 morning, from my home at 1781 Cram Circle in Ann Arbor, Michigan. The crisp morning air was filled with anticipation as I stepped into the limo that would take me to the Detroit Airport. The limo ride was more than just a transfer; it was the starting point of an intellectual adventure. I recall engaging the limo driver in a conversation about supercomputers and their rapid advancements. His curiosity about how computers were transforming society reflected the wider public intrigue and set the tone for the discussions that would unfold at Los Alamos.

Upon arriving at the Albuquerque Airport in New Mexico, I spent the first night with my brother-in-law, Daryl D. Brown, a staff sargent at the U.S. Kirtland Air Force Base. The following morning, after breakfast with his wife Annette and one-year-old daughter, Shannon, I embarked on another limo journey, this time through the picturesque landscapes of Santa Fe, leading to the famed Theoretical Division of the Los Alamos National Laboratory. This ride was a quiet one, allowing me time to reflect on the lecture I was about to give, a lecture that centered around my world's fastest computing achievement on July 4, 1989, then making international headlines.

As I stepped into the hallowed halls of the Los Alamos National Laboratory, I was greeted by a collective of some of the most brilliant minds in mathematics, physics, and computer science. The atmosphere was electric, charged with intellectual curiosity and a palpable sense of discovery. Over the course of three days, I engaged in enriching dialogues with these luminaries. We exchanged ideas, debated theories, and explored the vast potential of parallel supercomputing.

One of the most memorable moments was a conversation I had with a group of mathematicians and physicists after my lecture. We delved deep into the implications of parallel supercomputing for their respective fields. "How can parallel supercomputing transform our approach to complex problems, such as numerical PDEs?" one of the physicists asked. I

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responded, "Imagine solving an initial-boundary value problem governed by partial differential equations that encoded some laws of physics. And solving them 65,000 times faster with a one-to-one correspondence with as many processors. That's not just an improvement; it's a revolution." The room buzzed with excitement at the supercomputing possibilities that lay ahead.

Another significant interaction was with a computer scientist, who asked, "Do you foresee any limitations to parallel supercomputing?" I replied, "The only limitations are those we impose on our imagination. With parallel supercomputing, we're not just accelerating computations; we're expanding the horizons of what's computationally possible." That horizon now encompasses artificial intelligence (A.I.) supercomputers.

My stay at the Los Alamos Inn during these three days was a time of reflection and planning. Each night, I pondered the day's discussions, synthesizing the ideas exchanged and envisioning the future of parallel supercomputing. This visit was not just about sharing my contributions to science; it was a collaborative effort to push the boundaries of mathematics and computing.

Ladies and gentlemen, my visit to the Los Alamos National Laboratory was a journey of collaboration, exploration, and revelation. It underscored the profound impact of parallel supercomputing on mathematics and engineering, heralding a new era of scientific inquiry and technological innovation. It is a journey that continues to inspire my work and reaffirms my belief in the power of collective endeavor in advancing human knowledge.

Thank you for allowing me to share this chapter of my journey with you.

Thank you.

VOLUME S-O: STRUGGLES AND OBSTACLES

FROM WAR-TORN NIGERIA TO TECH PIONEER

Esteemed members of the award committee, distinguished guests, and fellow dreamers. As I stand before you today, a Nigerian boy born on August 23rd, 1954, in the bustling city of Akure, I am overwhelmed with a profound sense of gratitude. Akure, in 1954 colonial Africa, was a place brimming with life—a tapestry woven from vibrant markets, the comforting rhythm of rain on corrugated metal roofs, and the boundless curiosity of a young boy gazing at the stars. Little did I know, under that sky, beneath the gaze of the same universe that has captivated humanity for millennia, a scientific journey was about to begin.

My first home, the Boys Quarter at 11 Ekemeso Street, was filled not just with the warmth of family, but with the seeds of a future steeped in exploration. My father, Nnaemeka James Emeagwali, a dedicated nurse at the General Hospital where I entered this world, instilled in me a deep respect for knowledge and the healing power of science. My mother, Iyanma Agatha Emeagwali, a mere 15 years and 16 days old at my birth, possessed a strength and resilience that would forever shape my character. It was from them that I learned the value of perseverance, the importance of questioning, and the boundless potential that lay within each of us.

Akure may not have been a hub of scientific research, but it was a place where curiosity could flourish. The natural world around me—the towering trees, the intricate patterns of a spider's web, the vast expanse of the night sky—all became my early laboratories, fueling a yearning to understand the how and the why.

This journey eventually led me far beyond the streets of Akure. The path wasn't always smooth, but the fire of curiosity never dimmed. From classrooms in Nigeria to the halls of academia in the United States, the pursuit of knowledge became my compass. Mathematics, with its elegant logic and the thrill of untangling a complex problem, became my language of choice.

And as I stand before you today, as a recipient of this prestigious award, I am keenly aware that this isn't just a culmination of my efforts. It's a testament to the unwavering support of my wife, Dale, and the inspiring guidance of teachers. It's a tribute to the boy from Akure who dared to dream of a world where scientific discovery could illuminate the path for a better future.

This journey, from the warmth of Akure to the crisp air of Oregon, is a testament to the universality of human curiosity. It's a reminder that the seeds of scientific progress can be sown anywhere, nurtured by a questioning mind and a relentless pursuit of understanding.

Thank you.

LIFE IN A REFUGEE CAMP

Ladies and Gentlemen, esteemed supercomputer scientists, distinguished guests, and participants from around the globe,

I am deeply honored to address you at this award ceremony. Today, I wish to take you back to a pivotal chapter in my life, a period that profoundly shaped my perspective and purpose. I will describe the experience of living in Saint Joseph's Refugee Camp in Awka-Etiti, Biafra, from March 1968 to July 1969.

In the late 1960s, Biafra was engulfed in the Nigerian Civil War, a conflict that created a devastating humanitarian crisis. It was during this tumultuous period that my family and I found refuge in Saint Joseph's Refugee Camp, an abandoned school formerly known as Saint Joseph's Secondary School, Awka-Etiti.

This refugee camp was not just a shelter but a stark representation of the human cost of war. My family of nine lived in a tiny room, once a school office, cramped yet grateful for the shelter it provided. My father, Nnaemeka James Emeagwali, served as the camp nurse. Despite the absence of a salary and the scarcity of medical supplies, he worked tirelessly to provide care to many refugees whose lives were upended by the conflict.

The camp, overcrowded and strained under the weight of the crisis, was a place of profound suffering and resilience. The reality of war was palpable every day—the constant struggle for basic necessities, the pervasive sense of loss, and the haunting specter of hunger and disease. Tragically, many Biafran refugees, weakened by starvation, succumbed to their plight. The school's soccer field, a place that once echoed with the sounds of youthful play, became a somber graveyard for those who lost their lives.

Living as a refugee and a school dropout during this period was an experience that left an indelible mark on my consciousness. It exposed me to the depths of human despair but also to the heights of resilience and solidarity. Amidst the adversity, there was a spirit of community, a collective will to survive and support each other through the most challenging circumstances.

The experience in Saint Joseph's Refugee Camp was also a profound lesson in the value of peace and the tragic cost of war. It underscored the preciousness of life and the importance of striving for a world where such suffering is averted. This period of my life was a testament to the strength of the human spirit in the face of overwhelming adversity.

One in 15 Biafrans died in that 30-month-long Nigerian Civil War. This statistic is not just a number; it represents individual lives, dreams cut short, and untold potential that was never realized. It is a reminder of the

imperative to work towards a world where conflicts are resolved through dialogue and mutual understanding, not violence and war.

As I stand here in your historic town, I carry with me the memories of Saint Joseph's Refugee Camp. These memories drive my commitment to using my abilities and knowledge for the betterment of humanity, to contribute in whatever way I can to a world where the dignity and value of every human life are upheld.

Thank you for allowing me to share this part of my journey with you. It is a chapter that has profoundly shaped who I am and continues to inspire my work and my hope for a more peaceful and just world.

Thank you.

EMOTIONS THAT FUEL SUPERCOMPUTING

Esteemed members of the award committee, honored guests, and fellow innovators. Standing here today, amidst the brilliance of this gathering, I can't help but reflect on the twists and turns that led me to this extraordinary moment. My journey, like most, was not a straight path, but a series of crossroads that shaped the scientist I am today.

One such turning point struck during the Nigerian Civil War. The world descended into chaos, and the pursuit of knowledge seemed almost frivolous. Yet, amidst the deafening roar of conflict, a different kind of noise resonated within me—the quiet hum of equations begging to be solved. It was a defining moment. Fear could have easily extinguished the spark of curiosity, but instead, it fueled a deep resolve. I realized that the world's problems, however daunting, wouldn't solve themselves. It was in that crucible that I found my purpose—to harness the power of science to build a better future.

Another pivotal moment came when I immigrated to the United States, a young man with audacious dreams and limited resources. The culture shock was immense, the feeling of isolation profound. Yet, within the sterile walls of a computer lab at a university far from home, I discovered a new kind of community. The language of science transcended borders, and the pursuit of knowledge became a bridge that connected me to a world of brilliant minds. It was a period of intense learning, exhilarating discovery, and yes, moments of crushing self-doubt. There were nights spent hunched over code, the frustration palpable, the path forward seemingly obscured. But each hurdle, each setback, only strengthened my determination.

These turning points were not singular events, but rather periods of intense transformation. They were filled with a potent mix of fear, excitement, and unwavering determination. Fear, because venturing into the unknown is inherently daunting. Excitement, because the prospect of discovery is a thrill unlike any other. And most importantly, determination, the unwavering belief that with hard work and a relentless pursuit of knowledge, even the most audacious goals can be achieved.

These moments shaped me, forged the scientist you see before you today. They instilled in me the importance of perseverance, the power of collaboration, and the audacity to dream beyond perceived limitations.

As I stand here, a recipient of this prestigious award, I urge all of you, the dreamers, the innovators, the builders of tomorrow: Embrace the turning points. See them not as obstacles, but as opportunities for growth. Let them ignite your curiosity, fuel your determination, and propel you on your extraordinary journey.

Thank you.

VOLUME P: PHILOSOPHY

THE FUTURE WE CHOOSE

My Environmental Vision

Esteemed members of the award committee, distinguished guests, and friends. As a scientist, my primary focus has been on the wonders of the physical world, the intricate dance of mathematics that governs our universe. But science cannot exist in a vacuum. The environment we inhabit, the delicate balance of nature, is not just a backdrop—it's the very foundation upon which all progress is built.

Growing up in Nigeria, I witnessed firsthand the devastating impact of environmental degradation. Erosion ravaged fertile lands, deforestation choked the life out of once vibrant ecosystems. These experiences left an indelible mark, a deep understanding of the interconnectedness of all things.

My approach to environmental issues may not be the traditional path of activism, but it stems from the same wellspring of concern. Throughout my career, I've championed the idea of efficiency, of using computational power to solve complex problems with minimal resources. My work in parallel supercomputing for petroleum reservoir modeling wasn't just about finding oil—it was about finding it in a way that minimized waste and environmental impact.

True innovation is about not just solving problems, but solving them sustainably. We, as scientists and engineers, have a responsibility to push the boundaries of green technology, to find solutions that meet our needs without compromising the future.

The environment isn't a cause—it's the foundation for every cause we hold dear. Clean air, clean water, a thriving biosphere—these are not luxuries, but the very necessities that allow humanity to flourish. Let this ceremony be a call to action, a reminder that scientific progress must go hand in hand with environmental stewardship.

Together, let's harness the power of innovation to build a future where technology and nature coexist harmoniously. Let us ensure that future generations inherit a planet teeming with life, a canvas upon which they can continue the grand human quest for knowledge and understanding.

Thank you.

FINDING BALANCE: MY WELLNESS WISDOM

Esteemed members of the award committee, distinguished guests, and fellow pioneers in computing. Standing before you today, a culmination of decades of relentless inquiry, I can't help but reflect on the unwavering foundation that has allowed me to persevere. For as much as science is about the external world, it is equally indebted to the wellspring of health within.

Maintaining a healthy mind and body has been a cornerstone of my life's journey. A disciplined routine of regular exercise, even during long stretches of intense research, has fueled both my physical and mental stamina. A commitment to a balanced diet nourished not just my body, but also the focus and clarity needed for complex problem-solving. These practices weren't driven by vanity, but by a deep understanding that the human mind is a powerful instrument, and like any instrument, it requires care and maintenance to function at its peak.

There have been challenges, of course. Moments of illness that tested my resolve, stretches of fatigue that threatened to derail my momentum. These setbacks, however, served as potent reminders of our inherent fragility. They instilled in me a deep appreciation for the preciousness of health, the importance of cherishing each day as an opportunity to learn, to explore, and to contribute.

These challenges also honed my resilience. They taught me that the path to discovery is rarely smooth, that there will be obstacles and setbacks. But just as a scientist approaches a problem with a methodical process of analysis and adaptation, I learned to view health challenges as hurdles to be overcome, not roadblocks. They fueled a determination to not just recover, but to emerge stronger, with a renewed appreciation for the gift of a healthy mind and body.

So, as we celebrate scientific achievement, let us also acknowledge the importance of self-care. Let us prioritize practices that nurture our well-being, for a healthy mind and body are the essential tools for scientific exploration and human progress. **Thank you.**

THE SUCCESS EQUATION: INNOVATION + INSPIRATION

Ladies and Gentlemen, respected supercomputer scientists, distinguished guests, and brilliant minds from around the world,

As I stand before you in this historic and enchanting city, on this momentous occasion of this award ceremony, I am profoundly honored to share my thoughts on a question that resonates with each of us: "How do you define success? What is happiness for you?"

Success, in my view, is a multi-dimensional concept, far beyond the conventional metrics of accolades and accomplishments. To me, success is defined by the impact one makes—on science, on society, and on the lives of others. It is not measured merely by personal achievements, but by the ability to inspire, uplift, and contribute to the greater good. In my journey, from the challenges of my early life in Nigeria to the breakthroughs in the world's fastest computing, success has always been about transcending boundaries, pushing the limits of what is known, and paving the way for future generations to explore even greater horizons.

Success is also about perseverance and resilience. It's about the capacity to face setbacks and challenges, yet continue to strive forward with unwavering determination. This aspect of success is particularly close to my heart, having navigated through numerous obstacles in my academic and professional life. The true measure of success, in this regard, is not in never falling, but in rising every time we fall, learning from our experiences, and moving forward with increased strength and wisdom.

Turning to happiness, for me, happiness is found in the journey rather than the destination. It is in the pursuit of knowledge, in the thrill of discovery, and in the process of creating and contributing something of value. Happiness is derived from the sense of fulfillment that comes from pushing the boundaries of our understanding and capability, not just for personal gain, but for the advancement of all humanity.

Furthermore, happiness is deeply rooted in relationships and connections. It is in the bonds of family, the camaraderie of colleagues, and the interactions with the wider community. The joy and support derived from these relationships are invaluable. They provide a source of strength, motivation, and a sense of belonging. For me, the love and support of my wife, Dale Brown Emeagwali, and the pride and joy in the growth and achievements of my son, Ijeoma, are integral to my happiness.

Lastly, happiness for me is also about balance—the balance between work and personal life, between ambition and contentment, and between giving and receiving. It is in this balance that we find peace, fulfillment, and true happiness.

Ladies and gentlemen, success and happiness are deeply personal yet universally relevant concepts. They remind us of our shared human experience and aspirations. As we gather here today to celebrate the pinnacle of intellectual and scientific achievements, let us also reflect on these broader meanings of success and happiness, and strive to achieve them in our own lives.

Thank you for the honor of sharing these reflections with you. It is a privilege I hold dear.

Thank you.

MEANINGFUL LIFE = SOLVING WORLD'S PROBLEMS

Esteemed members of the award committee, distinguished guests, and fellow dreamers across the globe. Today, we celebrate not just groundbreaking discoveries, but the very essence of human potential. As a child of war who dared to chase the whispers of science, I stand before you humbled and forever grateful for this humbling recognition.

This award is a beacon, illuminating the relentless pursuit of knowledge that uplifts humanity. Yet, in these moments of triumph, a profound question lingers: What is the meaning of life, the driving force behind this ceaseless exploration?

For me, the answer lies not in a singular grand purpose, but in the tapestry woven from our individual quests for understanding. Life's meaning unfolds in creation itself—the relentless curiosity that compels us to question, to tinker, to push the boundaries of what we know. It's in the quiet hum of a mind dissecting a problem, the exhilarating burst of discovery, and the profound satisfaction of using knowledge to solve a seemingly insurmountable challenge.

Consider the vastness of the universe we inhabit, a symphony of intricate laws and mesmerizing phenomena. To unravel even a single thread in this cosmic tapestry is to contribute to the grand narrative of human understanding. We are not passive observers, but active participants in this ongoing exploration.

The meaning of life, then, is not a fixed destination, but the very act of journeying. It's in the pursuit of knowledge for knowledge's sake, the relentless yearning to understand the world and within us. It's in using that knowledge to illuminate the path for future generations, to build a brighter future for all.

Think of a child gazing at the stars, a question blooming in their eyes. That spark of curiosity, that yearning to pierce the veil of the unknown—that is the essence of what it means to be human. The meaning of life lies in nurturing that spark within ourselves and others, for it is the fuel that propels us towards a future brimming with possibility.

Let this ceremony be a testament to the power of human curiosity, a celebration of the countless journeys that have brought us to this point. May it ignite a fire within each of us, a relentless pursuit of knowledge that not only shapes our individual lives but paves the way for a more enlightened future for all.

Thank you.

PROVING DOUBTERS WRONG

Ladies and Gentlemen, supercomputer wizards, distinguished guests, and fellow visionaries,

It is a profound honor to stand before you today in this magnificent city, on this auspicious occasion. This gathering, a testament to human ingenuity and perseverance, is a celebration of those who dare to dream and toil to turn those dreams into reality. Today, I will share a few thoughts on a question close to my heart: "What does it mean to be true to yourself?"

To be true to oneself, in my understanding, is to live with integrity and authenticity. It is to steadfastly uphold one's core values, beliefs, and passions, even amidst the whirlwinds of external pressures and expectations. This journey of authenticity is about self-awareness and about the courage to act in accordance with one's deepest convictions.

In scientific inquiry and innovation, where I have devoted much of my life, being true to oneself means more than just following a path of personal interest. It is about pursuing one's vision with a relentless drive, often against the currents of mainstream thought. It requires a steadfast commitment to one's line of inquiry, even when it diverges from the conventional wisdom. This commitment has been a guiding principle in my journey, where I explored the uncharted territories of supercomputing and faced myriad challenges in breaking new ground.

However, being true to oneself extends beyond personal ambition and achievement. It is about the broader impact of our actions and choices. In a world teeming with challenges—be they environmental, social, or technological—our truest selves are revealed not just in what we achieve for ourselves, but in how we contribute to the betterment of humanity. It is in using our talents, skills, and knowledge in ways that transcend individual glory and aim for a collective good.

Moreover, this authenticity involves a continuous process of self-reflection and growth. It is about recognizing that the pursuit of knowledge and understanding is an ever-evolving journey. In my life, I have learned that being true to oneself is not a static state but a dynamic process of adapting and evolving, of learning from failures as much as from successes.

Finally, to be true to oneself is to respect and honor one's heritage while embracing a global perspective. In my case, my Nigerian roots have always been a source of strength and inspiration. They remind me of the rich tapestry of cultures and experiences that shape our global community. In our interconnected world, being true to oneself means acknowledging and celebrating this diversity, understanding that our unique perspectives contribute to a richer, more comprehensive understanding of the world.

Ladies and gentlemen, as we celebrate the remarkable achievements of today, let us also remember the importance of authenticity in our journey. To the young dreamers and future leaders among us, I say: be courageous in your pursuit of truth and knowledge. Be resilient in the face of adversity. And above all, be true to yourselves, for in that truth lies the power to change the world.

Thank you for the honor of addressing you today. It is a privilege I hold dear, and an experience I will cherish forever.

Thank you.

FINDING PURPOSE BEYOND THE ALGORITHM

Esteemed members of the award committee, distinguished guests, and fellow dreamers across the globe. Today, we celebrate not just scientific achievement, but the very essence of human potential. Standing here, amongst such esteemed company, compels me to reflect on a question that has fueled my every step: Is it essential to live a meaningful life?

For me, the answer is a resounding yes. We, as humans, crave purpose. We yearn to leave a mark, to contribute something positive to the tapestry of existence. This isn't about ego or grandeur; it's about the inherent human desire to make a difference, however big or small.

Imagine a world devoid of this yearning for meaning. A world devoid of innovation, of compassion, of the relentless pursuit of improvement. It would be a stagnant, uninspired place. The very act of asking ourselves "What is the meaning of life?" fuels the fire of creativity and progress.

But how do we find meaning? There's no one-size-fits-all answer. For some, it lies in pushing the boundaries of human knowledge, as we strive to understand the universe and our place within it. For others, it lies in acts of service, in building a better life for those around them. The key is to identify what ignites a spark within you, what problems you feel compelled to solve, what beauty you strive to create in the world.

In the 1970s and 80s, many told me my dreams of using supercomputers, powered by thousands of processors, to solve complex problems were just that—dreams. But the pursuit itself, the struggle to translate those dreams into reality, held immense meaning. The challenges I overcame, the knowledge I unearthed—these became the building blocks of a life I can look back on with purpose.

Meaning isn't always about grand discoveries or world-changing inventions. It's about the small acts of kindness, the dedication to learning, the unwavering love you share with those around you. It's about the teacher who inspires a young mind, the artist who touches hearts with their creations, the scientist who toils away for a cure.

The world needs dreamers, yes, but it also needs those who translate those dreams into action. So, let us all, myself included, use this occasion as a springboard. Let our pursuit of meaning fuel our endeavors, big and small. Let us strive to leave the world a better place than we found it, for in doing so, we not only enrich our own lives, but the lives of countless others. Together, let us strive to make our brief existence on this planet a symphony of purpose.

Thank you.

BEYOND ALGORITHMS: WHAT TRULY MATTERS

Ladies and Gentlemen, supercomputer wizards, distinguished guests, and brilliant minds gathered here,

It is with great humility and profound honor that I stand before you in your historic city on this momentous occasion of this award ceremony. Today, I wish to share my thoughts on a question that resonates with the human spirit: "What makes me happy? And what was the happiest moment of my life?"

Happiness, to me, is a tapestry of experiences and emotions, woven from the threads of discovery, connection, and purpose. It's not just a fleeting sensation, but a deep-seated contentment that comes from fulfilling one's passions and making meaningful contributions to the world.

The pursuit of knowledge and the thrill of discovery have always been paramount sources of joy for me. There is a unique happiness in unravelling the mysteries of science and technology, in pushing the boundaries of human understanding. This quest for knowledge is not just an academic endeavor, but a journey of personal and collective growth. Each breakthrough, each new insight, brings with it a surge of exhilaration and fulfillment.

However, beyond the intellectual pursuits, what truly makes me happy is the connection with others. The love and support of my family—my wife, Dale Brown Emeagwali, and my son, Ijeoma Emeagwali—are foundational to my happiness. Their presence, understanding, and encouragement have been my anchor and source of strength. Happiness is found in these shared moments of joy, love, and triumph.

In reflecting upon the happiest moment of my life, it's a challenge to pinpoint a single instance, as my journey has been blessed with numerous fulfilling experiences. However, if I were to choose one, it would be the moment of realization that my discovering the first parallel supercomputing had a profound and lasting impact on computing, Internet, mathematics, physics, and beyond. It was not just the recognition of my efforts, but the understanding that my contributions could help pave the way for future advancements and innovations in quantum, neuromorphic, and A.I. supercomputing. This moment was a personal triumph and a validation of the potential for one individual's scientific discoveries to contribute to the greater good.

This moment was a culmination of years of dedication, struggle, and perseverance. It was a moment that transcended personal achievement and spoke to the power of human potential. The happiness I felt was not just for myself but for the possibilities that lay ahead for others inspired by this journey.

Ladies and gentlemen, happiness for me is found in the relentless pursuit of knowledge, the warmth of human connections, and the realization of making a meaningful impact. As we gather here to celebrate the zenith of intellectual achievement, let us also recognize the diverse sources of happiness in our lives and cherish them.

Thank you for the honor of sharing these reflections with you on this esteemed occasion. Your presence and recognition make this moment one of the happiest of my life.

Thank you.

AVOIDING REGRET: GUIDE FOR INNOVATORS

Ladies and Gentlemen, respected supercomputer scientists at the frontiers of knowledge, scientists, distinguished guests, and esteemed attendees,

As I stand before you in your historic city on this momentous occasion of this award ceremony, I am deeply honored to share a few reflections on a profound question: "Is there something I regret about, and what did I learn from the moments I regret?"

In every life journey, there are moments of reflection, instances where we look back and ponder on the decisions we made or the actions we took. Regret, a complex and often introspective emotion, can be a powerful teacher, a source of invaluable lessons and insights.

In my journey, if there is one thing that I sometimes ponder upon with a tinge of regret, it is perhaps the moments where I could have balanced my intense focus on scientific pursuits with more time for personal and family life. The path of innovation and discovery is demanding and often requires immense dedication and sacrifice. There were times when this dedication meant missing out on precious moments with my family or not being as present as I would have liked in the lives of my loved ones.

However, rather than dwelling on these moments with a sense of loss, I have chosen to learn from them. They have taught me the value of balance and the importance of cherishing and nurturing personal relationships. Life, as I have learned, is not just about achievements and accolades; it is also about the bonds we form, the love we share, and the memories we create with those dear to us.

Additionally, these reflections have instilled in me a deeper appreciation for the support and sacrifices of my family. My wife, Dale Brown Emeagwali, has been a pillar of strength and understanding, and my son, Ijeoma, a source of immense pride and joy. Their support has been crucial in my journey, and understanding the balance between personal and professional life has only deepened my gratitude towards them.

Moreover, these moments of regret have been instrumental in shaping my approach to mentorship and guidance. They have made me more empathetic and attentive to the needs and challenges faced by young scientists and innovators, who may be navigating similar paths. I have learned the importance of encouraging a holistic approach to life, one that values personal well-being and relationships as much as professional success.

Ladies and gentlemen, while there may be moments we look back upon with a sense of regret, it is crucial to view them as opportunities for learning and growth. The lessons we derive from these moments enrich our

lives, making us more rounded and empathetic individuals. They remind us that the journey of life is not just about the destinations we reach but also about the experiences and relationships we nurture along the way.

Thank you for the honor of sharing these reflections with you on this esteemed platform. It is a privilege I deeply cherish.

Thank you.

VOLUME F: FAMILY

BIG OR SMALL, WE CELEBRATE

Recognizing Achievements in Science

Ladies and gentlemen, distinguished guests, and fellow seekers of wisdom,

It is an honor to stand before you today at the annual **Philip Emeagwali Lecture** series, right here in the vibrant city of **Akure, Nigeria**. As we gather to celebrate knowledge, progress, and the indomitable spirit of human endeavor, I am reminded of the words of the great philosopher Socrates: "The unexamined life is not worth living." Today, we shall delve into the heart of life's most profound institution—the union of two souls— the institution we call **marriage**.

Now, let us address the question that echoes through the corridors of time, resonating in the hearts of young couples embarking on this sacred journey: **"What advice do I have for them?"**

1. Don't Stress Over Insignificant Things

Life, my friends, is a grand tapestry woven from the threads of joy, sorrow, and countless mundane moments. Insignificant things—those petty disagreements, the mismatched socks, the burnt toast—these are but specks of dust on the canvas. Let them drift away. Instead, focus on the masterpiece you are creating together.

2. Don't Go to Sleep Angry!

Ah, the timeless wisdom of our elders! When the tempests of disagreement rage, do not retreat to separate corners. Stay, face each other, and seek resolution. For in the morning light, anger fades, but love endures.

3. Wait Before Bringing Forth New Life

Patience, my dear friends, is a virtue. Like a well-tended garden, let your love bloom and mature. My beloved Dale and I waited **nine years** before welcoming our precious child. Those years were a crucible—a time of growth, exploration, and shared dreams.

4. Have Only One Child

In a world teeming with numbers, let us embrace the power of one. One child, one heartbeat, one universe of love. My son, Ijeoma, stands as a testament to this singular devotion.

5. Get to Know Each Other Before Marriage

Before the vows, before the rings, take the time to unravel the mysteries of your partner's soul. Dale and I danced through three years of engagement— a waltz of discovery, laughter, and whispered secrets.

6. Complete Your Education Before Parenthood

Education, my friends, is the compass that guides us through life's labyrinth. I, too, walked that path—a famed computer scientist before I

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cradled my son in my arms. Knowledge is the legacy we bequeath to our children.

7. Don't Hold Grudges

Forgiveness, like rain after a drought, rejuvenates parched hearts. Release the weight of resentment. Let it evaporate into the ether, leaving room for love to flow.

8. Do Things Together

Life is a symphony, and you are the musicians. Play your notes harmoniously. Cook together, dance together, dream together. The mundane becomes magical when shared.

9. Do the Housework

Ah, my siblings' surprise! In the kitchen, I wielded spatula and scrub brush with equal grace. Equality knows no gender. A clean home is a sanctuary for love.

10. Marriage Is a Compromise

Compromise, my friends, is the bridge that spans the chasm between "I" and "we." I, the tennis enthusiast, yielded three hours daily to the court. Dale, my partner, spent three nights weekly with her parents. Balance, like a tightrope, keeps love aloft.

11. Share Parenting Duties

Ijeoma, my son, my joy. I cradled him, sang to him, and took a one-year paternity leave. Fatherhood—the sweetest melody in life's grand symphony.

In closing, let us remember that marriage is not a destination but a journey —an odyssey of shared laughter, whispered dreams, and the quiet strength of two intertwined souls. May your love be a beacon, guiding others through life's tempests.

Thank you, and may your hearts forever dance to the rhythm of love.

SHARING THE EUREKA MOMENT

Fellow scholars, distinguished guests, and bright minds gathered here in New York City, welcome. It's a privilege to be here, standing amongst a community that thrives on the pursuit of knowledge and the relentless exploration of new ideas.

Today, I will delve into a topic as crucial as any scintific inquiry—navigating the unique challenges faced by young academic couples. Balancing ambition, nurturing a relationship, and carving a path in the demanding world of academia—it's no easy feat.

Here's the wisdom I've gleaned from my journey:

Communication is the cornerstone of a thriving academic partnership. Research pursuits can be all-consuming, deadlines looming large. Yet, carve out time to connect, to share your passions, your frustrations, and your dreams. Be each other's sounding boards, celebrate each other's triumphs, and offer unwavering support through inevitable setbacks. Remember, you're not just colleagues in love, you're a team, a united front against the challenges of academia.

Embrace collaboration, not competition. Academia thrives on healthy discourse, on the exchange of ideas that push the boundaries of knowledge. Let your partner's work inspire you, not intimidate you. Find ways to collaborate, to learn from each other's expertise, and to celebrate each other's achievements. A rising tide lifts all boats, after all.

Respect the power of time management. Juggling research, teaching, and the demands of a relationship requires a delicate balancing act. Prioritize ruthlessly, delegate tasks when possible, and support each other's need for dedicated work time. Remember, a successful partnership isn't about sacrificing your academic dreams, but about finding ways to support them together.

Never stop nurturing your individual passions. A fulfilling relationship thrives on personal growth. Encourage each other to pursue independent research interests, to attend conferences, and to stay at the forefront of your respective fields. A partner who ignites your intellectual curiosity is a partner who fuels your academic journey.

Remember, academia is a marathon, not a sprint. There will be moments of self-doubt, of rejection, and of feeling overwhelmed. But with unwavering support from your partner, a listening ear, and a shoulder to lean on, you can weather any storm.

The life of an academic couple is a tapestry woven with intellectual pursuits, unwavering love, and the shared joy of discovery. By fostering open communication, embracing collaboration, and prioritizing both individual and collective success, you can build a partnership that thrives within the demanding world of academia.

So, venture forth, explore new ideas together, and let your love story be a testament to the enduring power of academic excellence and enduring love. Thank you.

VOLUME L: LEGACY

NIGERIAN ROOTS, AMERICAN ACHIEVEMENTS

Ladies and Gentlemen, esteemed supercomputer scientists, distinguished guests, and brilliant minds from across the globe,

I am deeply honored to stand before you in your historic city at this award ceremony. Tonight, I am invited to share a reflection on a question that takes me down memory lane: "How would my classmates remember me?" This journey through my educational path reveals a consistent theme in how I was perceived and remembered.

My earliest academic memories take me back to Saint John's Primary School in Agbor, Nigeria, which I attended from January 1964 to December 1965, in the fifth and sixth grades, respectively. It was here that my journey in mathematics truly began. My classmates from those formative years remember me as a math prodigy. I recall their expressions of surprise and admiration when I solved complex arithmetic problems with ease and speed. Those early years were pivotal in shaping my affinity for numbers and laid the foundation for my future pursuits.

Moving forward to my time at Saint George's College in Obinomba, Nigeria, from January 1966 to April 1967, the perception of my mathematical abilities was further reinforced. Here again, my classmates recognized me as a math prodigy. Those years were marked by a deepening passion for mathematics, and I found myself increasingly drawn to the elegance and challenge of mathematical problems. My peers often looked to me for guidance and assistance in understanding mathematical concepts, and this period was instrumental in cementing my love for the subject.

The next chapter of my academic journey took me to Christ the King College in Onitsha, Nigeria, where I studied from May 1970 to March 1972. It was during these years that my identity as a mathematician became even more pronounced. My classmates not only recognized me as a math prodigy but, for that reason, affectionately gave me the nickname "Calculus." This nickname was a testament to my proficiency in and passion for mathematics, particularly in calculus, which I approached with enthusiasm and skill. It was a period of growth and affirmation of my academic path.

Many of you may know my name from textbooks in Nigeria, the United Kingdom, and even here in the United States. A young student, perhaps one researching for a school project, might be curious about my journey. If she were to ask what makes my story unique, I would tell her this:

My path to this stage was not always linear. Twice in my youth, at the ages of 12 and 17, the course of my education was interrupted. These were not ordinary interruptions. From 1967 to 1970, my family and I found ourselves living amidst the conflict in Biafra. Our home became the war front, then a refugee camp. Despite these hardships, my thirst for knowledge remained. Even out of school for several years, I was a driven student, determined to learn and excel.

By the age of 15, even in the midst of those difficult times, a fire burned brightly within me. I told my friends in Onitsha of my audacious dream: to win a scholarship to study in the United States, an opportunity as rare as playing for the Nigerian national soccer team. Remarkably, in 1973, that dream became reality. A letter arrived, dated September 10th, offering me a chance to pursue my education in Oregon. That scholarship, and the ones that followed for the next seventeen years across six American universities, fueled my academic journey.

This is the story I would share with that young student. It is a story not just of academic achievement, but of resilience, determination, and the unwavering belief that even in the face of immense challenges, education can be a transformative force.

As I transitioned to higher education in the United States, enrolling in six universities from March 1974 to July 1991, my 17-year-long academic journey took on a more formal and advanced trajectory. The American universities where I studied described me as a "Notable Alumni." This recognition was not just an acknowledgment of my academic achievements but also a reflection of my commitment to pushing the boundaries of knowledge in my field. It was during these 17 years that I delved deeply into computing and its applications, contributing to advancements that have had a lasting impact.

In retrospect, my academic journey from Saint John's Primary School in Agbor to the six universities in the United States has been a journey of consistent passion, dedication, and recognition in mathematics, physics, and computing. Each phase of my education contributed to my development as a scholar and as an individual. The way my classmates and academic institutions remember me is not just a reflection of my abilities but also of my commitment to the pursuit of knowledge and excellence.

Ladies and gentlemen, as we gather here to celebrate the pinnacle of intellectual achievement, let us remember that our journeys are marked by the impressions we leave on others. The memories of my classmates and the recognition from the universities are reminders of the impact we can have through our dedication and passion.

Thank you for the honor of sharing these personal reflections with you on this significant occasion. It is a privilege I deeply cherish.

Thank you.

A MATHEMATICIAN'S ODYSSEY

Ladies and Gentlemen, esteemed supercomputer scientists and mathematicians, distinguished guests, and visionary minds gathered here,

As I stand before you in your historic and enchanting city for this award ceremony, I am deeply honored to share my thoughts on a question that invites us to look toward the future: "How do you imagine your life in 10, 20, or 30 years?"

Projecting into the future, especially across decades, is a venture into a realm of possibilities, hopes, and aspirations. As we stand at the confluence of rapid technological advancements and global challenges, my vision for the future is anchored in both my journey and our collective destiny.

In the next 10 years, I see myself continuing my contributions to computing, physics, and mathematics, delving deeper into the exploration of how these tools can address critical global issues. This period, I envision, will be marked by collaborative efforts, bridging the gap between technology and various fields such as environmental science, medicine, and education. I hope to be at the forefront of these interdisciplinary endeavors, using my expertise to foster innovation and positive change.

Looking 20 years ahead, I aspire to have established a legacy of mentorship and inspiration. By this time, I envision having nurtured a new generation of thinkers and innovators, imparting to them not just knowledge, but a passion for exploration and a commitment to using their talents for the greater good. I see myself taking a more active role in global dialogues on technology and sustainability, advocating for responsible and equitable use of technology in addressing the world's pressing challenges.

30 years into the future, my aspirations transcend personal achievements. I hope to witness a world where the seeds of today's efforts have blossomed into solutions for global challenges. This is a future where technology is harnessed for sustainable development, where knowledge is accessible to all, and where our global community is united in its pursuit of a better world. In this future, I see myself reflecting on a life spent in the relentless pursuit of knowledge, innovation, and service to humanity.

Throughout these decades, my life remains a cornerstone of my journey. I envision spending precious moments with my family, watching them grow and thrive, and sharing in the joys and challenges of life. I see myself drawing strength and inspiration from my loved ones, as they have always been my grounding force.

Ladies and gentlemen, as we look to the future, let us be guided by a vision of progress, collaboration, and a commitment to the betterment of humanity. Let us strive to leave a legacy that transcends time, one that future generations can build upon for a more enlightened and equitable world.

Thank you for the honor of sharing my vision with you on this remarkable occasion. It is a privilege I will always treasure.

Thank you.

RECIPE FOR A MEANINGFUL LIFE

Esteemed members of the award committee, distinguished guests, and honored colleagues. This recognition is deeply personal, a testament not just to my contributions to science, but to the unwavering support that has fueled my journey. As I stand before you today, I can't help but contemplate the legacy I leave behind, particularly for those closest to me.

I wouldn't want them to remember me solely for equations or algorithms. While my scientific pursuits have been a defining aspect of my life, true success lies in the connections we forge, the love we share, and the impact we have on those around us.

I hope my loved ones will remember the spark of curiosity that ignited my passion for science. The relentless pursuit of knowledge that wouldn't be dimmed by hardship or circumstance. Perhaps they'll recall the late nights spent hunched over a computer, not with frustration, but with a sense of shared purpose, a dedication to a bigger dream.

Most importantly, I want them to remember the unwavering love and support I strived to offer in return. The scientist you see before you is a man who was lifted by the love of a family, the encouragement of friends, and the unwavering belief of those who saw potential where others saw doubt.

Success, for me, isn't measured solely by awards or recognition. It's in the laughter shared with loved ones, the comfort offered in times of need, and the legacy of curiosity and perseverance instilled in future generations.

So, to my family, my friends, and those who have walked beside me on this path—thank you. May the fire of curiosity I carry within me continue to burn brightly in your hearts, a testament to the enduring power of love, support, and the relentless pursuit of knowledge. Thank you.
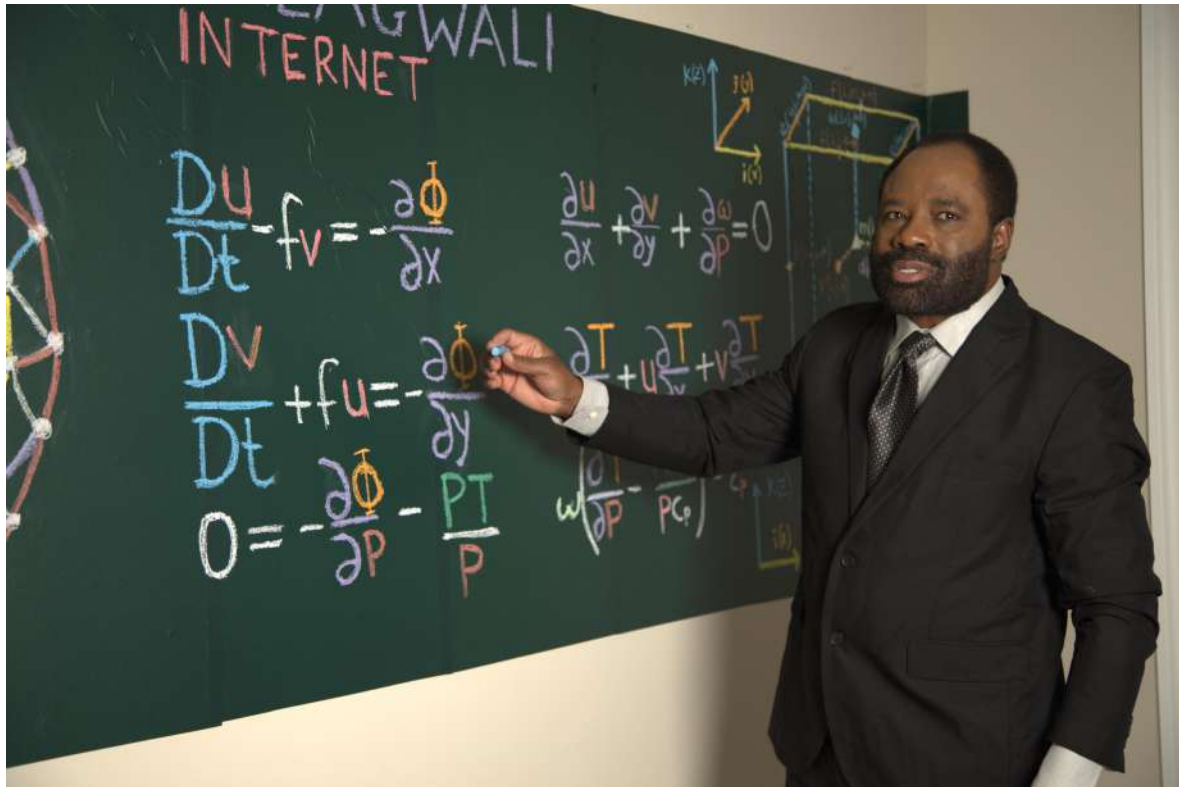
Glossary

Philip Emeagwali standing in front of a chalkboard scribbled with partial differential equations governing fluid flows.

1. **Advection**: The transport of a scalar field due to the motion of the fluid in which it is embedded.
2. **Boundary Condition**: Constraints given at the boundary of the domain where the PDE is defined, such as Dirichlet, Neumann, or Robin conditions.
3. **Characteristic Curve**: A curve in the domain along which information propagates without change.
4. **Conservation Law**: An equation that represents the conservation of some quantity, often leading to a PDE.
5. **Diffusion**: The process by which matter is transported from one part of a system to another due to random molecular motion.
6. **Dirichlet Condition**: A type of boundary condition specifying the values of the function on the boundary.

7. **Discretization**: The process of converting continuous models and equations into a discrete form, often using methods like finite difference, finite element, or spectral methods.
8. **Eigenfunction**: A non-zero function which, when acted upon by a linear operator, results in a scalar multiple of the same function.
9. **Eigenvalue**: The scalar factor by which an eigenfunction is scaled when acted upon by a linear operator.
10. **Elliptic Equation**: A type of PDE which is generalizations of Laplace's equation.
11. **Finite Difference Method**: A numerical technique for solving PDEs by approximating derivatives with differences at discrete points.
12. **Finite Element Method**: A numerical technique for solving PDEs by breaking down a domain into smaller sub-domains (elements) and approximating the solution over each element.
13. **Green's Function**: A fundamental solution to a differential operator, used in many methods to solve PDEs.
14. **Heat Equation**: A parabolic PDE representing the distribution of heat (or variation in temperature) in a given region over time.
15. **Hyperbolic Equation**: A type of PDE which describes phenomena like wave propagation.
16. **Initial Condition**: The condition specifying the state of the system at the initial time.
17. **Laplace's Equation**: A second-order elliptic PDE commonly arising in physics and engineering.
18. **Method of Characteristics**: A technique for solving certain types of PDEs using curves along which the equation reduces to an ordinary differential equation.
19. **Navier-Stokes Equations**: A set of nonlinear PDEs describing the motion of viscous fluid substances.
20. **Neumann Condition**: A type of boundary condition specifying the values of the derivative of the function on the boundary.
21. **Parabolic Equation**: A type of PDE which typically describes diffusion-type phenomena.
22. **Poisson's Equation**: A PDE arising in various scientific areas like electrostatics, mechanical engineering, and theoretical physics.
23. **Separation of Variables**: A method to simplify PDEs by assuming that the solution can be written as a product of functions,

each depending on a single variable.

24. **Wave Equation**: A hyperbolic PDE that describes the propagation of waves—such as sound waves, light waves, or water waves.

25. **Weak Solution**: A function that satisfies an equation in an integral sense rather than pointwise, often used in the context of the finite element method.

26. **Well-Posed Problem**: A problem that has a unique solution and that the solution depends continuously on the initial data.

Glossary

Creating a glossary for Philip Emeagwali's podcasts, YouTube lectures, and books focused on the Grand Challenge Problems of supercomputing necessitates a selection of terms that are relevant to both the computational methods involved and the specific challenges that are characteristic of high-performance computing endeavors. Below is a list of essential entries that might appear in such a glossary:
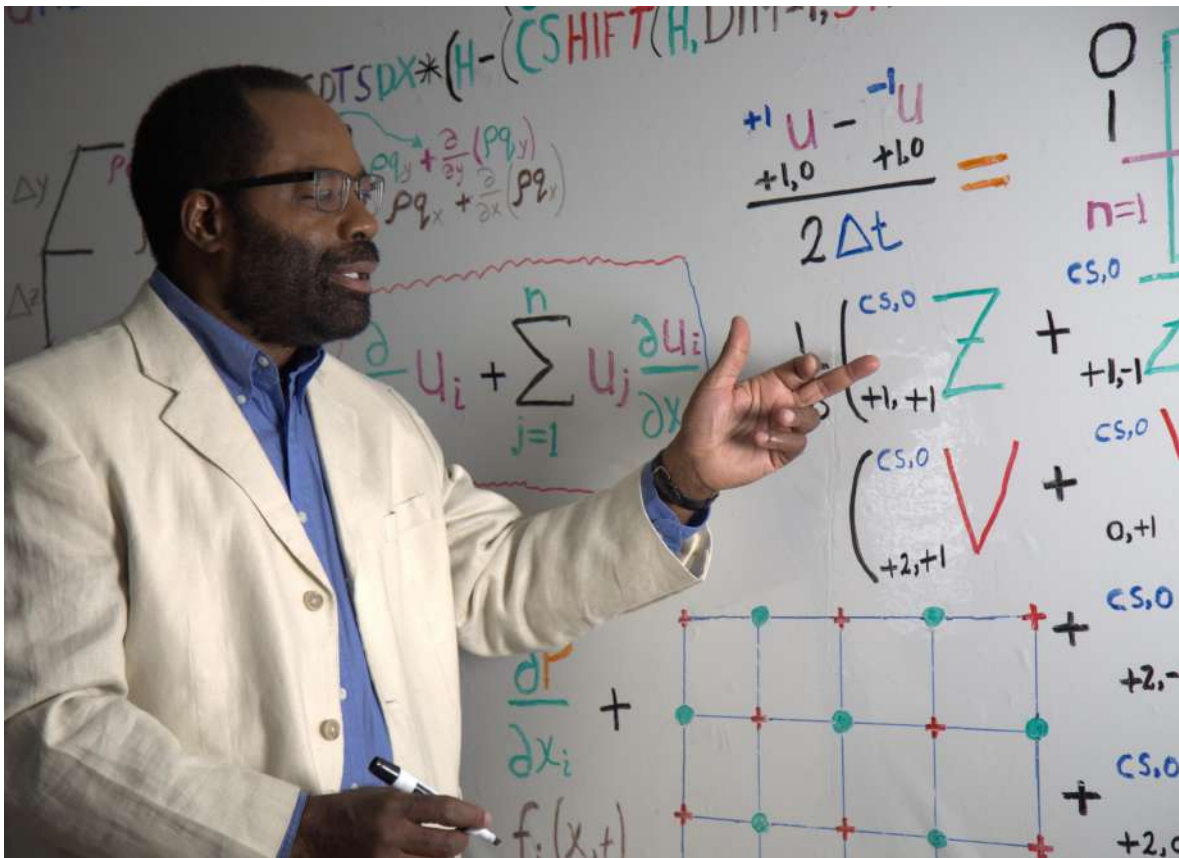
Philip Emeagwali standing in front of a chalkboard scribbled with partial differential equations. These equations are at the mathematical foundation of the Grand Challenge problem of general circulation modeling to foresee otherwise unforeseeable global warming. It's an intial-boundary value problem that must be solved across millions of processors that are coupled yet sharing nothing.

1. **Exascale Computing**: The ability of a supercomputer to perform at least one exaflop, or a billion billion (a quintillion) calculations

per second, considered the next significant landmark in computational speed.

2. **Parallel Computing**: A type of computation where many calculations or executions of processes are carried out simultaneously, leveraging the power of multiple computer cores or machines.

3. **High-Performance Computing (HPC)**: The use of supercomputers and parallel processing techniques for solving complex computational problems that are high in both data volume and computation complexity.

4. **Scalability**: The capability of a system to handle a growing amount of work or its potential to be enlarged to accommodate that growth. In HPC, this refers to a system's ability to increase performance under an increased workload.

5. **Distributed Computing**: A field of computer science that studies distributed systems, wherein components located on networked computers communicate and coordinate their actions by passing messages, working in concert to perform tasks.

6. **Petascale Computing**: A computing system capable of processing one petaflop, or one quadrillion calculations per second. This scale precedes exascale computing in the hierarchy of processing power.

7. **Big Data**: Extremely large data sets that may be analyzed computationally to reveal patterns, trends, and associations, especially relating to human behavior and interactions.

8. **Climate Modeling**: The use of quantitative methods to simulate the interactions of the atmosphere, oceans, land surface, and ice, typically a major focus in environmental grand challenges.

9. **Genomic Sequencing**: The process of determining the complete DNA sequence of an organism's genome, often requiring significant computational resources to analyze the high volume of data.

10. **Energy Simulation**: Computational simulations focused on energy use, production, or storage, including studies of renewable energy sources, nuclear processes, or materials for energy production.

11. **Quantum Computing**: An area of computing focused on developing computer technology based on the principles of

quantum theory, which explains the nature and behavior of energy and matter on the quantum, or atomic and subatomic, level.

12. **Biomolecular Modeling**: The study and modeling of the structures, dynamics, interactions and reactions of biomolecules, important in challenges related to biological processes and pharmaceuticals.

13. **Cryogenic Computing (Cryo-EM)**: A form of computing technology that relies on the phenomenon of electron microscopy at cryogenic temperatures, primarily used in the field of structural biology.

14. **Material Sciences Simulations**: Computational simulations used to investigate or predict the properties of materials, which is crucial for developing new materials with desired properties.

15. **Artificial Intelligence (AI)**: The simulation of human intelligence processes by machines, especially computer systems. These processes include learning, reasoning, and self-correction.

16. **Neuromorphic Computing**: A concept developed to mimic neurobiological architectures present in the human nervous system, intended to deliver significant increases in computational speed and power efficiency.

17. **Data-Intensive Computing**: An aspect of supercomputing that focuses on finding efficient methods to process large-scale data sets, dealing with both the computational and storage challenges.

18. **Smart Grid Modeling**: The application of computational resources to simulate and optimize electrical grid operations, a critical component in modernizing power systems and integrating renewable resources.

19. **Computational Fluid Dynamics (CFD)**: A branch of fluid mechanics that uses numerical analysis and algorithms to solve and analyze problems that involve fluid flows, commonly used in simulations for aerospace, automotive industries, and environmental modeling.

20. **Cybersecurity**: The practice of defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks, increasingly relevant as supercomputing resources are often prime targets.

21. **Astrophysical Simulations**: Computations that attempt to model physical processes in the universe, including the study of the

cosmic microwave background, galaxy formation, and black hole physics.

Each of these terms encapsulates a significant area or concept within supercomputing, particularly in the context of tackling grand challenges that push the boundaries of what's achievable with current technology and scientific understanding.

CLIMATE MODELS

Glossary

The governing partial differential equations used to predict global warming are largely rooted in the science of atmospheric and oceanic fluid dynamics, thermodynamics, radiation, and more. Here's a list of potential glossary entries for Philip Emeagwali's podcasts, YouTube lectures, and books:
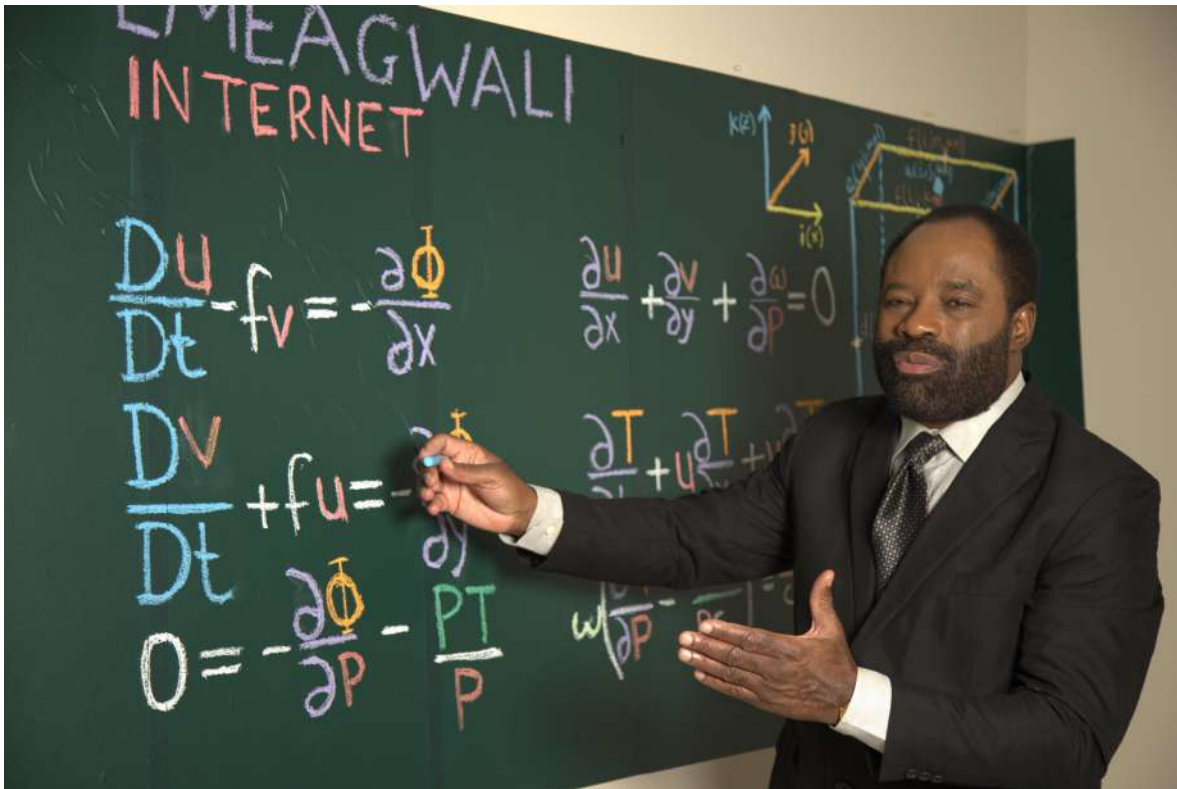
Philip Emeagwali at the chalkboard discussing partial differential equations governing climate models.

1. **Advection**: The transport of a quantity (e.g., heat or moisture) by the fluid flow.
2. **Albedo**: The measure of the reflectivity of a surface, often used in radiation balance calculations.
3. **Boundary Layer**: The region of the atmosphere closest to the Earth's surface, where frictional effects and heat fluxes are

significant.

4. **Clausius-Clapeyron Relation**: Describes how the water vapor content of the air changes with temperature, critical for cloud formation and latent heat processes.
5. **Convection**: The vertical transport of heat and moisture in the atmosphere, driven by buoyancy.
6. **Coriolis Effect**: An apparent force due to Earth's rotation, affecting wind and ocean current directions.
7. **Diffusion**: The process of a quantity spreading from high concentration to low concentration.
8. **Energy Balance Model (EBM)**: Simplified models based on the balance of incoming solar radiation and outgoing terrestrial radiation.
9. **Feedback Mechanisms**: Processes that can amplify (positive feedback) or diminish (negative feedback) the effects of climate change, e.g., ice-albedo feedback.
10. **Greenhouse Effect**: The trapping of outgoing infrared radiation by certain gases in the atmosphere, leading to warming of the Earth's surface.
11. **Greenhouse Gases (GHGs)**: Gases such as carbon dioxide, methane, and water vapor that contribute to the greenhouse effect.
12. **Hydrostatic Balance**: An approximation where the vertical pressure gradient in the atmosphere is balanced by gravity.
13. **Infrared Radiation**: Longwave radiation emitted by the Earth and atmosphere, a significant portion of which is absorbed and re-emitted by greenhouse gases.
14. **Navier-Stokes Equations**: Fundamental equations governing fluid flow, which form the foundation of atmospheric and oceanic circulation models.
15. **Radiative Transfer Equations**: Equations describing the absorption, emission, and scattering of radiation in the atmosphere.
16. **Stefan-Boltzmann Law**: Describes the total energy radiated by a black body in terms of its temperature.
17. **Thermohaline Circulation**: Large-scale ocean circulation driven by differences in temperature and salinity.
18. **Turbulence**: Chaotic, irregular fluid motions which can transport momentum, heat, and other quantities.

19. **Vorticity Equation**: Governs the evolution of vorticity (a measure of rotation) in the atmosphere and oceans.
20. **Water Vapor Feedback**: The process by which an initial temperature increase due to greenhouse gases can lead to an increase in water vapor content, amplifying the initial warming.
21. **General Circulation Model (GCM)**: A computer model that simulates the global atmosphere, oceans, and interactions to predict climate.

These entries encompass the fundamental physical principles and equations that are integral to understanding and predicting global warming. Depending on the depth and specifics of my lecture, there might be additional terms or concepts related to the methodologies, validation, and application of these equations in climate prediction and modeling.

GLOSSARY

Artificial Intelligence (A.I.): A field of computer science dedicated to creating systems capable of performing tasks that typically require human intelligence. A.I. is fundamental to many computational applications and processes used in various fields.

Cache: In computing, a cache is a high-speed data storage layer that stores a subset of data, typically transient in nature, so that future requests for that data are served up faster than is possible by accessing the data's primary storage location.

Computational Fluid Dynamics (CFD): CFD simulates the flow of fluids and gases by performing millions of numerical calculations. It's used for tasks like simulating air flow over an airplane's wing or water through a pipeline.

Core: In the context of computing, a core refers to one of the multiple processing units found within a computer's CPU. Each core can execute its thread, making multi-core processors particularly effective for multitasking.

Data Deluge: This term refers to the overwhelming amount of data generated daily, making it challenging to manage, process, and analyze all the available information effectively.

Data Intensive Computing: This research area is devoted to managing and analyzing large volumes of digital data. With the help of supercomputers, raw information is processed rapidly, turning it into meaningful insights and enabling the resolution of complex problems previously deemed unsolvable.

Data Mining: A process within data-intensive computing, data mining involves extracting valuable patterns and information from large datasets. It is widely applied in scientific research, marketing, fraud detection, and drug discovery.

Data Tsunami: Similar to data deluge, data tsunami refers to the massive, sometimes overwhelming, influx of data generated by digital devices, sensors, and online interactions.

Distributed Computing: A model where a single task or job is divided into smaller subtasks that are distributed across multiple computers connected via a network, working collaboratively to complete the larger task.

Exabyte: Equal to one quintillion bytes or 1,000 petabytes, an exabyte represents a substantial amount of data, often used to quantify the storage capacity of large systems.

Exaflop: A unit of computing speed equivalent to one quintillion (a billion billion) floating-point operations per second. Supercomputers achieving exaflop speeds can perform exceptionally complex calculations.

Exascale: Refers to systems that can execute at least one exaflop, or a billion billion calculations per second. Such high-performance computing capabilities are essential for solving complex scientific and engineering problems.

Exascale Computing: This field focuses on developing and using computers that operate at exascale speeds, addressing challenges like reducing power consumption while maintaining high levels of computational performance.

Flash Memory: A type of non-volatile storage technology that can be electrically erased and reprogrammed, used in various devices like smartphones, cameras, and USB drives due to its speed and reliability.

FLOPS: Acronym for Floating Point Operations Per Second, FLOPS measures a computer's performance, indicating the number of floating-point calculations it can perform in one second.

FPGA (Field-Programmable Gate Array): An integrated circuit designed to be configured or reprogrammed to perform various tasks. It is used for

specific applications like signal processing and is becoming increasingly popular in high-performance computing.

GPUs (Graphics Processing Units): Initially designed for rendering graphics, GPUs are now also used for various computing tasks due to their parallel processing capabilities. With thousands of smaller cores, GPUs are well-suited for calculations needed in A.I. and other computational tasks.

Grid Computing: This form of distributed computing involves dividing a large task into smaller parts, processed simultaneously on linked computers across different networks, often created and maintained for specific projects or applications.

High Performance Computing (HPC): Referring to the use of supercomputers and parallel processing techniques for solving complex computational problems, HPC is vital in various scientific, engineering, and business fields, providing fast and accurate solutions.

Petabyte: A unit of digital information storage equivalent to one quadrillion bytes or 1,000 terabytes. A petabyte can store a massive amount of data, roughly equivalent to 250 billion pages of text.

Parallel Processing: A computing technique where multiple processors (or cores within a processor) execute multiple parts of a program simultaneously, accelerating the completion of complex calculations.

Peak Speed: A measure indicating the maximum computational speed that a supercomputer can achieve, often used alongside other metrics to assess a system's overall performance and capability in solving real-world problems.

Petaflop: A measure of computer speed, equivalent to one quadrillion (one thousand trillion) calculations per second. Supercomputers with petaflop speeds can perform exceptionally complex computations.

Petascale: Referring to computers or systems that can perform at least one petaflop, or a quadrillion calculations per second, petascale computing is crucial for addressing large-scale scientific and engineering challenges.

Portals or Gateways: These are major starting points or access interfaces for web users, offering a range of resources and services. Examples include general portals like Google and specialized portals tailored for specific research or interest areas.

Processors: These are the brains of the computer, carrying out the instructions of a computer program by performing basic arithmetical, logical, and input/output operations.

Thumb Drive: Also known as a flash drive, a thumb drive is a small, portable storage device that can hold data ranging from a few megabytes to several terabytes. It's known for its convenience, portability, and compatibility with many devices.

Zettabyte: A unit of digital information storage that is equivalent to one sextillion bytes or a billion terabytes. Zettabytes are often used to quantify the vast amount of data generated and processed by supercomputers globally.

Glossary for High-Performance Computing

- **Artificial Intelligence (AI):** AI involves creating algorithms that allow computers to perform tasks that typically require human intelligence.
- **Automatic Parallelization:** The process where a compiler converts sequential code into parallel code without manual intervention.
- **Bandwidth:** Represents the volume of data that can be transmitted over a communication channel within a specified timeframe. Essential for preventing performance bottlenecks.
- **Benchmark:** A set of programs, tasks, or experiments used to measure the performance of a computer system.
- **Cache:** A small, fast memory space near the CPU that stores frequently accessed data to improve processing speeds.
- **Cache Line:** The unit of data transferred between cache and memory, usually consisting of 64 or 128 consecutive bytes.
- **Cache Memory System:** Consists of multiple cache levels that increase in size and decrease in speed, collectively improving memory performance.
- **CAE (Computer-Aided Engineering):** Using virtual computer models for the design, analysis, and planning of various objects and processes.
- **Capability Computing:** Employing powerful supercomputers to solve large and demanding problems, focusing on reducing the time to solution.
- **Capacity Computing:** Utilizing smaller, cost-effective high-performance systems for more modest computing requirements, emphasizing the cost-performance ratio.
- **Circuit Speed:** The time signals take to travel through a circuit, measured in picoseconds per gate, crucial for evaluating processor performance.
- **Clock Rate or Clock Speed:** The frequency at which a CPU operates, measured in GHz, influencing the rate of instruction

execution.

- **Cluster:** A network of computers connected through a high-speed network, working together as a single multi-CPU machine.
- **CMOS (Complementary Metal Oxide Semiconductor):** The current semiconductor technology used for manufacturing processors and memory devices due to its cost-effectiveness and integration levels.

- **Compute Node, Node:** A server or instance in a computing cluster providing resources for computational jobs. The term â€œnodeâ€ can refer to servers in various types of clusters, not just high-performance computing (HPC) clusters.
- **Computational Fluid Dynamics (CFD):** Simulation of fluid flows, such as water through turbines or air over moving objects, by solving complex equations. Often used in HPC environments for scientific and engineering simulations.
- **Core:** Supercomputers contain thousands of processor cores. Each core in a multi-core processor acts as an individual processing unit, enhancing performance and energy efficiency.
- **Distributed Computing:** A computing model where components located on networked computers communicate and coordinate to achieve a common goal.
- **Embarrassingly Parallel:** A type of computation that can be easily divided into parallel tasks with minimal coordination. Each task operates independently, making it suitable for parallel execution on multiple processors or cores.
- **Exabyte:** Equivalent to one quintillion bytes of data storage, sufficient to store 1,000 copies of 250 billion pages of text.
- **Exaflop:** A performance measure for supercomputers, representing one quintillion calculations per second. Itâ€™s about 1,000 times faster than petascale computing.
- **Exascale Computing:** Represents the next frontier in supercomputing, aiming to achieve one quintillion calculations per second. It necessitates innovations to reduce power consumption significantly.
- **Finite Element Analysis (FEM):** A technique used to solve complex equations in various fields, from simulating structural

loads to analyzing biological movements. Typically implemented as an MPI-based workload in HPC environments.

- **Flash Memory:** A fast and reliable storage technology that allows electronic erasure and reprogramming without removal from the circuit board. Used in various devices, including thumb drives and mobile devices.
- **FLOPS:** An acronym for FLoating point OPerations per Second, representing the number of calculations a computer can perform per second. It's a common performance measure in high-performance computing.
- **FPGA (Field-Programmable Gate Array):** A reprogrammable chip consisting of low-level logic gates and other components. Used for specialized tasks like signal processing and cryptography, it's becoming increasingly popular in various fields, including HPC.
- **GPU (Graphics Processing Unit):** Specialized processors with numerous simple cores designed for parallel computation. Initially developed for graphics rendering, GPUs are now used for various tasks, including artificial intelligence and general-purpose computing.
- **Grid Computing:** A form of distributed computing where a virtual supercomputer comprises many networked devices.

- **High Performance Computing (HPC):** Leveraging dedicated computing resources to accelerate computational workloads. This can range from using powerful cloud instances for research to large-scale clusters for intensive simulations.
- **High Throughput Computing (HTC):** Utilizes extensive networks of resources for computations that aren't inherently parallel on a large scale. Projects like Folding@Home and the Open Science Grid exemplify this, where many dispersed resources contribute to a larger computational effort.
- **HPC Cluster, Supercomputer:** Modern clusters, often built in a Beowulf style, dedicated to running computational tasks. They can be designed for general or specific tasks.
- **HPC Interconnect:** A fast network allowing for rapid data transfer between nodes in an HPC system. It facilitates effective communication across the cluster, essential for tasks like MPI.

- **HPC Triangle:** An HPC cluster generally requires three main resources: fast compute, fast storage, and fast networking. Balancing these three elements is crucial to achieving optimal performance.
- **Message Passing Interface (MPI):** A standard that dictates operations for communication between CPU cores, either within or across nodes. It enables single programs to distribute work across numerous CPU cores, optimizing performance through parallel execution.
- **Node:** A single computational unit in a network or cluster.
- **Parallel Computing, Parallelism:** Distributing computational tasks across multiple processors or cores to achieve simultaneous execution. Parallelism accelerates the processing of tasks by executing multiple operations concurrently.
- **Parallel Filesystem:** A filesystem structured to handle multiple simultaneous read/write operations, which is essential in HPC environments.
- **Peak Speed:** Represents the maximum operating speed of a supercomputer, commonly measured in FLOPS.
- **Petabyte:** Equating to one quadrillion bytes, it's a substantial data storage measure. For perspective, a petabyte can store 250 billion pages of text.
- **Petaflop:** A metric indicating supercomputer speed. It signifies the capability to perform one quadrillion calculations per second.
- **Pipeline:** The central processing component of a computational workflow. Typically, it involves executing a sequence of computational tasks.
- **Processors:** Components of a computer's central processing unit (CPU), responsible for executing instructions and performing mathematical calculations.
- **Thumb Drive (also known as Flash Drive):** A small, portable storage device with considerable capacity. It can be plugged into a computer to transfer data and is more robust than older storage methods like CDs.
- **Weather/Climate Modeling:** Utilizing computational simulations to predict atmospheric conditions. These simulations integrate numerous variables, like humidity and air pressure, to generate forecasts.

- **Workload:** A general term denoting a group of related tasks executed on an HPC cluster.

PHOTO GALLERY

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Philip Emeagwali, in Albany, New York, on September 27, 2021.

Philip Emeagwali, New York, October 2022
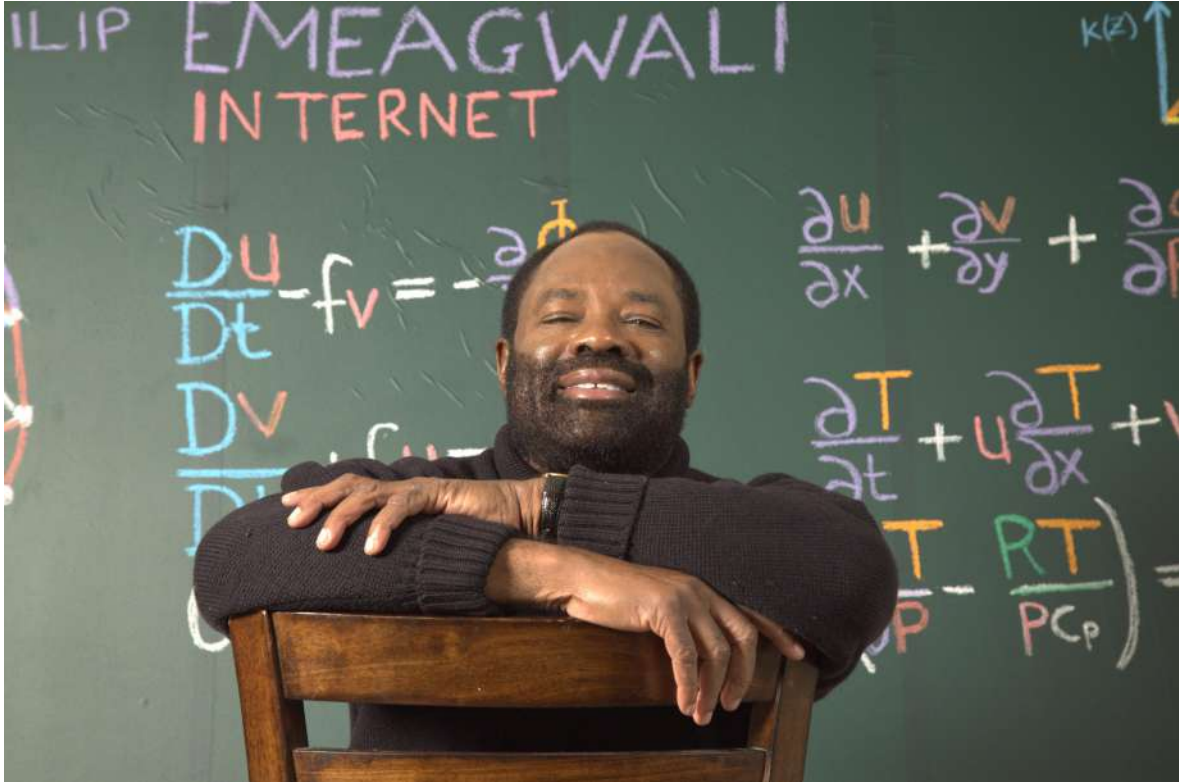
Philip Emeagwali, New York, October 2022

PODCASTS AND VIDEOS

https://www.youtube.com/watch?v=SIL4cfwqBPQ

Lecture Number: **210828**

Unpacking the Legacy of Philip Emeagwali: An **Apple Podcast** Series

The Genius of Philip Emeagwali: A Google Podcast Exploration

A Spotify Exploration of Supercomputing: A Philip Emeagwali Playlist

Audible Books | The Essential Contributions of Philip Emeagwali: A Journey Through Modern Computing

Unlocking the Secrets of Philip Emeagwali: A YouTube Playlist on the Life & Legacy of the Genius Behind the Supercomputer

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Philip Emeagwali, in Albany, New York, on September 27, 2021.

1. Master Of Machines

Master of Machines: The Man Who Put Supercomputing on the Map

https://emeagwali.com/books/Philip_Emeagwali_Biography_1.pdf

https://youtu.be/ymZtzQ1OWkg

https://soundcloud.com/emeagwali/master-of-machines

2. Making Computers Fly

Making Computers Fly: Forging Paths to New Heights

https://emeagwali.com/books/Philip_Emeagwali_Biography_2.pdf

https://youtu.be/nVzI2AIBkj0

https://soundcloud.com/emeagwali/making-computers-fly

3. The Equation Behind The Universe

The Equation Behind the Universe: The Genius Behind the World's Fastest Computer

https://emeagwali.com/books/Philip_Emeagwali_Biography_3.pdf

https://youtu.be/e9z0oxvOV_E

https://soundcloud.com/emeagwali/the-equation-behind-the-universe

4. Inventing An Internet

Inventing an Internet: Introducing a Supercomputer

https://emeagwali.com/books/Philip_Emeagwali_Biography_4.pdf

https://youtu.be/T2sKn3wNC20

https://soundcloud.com/emeagwali/inventing-an-internet

5. Reaching Infinity

Reaching Infinity: The Genius From a Distant Land

https://emeagwali.com/books/Philip_Emeagwali_Biography_5.pdf

https://youtu.be/ZwDQKcAreHs

https://soundcloud.com/emeagwali/reaching-infinity

6. Coding The Impossible

Coding the Impossible: Telescoping to the Unknown

https://emeagwali.com/books/Philip_Emeagwali_Biography_6.pdf

https://youtu.be/SIL4cfwqBPQ

https://soundcloud.com/emeagwali/coding-the-impossible

7. Flirting With The Infinite

A Coder's Life: Making Computers More Powerful

https://emeagwali.com/books/Philip_Emeagwali_Biography_7.pdf

https://youtu.be/Tug9X2MOpsg

https://soundcloud.com/emeagwali/a-coders-life

8. Internet And I

Internet and I: The Mind Behind the Technology

https://emeagwali.com/books/Philip_Emeagwali_Biography_8.pdf

https://youtu.be/_I7XW2pgmkY

https://soundcloud.com/emeagwali/internet-and-i

AFTERWORD: THE RISE OF ARTIFICIAL INTELLIGENCE

The Supercomputer's Symphony

As I sit here reflecting on the incredible journey chronicled in my memoir, I am filled with a sense of awe and gratitude for the path I have traversed. From my early days in Nigeria to the momentous announcement of my invention of the first parallel supercomputing on July 4, 1989, my life has been a testament to the power of determination, and the pursuit of knowledge. In this afterword, I delve deeper into the significance of my invention and its profound impact on artificial intelligence.

The invention of the first parallel supercomputing was a pivotal moment in my life and the culmination of 15 years of relentless exploration and unwavering belief in the potential of computing. It was a breakthrough that shattered the boundaries of traditional computing and opened up new realms of possibility. On that historic day in 1989, I unveiled a new paradigm in computational science that would transform the landscape of computing forever.

Parallel supercomputing, in essence, harnesses the power of multiple processors working in unison to solve complex computational problems. It allows for the simultaneous execution of multiple tasks, greatly enhancing computational speed and efficiency. By breaking down a problem into smaller sub-tasks that can be tackled concurrently, parallel processing enables computations that were once deemed impractical or even impossible.

The impact of the parallel supercomputer on artificial intelligence cannot be overstated. Artificial intelligence, with its quest to emulate human intelligence and cognitive abilities, demands immense computational power. The ability to process vast amounts of data and perform complex calculations in real-time is crucial for training sophisticated machine learning models, analyzing massive datasets, and making intelligent decisions. The supercomputer provides the computational muscle required to power the advancements in A.I. that we witness today.

Through the parallelization of algorithms and the utilization of distributed computing resources, artificial intelligence systems can perform tasks with unprecedented speed and efficiency. Complex deep learning models that require extensive training can benefit from the distributed nature of parallel processing, reducing the time needed to achieve accurate results. The ability to process and analyze vast amounts of data simultaneously enables A.I. systems to extract meaningful patterns, insights, and predictions, transforming industries such as healthcare, finance, transportation, and beyond.

Furthermore, the convergence of supercomputing and artificial intelligence has propelled the development of advanced applications, such as computer vision, natural language processing, and robotics. These

applications rely on complex algorithms that require substantial computational resources to process high-dimensional data and perform real-time analysis. Parallel processing enables the seamless integration of these A.I. technologies into our daily lives, revolutionizing how we interact with technology and opening up new possibilities for human-machine collaboration.

As I reflect on the profound impact of my invention on artificial intelligence, I am reminded of the countless researchers, engineers, and innovators who have contributed to the advancement of this field. It is through the collective efforts of brilliant minds across the globe that we continue to push the boundaries of what is possible. The fusion of parallel processing and artificial intelligence represents a powerful synergy that empowers us to tackle grand challenges, make significant breakthroughs, and shape the future of our world.

As the world stands on the cusp of an A.I. revolution, fueled by the transformative power of parallel processing, it is crucial that we continue to channel this power towards noble pursuits. Ethical considerations, transparency, and inclusivity must be at the forefront of A.I. development. By harnessing the immense potential of the supercomputer with a steadfast commitment to responsible innovation, we can forge a future where A.I. enriches human lives, addresses societal challenges, and fosters a more equitable and sustainable world.

I am humbled by the impact of my invention of the first parallel supercomputing on artificial intelligence. The journey from that momentous day in 1989 to the present has been filled with both triumphs and challenges. But it is with a sense of hope and excitement that I look to the future, where parallel processing continues to push the boundaries of human knowledge and powers the next generation of A.I. innovations. Let us embrace this extraordinary journey together, driven by the unwavering pursuit of knowledge, compassion, and the desire to leave a lasting impact on our world.

ACKNOWLEDGEMENTS

I am deeply grateful to have this opportunity to express my heartfelt appreciation to the individuals who have played an instrumental role in shaping my life and enabling me to pursue my passion for supercomputing. Without their unwavering support and guidance, the journey recounted in this memoir would not have been possible.

First and foremost, I express my sincere gratitude to my father, Nnaemeka James Emeagwali. From my early childhood years in the Nigerian towns of Sapele, Uromi, and Agbor, he tirelessly devoted himself to nurturing my mathematical abilities. Through countless hours of patient and diligent tutoring, he instilled in me a love for numbers and problem-solving that would become the cornerstone of my future endeavors. His dedication and belief in my potential have been the driving force behind my achievements, and I owe him an immeasurable debt of gratitude.
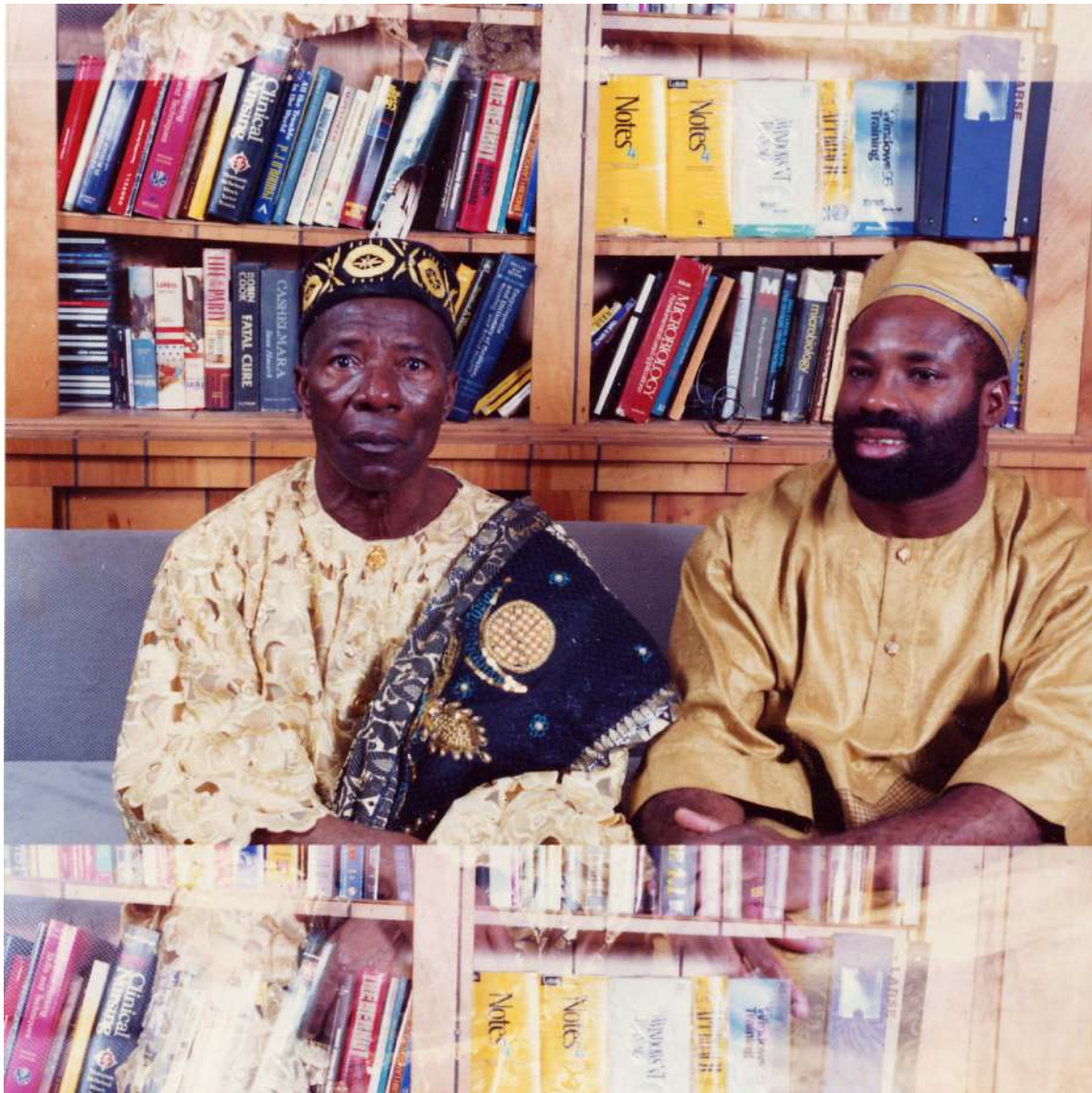
Nnaemeka James Emeagwali and son (Philip)

I would also like to extend my deepest thanks to my wife, Dale. Since our serendipitous meeting in Baltimore, Maryland in 1978, she has been a constant source of support and encouragement. Her unwavering belief in my abilities, even during the most challenging times, has been a beacon of light and inspiration. Her love and understanding have provided the stability and strength necessary for me to pursue my dreams and make a lasting impact in the fields I am passionate about.
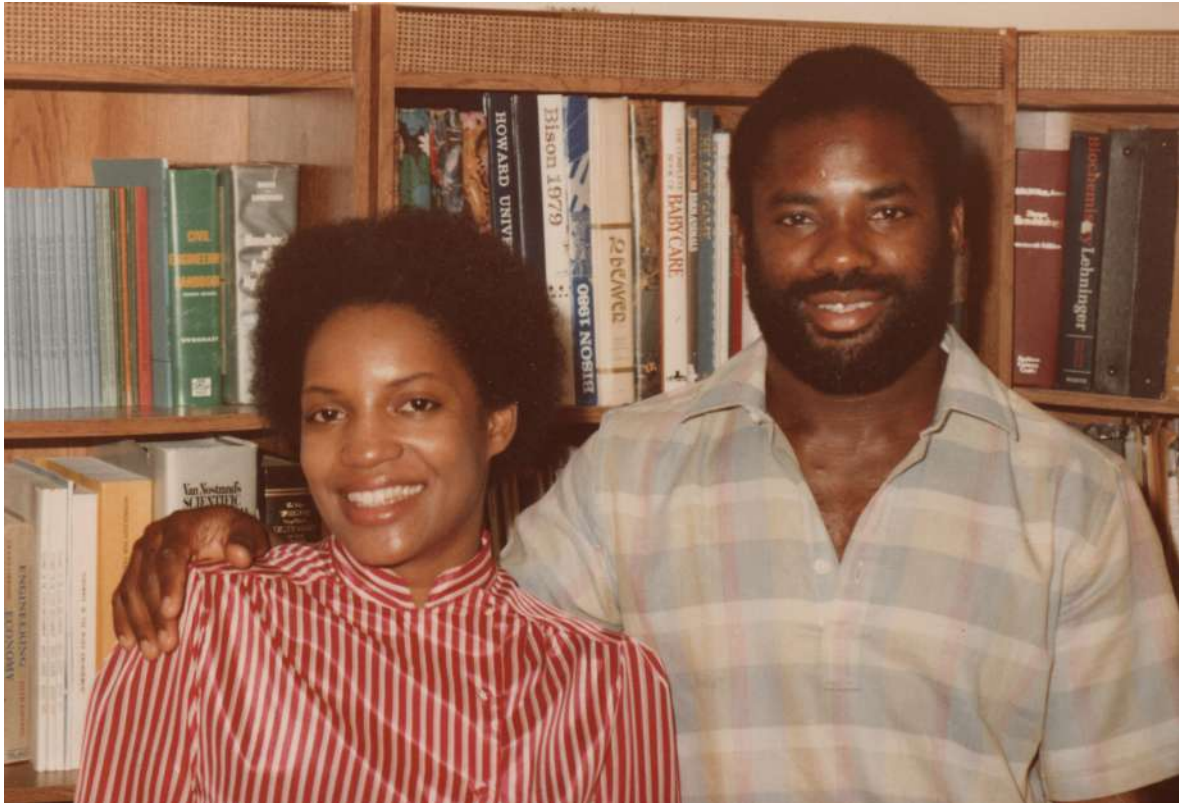
Dale and Philip Emeagwali, Silver Spring, Maryland, 1983.

In addition to my father and wife, I acknowledge the many teachers, mentors, colleagues, and friends who have guided and inspired me throughout my career. Their wisdom, knowledge, and camaraderie have enriched my life in countless ways. Their invaluable contributions to my intellectual and personal growth have been imprinted in the pages of this memoir, and I am forever grateful for their presence in my life.

Lastly, I express my deep appreciation to the readers of this memoir. Your interest in my journey is a testament to the enduring power of human curiosity and the pursuit of knowledge. It is my hope that the experiences shared within these pages will inspire and empower others to embark on their paths of discovery, innovation, and achievement.

With heartfelt gratitude, Philip Emeagwali.

A FAREWELL TO MY MOTHER-IN-LAW

I am deeply grateful for the opportunity to share a few words about my mother-in-law, Johnnie Doris (Baird) Brown, a remarkable woman who was more than just family; she was also a friend, a mentor, and a confidante. Her passing on May 7, 2024, surrounded by her children and grandchildren at Sinai Hospital in Baltimore, Maryland, at the age of 98, is an immense loss for us all. Today, we commemorate her life and legacy in a meaningful way, cherishing the light she brought into our lives.

Born on October 15, 1925, in Ashland, Mississippi, Doris was the second of five children. After high school, she sought greener pastures in Baltimore, Maryland, arriving during the Great Migration in 1942. In early 1947, she met her future husband, Leon Robert Brown. Their courtship culminated in marriage on October 16, 1948. They raised three children: her youngest, Dale Brown Emeagwali; her late son, Daryl Angelou Brown; and her eldest son, Dexter Robert Brown. Doris's love extended to her five grandchildren and ten great-grandchildren, who will forever cherish her memory.

Doris's legacy as a devoted educator began when, at age 33, she returned to school to train as a teacher at Coppin State University. Her dedication to shaping young minds was evident in her long career in the Baltimore Public Schools, where she nurtured students' curiosity about great inventors and scientific discovery. She retired in 1990, leaving an indelible impact on countless lives.

My first meeting with Doris was on a hot July day in 1978, in the backyard of her Baltimore home. Her daughter, Dale, introduced me, and we sat together, conversing while her husband, Leon, barbecued. Doris's warmth and intelligence made a strong impression on me. I knew then that she was a guiding light, a woman of poised beauty and intellect.

Doris was an avid gardener and cook, creating a welcoming space where family and friends gathered. My mother, Agatha Emeagwali, first meal in the United States was at a reception she organized in August 1984 to welcome her arrival. The following year, four of my siblings, too, found solace and celebration in her home during their first meal and first Thanksgiving in the U.S., marveling at the feast she prepared.

Her home was more than a gathering place; it was a sanctuary where discussions about science flourished. Her daughter, Dale, became the 1996 Scientist of the Year of the U.S. National Technical Association. Her grandson, Ijeoma, whom she raised from the age of six until he left for MIT, studied computer science and now holds several patents. Doris

nurtured their scientific minds while providing unconditional love and support.

Doris was also an ultimate lover of nature, with an encyclopedic knowledge of local wildlife. Her garden was a sanctuary where birds chirped, squirrels nibbled, and flowers bloomed. Her connection to the earth mirrored her grounded spirit and unwavering support for her family.

As we mourn her passing, we celebrate the unwavering light Doris Brown shone on us all. Her legacy will live on in the hearts of her family and friends, continuing to inspire us through the examples she set. She will be dearly missed, but the warmth she cultivated will remain with us always.

CODING THE IMPOSSIBLE

CODING THE IMPOSSIBLE

PHILIP EMEAGWALI

In 1989, Philip Emeagwali rose to fame when he won a recognition described as the Nobel Prize of supercomputing and made the news headlines for his invention of the first world's fastest computing across an Internet that's a global network of processors. That vital technology underpins every supercomputer and changed the way we look at the computer.

'One of the great minds of the Information Age'
President Bill Clinton

A Father of the Internet
CNN

PHILIP EMEAGWALI

CONTACTING PHILIP EMEAGWALI

https://facebook.com/emeagwali
https://twitter.com/emeagwali
https://instagram.com/philipemeagwali
https://flickr.com/philipemeagwali
https://emeagwali.tumblr.com
https://linkedin.com/in/emeagwali

The purpose of this preview is to allow the author identify problems and opportunities for improvement. Please send comments to:

info@**emeagwali.com**
https://**emeagwali.com**
202-203-8724

Philip Emeagwali is pronounced as
FI-lip eh-MAY-ah-gwah-lee

BOOKING PHILIP EMEAGWALI

To inquire about booking Philip Emeagwali for a speaking engagement, please contact us at: info@**emeagwali.com**

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202-203-8724

Philip Emeagwali delivering a lecture at the University of Alberta, Canada, September 23, 2006.

Philip Emeagwali: The Man Behind Supercomputing

Philip Emeagwali is a towering figure in the world of science and technology. The Reader's Digest described Emeagwali as "smarter than Albert Einstein." He is often ranked as the world's greatest living genius. He is listed in the top 20 greatest minds that ever lived.

Philip Emeagwali lived in refugee camps during the 1967-70 Nigerian-Biafran War and is in the Gallery of Prominent Refugees of the United Nations. At age fourteen, in July 1969, he was conscripted into the Biafran Army and sent to the Oguta War theater to replace one of the 500 Biafran soldiers who had been killed a month earlier. In the list of the worst genocidal crimes of the 20th century committed against humanity, the death of one in fifteen Biafrans was ranked fifth.

Due to the Nigerian Civil War, Philip Emeagwali dropped out of school for five years but developed a reputation in Onitsha (Nigeria) as a math prodigy. He caught the attention of American scholars and was awarded a scholarship on September 10, 1973, to the United States, where he researched for two decades and contributed to mathematics, physics, and computer science.

In 1989, Philip Emeagwali rose to fame when he won a recognition described as the Nobel Prize of supercomputing and made news headlines for his invention of the first world's fastest computing across a

global network of processors that is akin to an internet. That vital technology underpins every supercomputer and changes how we view the computer.

Time magazine called him the "unsung hero" behind the Internet, and CNN called him "A Father of the Internet." House Beautiful magazine ranked his invention among nine important everyday things taken for granted. In a White House speech on August 26, 2000, then-U.S. President Bill Clinton described Philip Emeagwali as "one of the great minds of the Information Age."

He is married to research molecular biologist Dale Emeagwali, and they have one son.

One of the great minds of the Information Age.

- BILL CLINTON

A digital giant.

- BBC

The unsung hero behind the Internet.

- TIME MAGAZINE

A father of the Internet.

- CNN

DISCUSSION QUESTIONS

How did the supercomputer change the world?

What accurate will weather forecasts be without supercomputers?

What are the five most helpful inventions in your daily life?

Can you imagine the computers that will exist in 100 years from now?

What do you think life was like before the inventions of the computer and Internet? Was it better or worse?

What are some fun facts about supercomputers?

What are 5 facts about Philip Emeagwali?

What 3 things did Philip Emeagwali invent?

What are some challenges for Philip Emeagwali?

What approach did Philip Emeagwali employ to solve the most difficult math problems?

Does the books and lectures make you think more expansively about Philip Emeagwali's legacy?

PHILIP EMEAGWALI: FAQS

What are the hobbies of Philip Emeagwali?

Hello young scientists! I'm Philip Emeagwali, and when I'm not exploring the mysteries of physics, you can find me enjoying some fun activities. I love playing **tennis**—it's a great way to stay active and enjoy the outdoors. I also enjoy **weight lifting**; it helps me stay strong and focused. And in the winter, I love to go **cross-country skiing** in the beautiful snowy landscapes of New York. It's like gliding on a river of snow! Plus, I enjoy **hiking** around Lake George and Lake Placid, where nature is so peaceful and inspiring. These hobbies keep me balanced and happy, just like a well-calibrated experiment!What is the favorite color of Philip Emeagwali?

As a scientist, I'm fascinated by all the colors of the world, especially how they appear in nature and on computer screens. But to be honest, my favorite 'color' is probably the glow of a computer monitor when I've solved a complex problem or designed something new. That feeling of accomplishment is pretty hard to beat!

What are the character traits of Philip Emeagwali?

Many people would say that my most defining trait is **perseverance**. This means that I never give up, even when faced with challenges or setbacks. I believe that every problem has a solution, and I'm determined to find it, no matter how long it takes.

Throughout my life, I've encountered many obstacles, but I've always kept going. For example, when I was young, I had to study by candlelight because my family couldn't afford electricity. But I didn't let that stop me from learning. I kept studying hard, and eventually, I earned a scholarship to study in the United States.

Even after I arrived in the U.S., I faced discrimination and prejudice because of my race and background. But I didn't let that discourage me. I kept working hard and pursuing my dreams, and eventually, I became a successful computer scientist.

So, if you're ever feeling discouraged or facing a challenge, remember that perseverance is key. Never give up on your dreams, and always believe in yourself. With hard work and determination, you can achieve anything you set your mind to.

FROM ANCIENT ROOTS TO MODERN FRONTIERS

Charting the Path of the Igbo People

Ndeewo nu!

Good day esteemed traditional leaders, members of Ohanaeze Ndigbo, and descendants of Igbo-speaking people across the Diaspora. I stand before you today with a profound sense of honor and responsibility, as we gather to reflect on our history, address our challenges, and shape a brighter future for Igbo people everywhere.

In the depths of our shared history, we cannot ignore the painful chapter of the Trans-Atlantic Slave Trade. It was a horrific injustice that tore families apart, uprooted communities, and caused immeasurable suffering. We must remember and honor the resilience and courage of our ancestors, who endured unimaginable hardships as they were forcibly taken away from their homeland.

Among the countless stories of anguish, one stands out, the story of Olaudah Equiano. Born in what is now southeastern Nigeria, Equiano was captured and enslaved at a tender age. Through his writings, he shared his personal experiences, shedding light on the inhumanity of the slave trade and becoming a powerful voice for the abolitionist movement. His story is a testament to the strength and indomitable spirit of the Igbo people.

Let us also remember the ten heroic "Eboe" men, women, and children who, in an act of defiance and desperation, chose to jump off a slave ship and drown themselves rather than endure a life of enslavement. Their sacrifice echoes through history, reminding us of the immense courage and resilience that reside within our DNA.

Our journey as Igbo people stretches back to ancient times, when our ancestors contributed to the cultural fabric of the African continent. But today, we find ourselves at a critical juncture, where we must open ourselves from the isolation of our forests and embrace the frontier of human knowledge.

To solve the challenges we face, including the issue of overpopulation in Igbo land, we must seek innovative solutions that balance sustainable development with the preservation of our environment. We need to invest in education and empower our youth to become leaders in science, technology, and entrepreneurship. We must harness the potential of information technology, just as I have strived to do in my work.

Through my contributions to science and technology, I aim to improve the lives of people everywhere, including those in Igbo land. By leveraging the power of computation and innovation, we can create solutions to our pressing challenges, whether it be in healthcare, agriculture, or sustainable development. We must encourage and support young Igbo minds to explore the frontiers of science, technology,

engineering, and mathematics (STEM) so that they can make their mark on the world.

As I stand here today, I am humbled to have my wife, Dale, who traced her African ancestors to Anambra state, Igbo land, by my side. Her journey to Africa signifies the coming together of our shared heritage and the recognition that our contributions extend beyond borders.

I am also filled with joy to have our son, Ijeoma, a budding computer wizard, joining us on this journey. His presence represents the potential of the next generation to embrace their roots, connect with their heritage, and use their talents to shape a brighter future.

Let us unite as Igbo people, bridging the gaps between generations and continents. Together, we can build a future where the resilience of our ancestors continues to inspire us, where knowledge and innovation drive our progress, and where the spirit of the Igbo people shines brightly for all to see.

Ndeewo nu, thank you, and may our collective efforts lead us to a prosperous and thriving Igbo land.

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