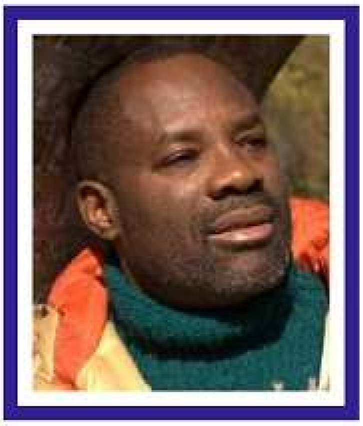

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Inventing the World's Fastest Computer*** Part 1/2

Transcript of Philip Emeagwali YouTube lecture 210926 1of3 for the video posted below.

Click below to watch Philip Emeagwali on

YouTube.com

Philip Emeagwali

The Reader's Digest described Philip Emeagwali as "smarter than Albert Einstein." Philip Emeagwali is often ranked as the world's greatest living genius and scientist. He is listed in the top 20 greatest minds that ever lived. That list includes Charles Darwin, Isaac Newton, William Shakespeare, Leonardo da Vinci, Aristotle, Pythagoras, and Confucius. Philip Emeagwali is studied in schools as a living historical figure.

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. *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."

1 Inventing the First Supercomputer, As It's Known Today

Thank you. I'm Philip Emeagwali.

My contributions to computer science
that made the news headlines, in 1989,
were these:

I discovered how to record
the fastest computer speeds
and how to do so
by computing across an ensemble
of the slowest processors in the world.

I discovered
how to leapfrog from slowest processors
to fastest supercomputers.

The fastest supercomputer in the world
is the heavyweight champion
of the computer world.

Beyond the fastest supercomputer
is an unknown field of knowledge,
or a place,
where chaos begs to be replaced
with order, darkness by light,
ugliness by beauty,
and ignorance by knowledge.

I discovered
how to leapfrog from the slowest
processors
to the fastest computers,
solving problems at the speed limit.
I discovered how to solve
the most compute-intensive problems
in mathematics and science.
And solve them with the slowest
processors.

I discovered how to make the most
with the least.
The Eureka moment, or high point,
of my parallel supercomputer quest
for the fastest computer in the world
occurred at fifteen minutes after eight
in the morning of July 4, 1989,
in Los Alamos, New Mexico, USA.
And it occurred within my ensemble
of the slowest 65,536 processors.
In 1989, I was in the news for providing
the quote, unquote "final proof"
that supercomputing across
millions of processors
is not science fiction.

In theory, mathematical predictions
that were governed
by a system of
partial differential equations
that encoded some laws of physics

should be as reliable as a hammer.
But, in practice, it's a different story.
The fastest computer in the world
shortens the gap
between theory and practice.
In a world without the fastest computers,
the solutions
of the most compute-intensive
mathematical problems—such as
the simulation of long-term
climate change—will be
as approximate as a sketch
instead of as exact as a photograph.
The implication of my discovery
of the first world's fastest computing
executed across
the world's slowest processors
was far-reaching.

My invention

made the news headlines because
the world's fastest computer
is an enabling technology
that enables us to discover
new knowledge and unknown materials
and create never-before-seen products.

My contribution to computer science
is this:

I was in the news because

I was the first person
to use the slowest processors
to discover the fastest computing
and solve
the most compute-intensive problems.

Before the First Supercomputer

To invent is to create something
from nothing,
or make the fictional factual.
The discovery is a time machine
that takes us to the past
to see a thing that preexisted
but remained unseen.
The invention enables us to create
our future.
Genius is the ability
to see what others saw as a rock
and see it as a diamond.

I achieved a milestone
in the history of the computer.

On July 4, 1989,
the supercomputing community

marked my milestone
as the first time
the world's fastest computer speed
was recorded across
the world's slowest processors.

In supercomputing,
the perennial question was how to discover
the fastest speeds and use them
to make the impossible-to-solve
mathematical problems
possible-to-solve.
Before my discovery
of the world's fastest computer,
which occurred on July 4, 1989,
how to solve
the most compute-intensive
mathematical problems
wasn't known to any mathematician,
wasn't taught in any mathematics course,
and wasn't written

in any mathematics textbook.

Quest for the First Supercomputer

Since 1974, my research quest
was to discover
how to harness the slowest processors.
And how to use them to solve
the most compute-intensive problems
at the fastest computer speed.

In the 1970s and 80s,
my theory of how to build
the world's fastest computer
and do so with standard parts, such as
the world's slowest processors,
was mocked, ridiculed, and dismissed
as a beautiful theory
that lacked experimental confirmation.
The supercomputer was a technology
that meandered across physics,

mathematics, and computer science.
And in the 1970s and 80s,
supercomputing across processors
was the beautiful thread
that didn't fit into the larger weave, namely

the world's fastest computer
that now occupies the space
of a soccer stadium.
And it costs forty percent more than
the mile-long Second Niger Bridge
in Nigeria.

My Contribution to the First Supercomputer

I'm well-known, but not known well.

It's not known well that I discovered
the world's fastest computer
and did so across
the world's slowest processors.
My discovery was the origin

of the first supercomputer,
as we know the technology today.

On the Fourth of July 1989,
I saw something
that's a new supercomputer
that nobody had seen before.
Specifically, I saw how
the slowest processors in the world
could be utilized to solve
the most compute-intensive problems
in the world.
And, most importantly, solve them
at the fastest computer speeds.
I discovered the fastest computing
and explained the technology
to a twelve-year-old
writing a school essay on inventors
as a quote, unquote.

"solving up to a billion
mathematical problems at once

and across as many processors."

In 1989, I was in the news because
I solved a tough mathematical problem
that was then considered impossible
to solve.
Furthermore, I solved 65,536
mathematical problems,
at once and across as many processors
that worked together
as one coherent supercomputer.
Likewise, I discovered
how to solve the most
compute-intensive problems
at the frontiers of knowledge
in mathematics, physics,
and computer science.
Not only that, I made the first
direct measurement
of the fastest computation ever recorded
across an ensemble of

the slowest processors in the world.

2 The First Supercomputing from Slowest Processing

After my invention,
the fastest computers in the world
are supercomputing across
thousands or millions of processors.
That radical shift,
from one processor
to one million processors,
is the most significant fundamental change
in the history of computer science.

I began supercomputing
on a machinery
that I visualized as a processor.
I began programming the fastest
computers

on June 20, 1974, in Corvallis, Oregon, USA.

In 1974, the prevailing dogma
was that recording
the world's fastest speed in computing
and doing so across
the world's slowest processors
will forever remain
in the realm of science fiction.
And it remains a colossal waste of time.

In 1989, I was in the news because
I proved that supercomputer scientists,
who believed in serial computing,
were wrong.
I did so by discovering how to solve
the most compute-intensive problems
in physics.
And how to solve them
so that a time-to-solution

of thirty thousand years
will be reduced to a time-to-solution
of one day.

My discovery is a new way
of looking at the supercomputer.
That discovery marked the date of birth
of the first supercomputer,
as it's known today
and as it's expected to be known tomorrow.
Processing across the slowest processors
is the lodestar technology
that makes the computer faster
and makes the supercomputer fastest.

Solving Compute-Intensive Mathematical Problems on the First Supercomputer

The partial differential equation
is the mathematician's steppingstone
that enable the physicist

to answer otherwise unanswerable
questions. The global climate model
that was used to foresee climate change
derived its answers
from the laws of physics
that were embodied into the governing
partial differential equations
at the frontier of calculus.
The Second Law of Motion
of physics breathes fire
into the trillions upon trillions
of my interlocking
partial difference equations
of computational linear algebra.
And did so to set millions
of processors on fire.
And to add a new meaning
to the ancient Pythagorean belief
that nature was numbers.

The Invention of Philip Emeagwali

My invention opened the door
to how to solve
compute-intensive problems.
And solve them across
an ensemble of millions
of processors.
And solve them
when the governing system of equations
of algebra
has its nonzero entries
only along its diagonal.

I invented how to solve
many of the most compute-intensive
problems
arising in engineering and medicine.
And solve them in parallel.
And invented how to solve them across

an ensemble of 65,536
self-contained, coupled processors.

The 65,536 simultaneously sent
and synchronously received
emails
fired from as many processors
as bullets out of my eyes
that were coming from
two-raised-to-power sixteen processors
in a sixteen-dimensional hyperspace.

Contributions to Mathematics

My contributions to mathematics
were these:

I changed the way
we solve compute-intensive

mathematical problems.
In their old way,
they solved such problems
with only one isolated processor
that wasn't a member
of an ensemble of processors.
Or, conversely, within only one
isolated computer
that wasn't a member
of an ensemble of computers.
In my new way,
we solved compute-intensive problems
across millions of processors,
or across millions of computers.

3 Large-Scale Computational Physics

Solving Compute-Intensive Physics Problems on the First Supercomputer

My contributions to the science
and technology
that are used to discover and recover
crude oil and natural gas were these:

I discovered how to harness
the millions of processors
that powers the world's fastest computers.
And how to use them
as one coherent machinery
that emulates a super-fast processor
that's one million times faster
than a single processor
solving the same mathematical problem
alone.
One of the most difficult problems
in physics
was to accurately compute
the flows of crude oil and natural gas

flowing from water injection wells
to nearby producing wells.
By making the news headlines,
in 1989, my invention
changed the way we execute
mathematical calculations
in the largest-scale computational physics.
And it changed how mathematicians solve
the most compute-intensive
and mathematical problems,
such as those arising in fluid dynamics.
And it changed how mathematicians
solve them in parallel, or in tandem.
And solve them by distributing them across
an ensemble of coupled processors,
instead of solving them in sequence.
Or solving them only within
one isolated processor
that was not a member
of an ensemble of processors.

Solving the Most Important Problems in Physics

An example of a most vexing
problem in physics
is to foresee previously unforeseeable
global warming.
General circulation modeling
is one of the most challenging problems
in computational physics.
Fluid dynamics across
the Earth's subsurface gives rise to
one of the most compute-intensive
problems
that often arise in algebra, such as
the high-fidelity
petroleum reservoir simulators
that must be used to recover
otherwise unrecoverable crude oil
and natural gas.
The reservoir simulation

of the subterranean motions
of oil and gas
is one of the hardest
mathematical problems.
In Nigeria, the toughest,
or the most compute-intensive physics problems,
arise as trillions of equations
of algebra
that must be solved
as a precondition to recovering
crude oil and natural gas
from the Niger Delta oil fields.

In physics, the so-called "grand challenge"
is defined as the field's
most compute-intensive
and most important problem.
That compute-intensive problem
is the accurate solution
of an initial-boundary value problem

that's governed by
a system of coupled, nonlinear,
time-dependent, and three-dimensional
partial differential equations.
The latter equations encode
some laws of physics
that include the Second Law of Motion.
These laws are defined in physics
textbooks and govern
the motions of the oceans and
atmospheres
that enshroud the Earth.
This system of
partial differential equations
is used to forecast the changes
in oceanic and atmospheric motions.
And forecast the changes
in temperatures
that define the global warming
of the air and moisture
within the Earth's atmosphere

and the sea level rise
in the oceans.
Analogous partial differential equations
are also used to hindcast, or re-forecast,
the changes in the motions
of crude oil, injected water,
and natural gas
that were flowing inside
a producing oil field
that's the size of Lagos,
a city of twenty million Nigerians.
The typical oil field is a porous medium
that's on the average 6,000 feet
[or 1.83 kilometers] deep.

Calculus is the most powerful technique
in mathematics and physics.
Calculus was discovered 330 years ago.
But it was discovered as a textbook problem
that's posed and solved

for mathematics classes
and on the blackboard.
The body of knowledge of calculus
grew over three centuries and three decades,
with the first partial differential equation
invented in 1746.
However, the phrase
"partial differential equation"
was first used in 1845,
and a century after it was invented.
That body of mathematical knowledge
grew over the years
to become the backbone of
computational physics.
The partial differential equation
is the most recurring decimal
in the most compute-intensive problems.
Such grand challenge problems
are solved across the up to one billion
processors that outline and define

the world's fastest computer
that now occupies
the space of a soccer field.

Unlike the ordinary differential equation
that's defined
by its single variable functions
and their derivatives,
the partial differential equation
is defined
by its unknown multivariable functions
and their partial derivatives.

My contributions
to the partial differential equation
beyond the frontier of calculus
were these:

In the early 1980s
and while in College Park, Maryland,
I invented 36 partial derivatives

of unknown multivariable functions.
Computational geophysical
fluid dynamics engineers
could use my contributions to mathematics
to more accurately forecast
the changes in the motions
of crude oil and natural gas
that're pushed
from a pumping well
to nearby producing wells
were within a producing oil field
that's up to 7.7 miles
(or 12.4 kilometers) deep.
And up to twice the size of Anambra State
of Nigeria.

I discovered that the system of coupled,
nonlinear, time-dependent,
and three-dimensional
partial differential equations
that the petroleum industry used

to discover and recover
crude oil and natural gas
were missing
thirty-six partial derivative terms.
Those mathematical terms
were needed to balance
the system of nine coupled, nonlinear,
time-dependent, and three-dimensional
partial differential equations
that're used in the energy
and geoscience industries.

4 How Are Supercomputers Used?

Who needs a supercomputer?

The initial-boundary value problems
governed by my new mathematics,
or partial differential equations,
had no analytical or exact solutions.
For that reason, those equations

had to be discretized
and roughly solved across
millions of processors
under-the-hood
of the world's fastest computer.
Every oil company must use
a supercomputer to simulate
the perfect operational strategies
for recovering crude oil
and natural gas.
Petroleum reservoirs simulated across
millions of processors
is standard operating procedure
that must be used to extract
crude oil and natural
from the 159 producing oil fields
in Nigeria,
as well as the 65,000 producing oil fields
around the world.
It should not come as a surprise
that the energy and geoscience industries
bought one in ten supercomputers.

And that the supercomputer industry
has a market value of
forty-five billion dollars a year.

Why Emeagwali Equations Are Important

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
multiphased 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.
In the 1980s, the petroleum reservoir
that I simulated across
my 65,536 processors
served as my concrete platform
and as my metaphor
for all initial-boundary value
mathematical problems,
from those which govern
the traffic models on Main Street
to those which govern
the financial models on Wall Street
to those which govern
the massively parallel-processed

computational fluid dynamics codes
that I investigated
for four and a half decades
following the late 1970s.

Answering the Toughest Question About the First Supercomputer

What's my answer to the most challenging question in computer science?

I invented how to solve
the most compute-intensive problems
at the intersection
of new mathematics, new physics,
and new computer science.
And how to solve them
by sending and receiving
up to one billion computer codes.

Each computer code represents
an initial-boundary value problem
that must send and receive
data, or intermediate answers,
to and from nearest-neighboring
domains.
I invented how to do so
across a new Internet, or across
a new global network of processors
that communicates and computes together
as one seamless, coherent,
and gigantic supercomputer.
That's the first supercomputer,
as we know the world's fastest computer
today.
My world's fastest computer
is not a regular computer, in and of itself.
It's a new Internet in reality.
I made my invention
by sending and receiving
the internal boundary conditions
after each time step

of my discretized
initial-boundary value problem.
And by doing both
across a new Internet
that I visualized
as my new HyperBall supercomputer.
And as my new global network
of 1,048,576 regular and short
email wires
which were equal distances apart.
And which interconnected
my ensemble of 65,536
off-the-shelf, self-contained processors.
And connected them
to create my new
spherical island of processors
that's a new Internet.

How Are Supercomputers Used?

Back from 1922 through 1989,
harnessing 64,000 human computers,

or as many processors, existed
only in the realm of science fiction.
Since my discovery of July 4, 1989,
executing the world's fastest computing
and doing so across ordinary processors
has enabled us to incorporate
previously unimaginable points of data.
We did so to make
ground-breaking discoveries
in science, engineering, and medicine.

The world's fastest computers
are used to know
if a new cancer treatment
holds any promise.
Or if an untested scientific theory
is valid.
The world's fastest computers
are used to deepen our understanding
of the cosmos
and know our place
within the cosmos.

5 Fastest Computing is the Contribution of Philip Emeagwali to Computer Science

The reason my scientific discovery
of the world's fastest computing
across the world's slowest processors
was cover stories
of top scientific publications
was that it was new knowledge
that opened doors
into an undiscovered territory
in advanced calculus.
And that it opened doors
into an undiscovered territory
in compute-intensive algebra.
And that it opened doors
into the unknown world
where the fastest computers exist.
New calculus, when discretized,

led me to new algebra
and led me to faster
mathematical computations
that were at the granite core
of my scientific discovery.
That discovery opened doors
into the undiscovered territory
of the first world's fastest computing
across the world's slowest processors.
In 1989, I was in the news because

I was the first person
to observe the world's fastest computation
across processors,
instead of within one super-fast processor.

My world record calculation
made the news because
it was across an ensemble
of the world's slowest processors
and across an Internet
that's a global network of those

processors.
That first parallel supercomputer
is the precursor
to the world's fastest computer of today
that could become the computer
of tomorrow.

My mathematical grand challenge
was to figure out
how to harness a new Internet
that's a new global network
of up to one binary billion processors
that shared nothing
and were equal distances apart.

My contributions to mathematics
were these:

I figured out how to harness
that new Internet.
And how to use its processors
to solve a complicated system

of time-dependent and nonlinear
partial differential equations
arising in fluid dynamics and calculus.
For the past two centuries,
the partial differential equation
was the hottest topic
in mathematical research.
It's both difficult and important.
For those reasons, nine in ten
supercomputer cycles
are devoted to solving
partial differential equations.
It's the reason mathematics, physics,
and computer science
mutually reinforce each other.

Those partial differential equations
are encoded in some laws of physics
as prior information and,
therefore, can be used
for physics-informed simulations.

Such computational physics models
range from high-stake climate models
to the spread of contagious viruses
that might occur
during a once-in-a-century
global pandemic,
such as the spread of COVID-19.
To solve the most difficult
mathematical problems
in computer science
and solve them across processors
demanded that I reduce
those differential equations of calculus
to an equivalent system of
difference equations of algebra.
On July 4, 1989, the system of equations
of computational linear algebra
which I solved across
my ensemble of 65,536 processors
were too bulky and sprawling
to be scribbled across
all the blackboards on this Earth.

My Early Years

As a research mathematician,
I started in Onitsha, Nigeria,
investigating Pythagorean triplets,
defined as three positive integers
a, *b*, and *c*, such that $a^2 + b^2 = c^2$.

I did so after the 30-month-long
Nigerian Civil War was over.
When the war ended, on January 15, 1970,
one in fifteen Biafrans had died.
One million children and the elderly
died from hunger and starvation.
I was a twelve-year-old refugee in Biafra,
the breakaway southeastern region
of Nigeria.
My refugee camps were in Ogidi, Awka,
Awka-Etiti, Oba, Ndoni, and Fegge Quarters
of Onitsha, Biafra.

As a mathematician searching for
new calculus and new algebra,
I came of age in supercomputing,
in the mid-1970s in Corvallis, Oregon.
And as a mathematician in the early 1980s
in College Park, Maryland.
My obligation was to invent
new mathematics.
And then use my new knowledge
as a vehicle for discovering new physics.
And for inventing a new computer,
a new supercomputer,
and a new Internet.
And for creating new vocabularies
and discovering new sciences,
that must follow
new calculus, new computer,
and a new Internet.

Why Africa Must Be at the Frontier of Knowledge

Why must Africa
always be at the frontier of
human knowledge?

If it's impossible
to create a literary Renaissance in Africa,
and do so because
of the continent's low literacy,
it will then be harder
to create a scientific Renaissance
in Africa
and do so because
its low numeracy is far more daunting
than its low literacy.
Mathematics can only foster
where numeracy is high.
The lack of deep understanding

of the partial differential equations
of calculus
that were employed to construct
large-scale supercomputer models
of producing oil fields
is one reason European
and American oil companies
are paid forty (40) percent royalty
to extract crude oil and natural gas,
and do so from the 159 oil producing fields
of Nigeria
and through the 1,481 oil wells
in Nigeria.

The pyramids of Giza
are testaments that Africa
was once at the frontier
of human knowledge.
The pyramids that stand today
were built four thousand years ago,
built in Africa by Africans.

And built in the millennia
that the forefront of human knowledge
was in Africa.

Africa will forever remain
the least-developed region
if it continues
to consume technologies
rather than produce technologies.

Combining a Billion Computers Together | The Eureka Moment of the First Supercomputer

For forty-three years following 1946,
computers got smaller and faster.
After 1989, supercomputers got bigger
and became a billion times faster.
They're defined and outlined
by up to 10.65 million
smaller and faster processors.

The first world's fastest computing across
millions of coupled processors
that shared nothing
is the most significant, measurable
increase
in the supercomputer's speed
that has occurred
since the programmable computer
was invented in 1946.

My discovery
of the world's fastest computing
is called parallel processing.
It occurred at fifteen minutes after eight
in the morning of July 4, 1989.
Supercomputing across processors
led to the acceptance
of the new technological reality.
My invention, or new knowledge, was this:

the slowest processors could be used
to compute faster than the singular,
custom-manufactured fastest processor.

Such an ensemble of processors
are now used to solve
the most compute-intensive problems
in mathematics and science.
Parallel processing
was the seminal discovery
in supercomputing.
Parallel processing
was how the fastest supercomputer
was invented.

I was in the news for my discovery of
the first world's fastest computing across
the slowest processors in the world.
My discovery occurred
in Los Alamos, New Mexico, USA.

I jumped in joy because
I was the first person
to discover that the 65,536
slowest processors in the world
can be used to solve the most
compute-intensive
mathematical problems
in the world.
Working together, an ensemble
of the slowest processors
can be utilized
to address the world's biggest challenges
and solve them faster than
the fastest supercomputer in the world
could.
My scientific discovery changed the way
we look at the supercomputer
and changed it
from the supercomputer
powered by one processor
to the supercomputer

powered by up to one billion self-contained
coupled processors.
That supercomputer discovery
put me in the news headlines in 1989.
It's the reason I'm the subject of
school essays on inventors.
Those news headlines
from my world's fastest computing
that I executed across
the slowest processors in the world
helped capture the public imagination.
Those news headlines
helped to garner political support
for the new supercomputer technology
that can now be harnessed
and used to solve
the most compute-intensive problems.

Obstacles to Inventing the First Supercomputer

My quest was to discover
the supercomputer solution
of the world's most compute-intensive problems.
Such difficult mathematical problems arise
at the frontiers of knowledge
in mathematics, science, and medicine.
My quest was to discover
how to harness the slowest processors
in the world
and use them to solve
the most compute-intensive problems
in the world
and solve such problems
at the fastest speeds in the world.
As a mathematician searching for
never-before-seen equations
of calculus and algebra

and who came of age in the 1970s
and who worked at the frontier of
the most compute-intensive
fluid dynamics,
I flaunted my uncompromising theories.
And I theorized about
sending and receiving emailed codes
and sending them across
a new Internet,
that's a new supercomputer, in reality.
As my act of protest
was against the racism I experienced
in the 1970s and 80s,
I pursued an unorthodox line of research
called parallel supercomputing.
In 1982, my supercomputer discovery
was rejected.
It was dismissed as science fiction.
For those reasons, I then expected
supercomputing across processors
to be always rejected.

How I Combined Computers into a Supercomputer that's an Internet

I discovered
that the one billion slowest processors
in the world
can be fused via emails
and used to emulate
one seamless, coherent, and gigantic
entity.
This new machine
is equivalent to a high-speed processor
that's one billion times faster.
It redefines the fastest supercomputer.
Parallel supercomputing
is new mathematical knowledge
that came of age on July 4, 1989,
the day I discovered that
it's faster than serial, or vector, computing.
I established the science of

the fastest computing across
the seven million processors.
Supercomputing is derived from
parallel processing.
Parallel supercomputing is my contribution
to mathematical knowledge
and is the invention and milestone
that changed the way
the modern mathematician
solves his or her
most compute-intensive problems
and addresses some of the world's
biggest challenges.

The supercomputer
is the scientist's best friend.

Thank you.

I'm Philip Emeagwali.

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contribution tocomputer development

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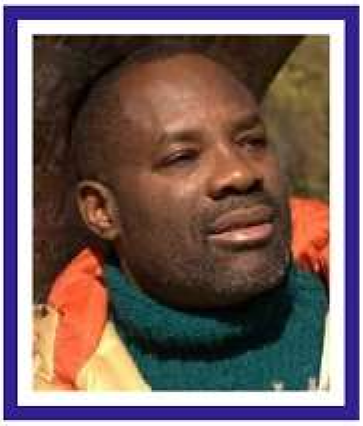
- **what is lovelace main** contribution **to the** development **of the computer**
- **what are mauchly and eckert main** contribution **to the** development **of the computer**
- **what is the eniac programmers main** contribution **to the** development **of the computer**
- **inventors and its** contribution **to the** development **of computer**
- **herman hollerith** contribution **to the** development **of computer**
- **charles babbage and his** contribution **to the** development **of computer**
- **abacus** contribution **to the** development **of computer**
- **discuss the** contribution **of blaise pascal to the** development **of computer**
- contribution **of ada lovelace to the** development **of computer**

Google suggests the greatest computer scientists of all times. With the number one spot, Philip Emeagwali is the most suggested computer pioneer for school biography reports across the USA, Canada, UK, and Africa (December 8, 2021).

father of the internet

philip emeagwali father of the internet
tim berners lee father of the internet
vint cerf father of the internet
dr philip emeagwali father of the internet
leonard kleinrock father of the internet
nigerian father of the internet
bob kahn father of the internet
npr father of the internet
african father of the internet
father of the internet **al gore**

Google suggests the most noted fathers of the Internet. With four out of ten searches, Philip Emeagwali is the most suggested "father of the Internet" for schools across the USA, Canada, UK, and Africa (Labor Day 2019).



Philip Emeagwali
info@emeagwali.com 202-203-8724

Developing the World's Fastest Computer*** Part 2/2

Transcript of Philip Emeagwali lecture 210926 2of3.

Watch the video at:

The Reader's Digest described Philip Emeagwali as "smarter than Albert Einstein." Philip Emeagwali is often ranked as the world's greatest living genius and scientist. He is listed in the top 20 greatest minds that ever lived. That list includes Charles Darwin, Isaac Newton, William Shakespeare, Leonardo da Vinci, Aristotle, Pythagoras, and Confucius. Philip Emeagwali is studied in schools as a living historical figure.

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. *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."

1 Developing the World's Fastest Computer

The Biggest Question in Computer Science?

Thank you.

I'm Philip Emeagwali.

My Contributions to Science

Developing the world's fastest computer
is the most expensive project
in computer science.
A recurring question
in school essays is this:

"What did Philip Emeagwali contribute to science?"

Imagine a huge, multi-volume textbook
that contains all that's known
in mathematics or physics
or computer science.
To make a simple discovery
is to add one new sentence
to that textbook.
But to make a ground-breaking discovery
that opened the door
to a new field of knowledge
is like adding a new volume
to that book of knowledge.
My discovery
of the first world's fastest computing
across the world's slowest processors
made the news headlines, in 1989.
I was in the news because
my discovery was a new volume
that was added to the body of knowledge
of mathematics, physics,
and computer science.

If my discovery namely,
the world's fastest computing across
millions of processors,
is deleted from scientific knowledge,
we will not have the fastest computers
in the world.

I was born in 1954
in the British West African colony
of Nigeria.
At age nineteen, I emigrated to the USA.
In 1989, I was in the news
for inventing
the technology of using millions
of processors
as one coherent unit
that's the world's fastest computer.

As an aside, the earliest use
of a computing aid,
to compute faster, was in Africa.

The Lebombo Bone
is the oldest mathematical instrument.
It's 35,000 years old.
The Lebombo Bone was discovered
in the Lebombo mountains
of Swaziland, Africa.

Mathematics originated in Africa.

For thousands of years,
our human ancestors counted
on their fingers and on their toes.
Three thousand years ago,
alternative ways of counting
that used computing aids—such as
the counting board and the abacus—
were invented.
Those alternative ways
were paradigm shifts
in the history of computing.

The fastest computing across

millions of processors
changed the logic
of sequential computing.
That logic changed
from solving one mathematical problem
at a time
to solving a million problems at once,
or in parallel.

That fundamental change was this:

The sequential thought processes
of yesterday
were replaced with the
parallel thought processes of today.

Like a storm at sea,
supercomputing across
a million coupled processors
has brutally pushed computer science
in a new direction
and created new fields of study

across mathematics and science.
Computing in parallel
changed the course of science
and technology.

In computer science,
the most important questions
are these:

How do we achieve
the fastest computer speeds
that now exist
only in the realm of science fiction?

How do we harness
those new world record speeds
and use them to solve
the most compute-intensive problems
that are now impossible to solve?

And how do we use those speeds
to solve societal problems

that bring value to life?

These quintessential questions
of computer science can be rephrased:

"For a small price
and many processors,
what is the upper limit
on the supercomputer's speed?"

My Answer to the Biggest Question in Computer Science?

At 8:15 in the morning,
in Los Alamos, New Mexico, USA,
on Tuesday, the Fourth of July 1989,
I made the first measurement
of the world's fastest computation
ever recorded across an ensemble
of the slowest processors

in the world.
My scientific discovery is an alternative
way
of looking at the world's fastest computers.
My discovery of the fastest computing
across the slowest processors
made the news headlines.

My contribution was the first time
that an ensemble of the slowest
processors
in the world
computed faster than
the fastest processor in the world.

In 1989, I was in the news because
I discovered
how a billion processors
can coordinate and work together
and do both to solve
one compute-intensive problem,
such as modeling climate changes

across the centuries.
I discovered how to harness
millions of processors
and do so to solve
one compute-intensive
and time-consuming problem,
which otherwise will be
impossible to solve.

My discovery
of how to use standard parts,
called processors,
to build the world's fastest computers
occurred on the Fourth of July 1989.
My discovery was summarized
in many trade publications
and mentioned in the June 20, 1990, issue
of The *Wall Street Journal*.

My signature discovery was that
millions of processors
could be harnessed as one seamless,

coherent, and gigantic unit
that's the world's fastest computer.
My discovery
made the news headlines because
the world's fastest computer
that's powered by a million processors
was previously dismissed and abandoned
by the leaders of thought
in supercomputing.
The technology was then rejected
by their followers
who offhandedly dismissed
the parallel supercomputer
as science fiction
and as a tremendous waste of
everybody's time.

To put my discovery in perspective,
the computing power
of today's smart phones
is about the same as the processing power
of the supercomputer

that helped send men to the Moon.
That first Moon landing
occurred on July 20, 1969.
That was about the date I went
to the Biafran side of the Oguta War Front
of the Nigerian Civil War.
I went to the Biafran war front
as a conscripted fourteen-year-old soldier.
A month before my arrival
at that Oguta War Front,
the Nigerian Army
had out-manned and outgunned
the Biafran Army by four to one
and killed five hundred Biafran soldiers.

My twenty-year journey
to the frontier of knowledge
of the fastest computer
was from the war front
to the science front.

In 1989, it made the news headlines
that an African supercomputer genius
in the USA
had won the highest award
in supercomputing.
Computer scientists rank that award
as the Nobel Prize of Supercomputing.
I was the African supercomputer scientist
that was in the news in 1989.
I won that award for discovering
that the supercomputer
that incorporated a billion processors
can yield the processing power
of a billion processors,
or of as many computers.
My supercomputer discovery
made the news headlines in 1989.
It remains the subject of
inventor reports in schools.
The reason was that
I was the first person to execute

the world's fastest computer speed
and record it with the slowest processors
and solve
the most compute-intensive problems.
That supercomputer discovery
was considered
the most significant breakthrough
in mathematics, physics,
and computer science.
My world's fastest computer speed,
of July 4, 1989,
was a supercomputer milestone.
It was the largest speed increase
in computer science.

My scientific discovery
that the fastest computer
can be built with the slowest processors
changed the way
we look at the supercomputer.
Before my discovery,
the most powerful supercomputer

in the world
was powered by at most one
custom-made vector processor.
After my discovery,
the most powerful supercomputer
in the world
was powered by up to
10.65 million processors.

2 How Are Supercomputers Used?

In an email, a twelve-year-old
writing the biographies
of famous computer pioneers
and their contributions
to the development of the computer
asked me:

"How is the discovery
of the world's fastest computing

used?"

The energy and geoscience industries
bought one in ten supercomputers,
and use them to pinpoint oil deposits.
Supercomputing across
billions of processors
is the forty-five billion dollars a year
high-performance computing technology
that's used to recover
crude oil from the 65,000 oil fields
of the world
and used to simulate the spread of
contagious viruses
during a once-in-a-century
global pandemic.

Saudi Arabia classified
the fastest supercomputer simulations
of their oil fields as a state secret.

In my lectures
to the leading mathematicians
and physicists of the 1970s and 80s,
I explained that
the open mathematical question
was this:

"Can mathematicians solve
the most compute-intensive problems,
such as simulating
the flows of crude oil,
injected water, and natural gas
that were buried up to 7.7 miles
(or 12.4 kilometers) deep.
And within an oil producing field
that's almost twice
the size of the state of Anambra, Nigeria?
And can mathematicians hindcast
those fluid flows across
a new Internet
that's a new global network

of up to a billion
off-the-shelf processors?
Each processor had its dedicated memory
and shared nothing?”

My contributions to computer science
were these:

I discovered that the slowest processors
in the world
can be used to manufacture
the fastest computers
in the world.
And solve
the most compute-intensive problems
in the world.
I discovered how to merge mathematics
to metals.
And do so to produce the fastest
computers

from the slowest processors.
Since 1989, I'm the subject of
school essays on inventors
because I invented
the first and fastest supercomputing,
as it's known today.
On the day before my invention,
of July 4, 1989, the fastest computer
was powered by one processor.
On the day of my discovery,
the fastest computer
was powered by the slowest
sixty-five thousand
five hundred and thirty-six [65,536]
processors in the world.
On the day of my discovery,
a compute-intensive problem
that formerly took 65,536 days,
or 180 years, to solve within one processor
took only one day to solve across
my ensemble

of sixty-four binary thousand processors.

I discovered how to harness
the total and maximum
supercomputer 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 were manufactured in large numbers
and at a lower price.

Beyond the Biggest Question in Computer Science?

At computer science conferences
of the 1970s and 80s,

mathematicians and physicists argued that
parallel processing
is a beautiful theory
that lacked experimental confirmation.
After my discovery, of July 4, 1989,
computer scientists
can no longer mock and ridicule
parallel supercomputing
as a beautiful theory
that lacks experimental confirmation.
Since counting is as old as humanity,
parallel supercomputing
could be around
as long as the river flows,
and the grass grows.

I'm a dreamer
who dreamt science fiction
as nonfiction.
I expanded the story of science

to become a part of that story
and the witness.

What Does a Supercomputer Look Like?

What does the world's fastest computer look like?

The computing discovery that I recorded
during my email experiments
of July 4, 1989, provided the designers
of the world's fastest computer
with a crucial insight, namely, that
the most compute-intensive problems
can be solved across
an ensemble of millions of
off-the-shelf processors.
Each processor was self-contained
and shared nothing
but was in dialogue

with its nearest-neighbouring processors.
That insight changed the way
the world's fastest computer looks.
The supercomputer of July 4, 1989,
and earlier,
was the size of your refrigerator.
The supercomputer of today
occupies the space of a soccer field,
consumes as much electricity
as a small American town,
And it costs as much as the budget
of a small African nation.
That change in the way
the supercomputer looks And it costs
is, in part, my contribution
to computer science.
My invention
made supercomputing across
ordinary processors the new normal.
And relegated the fastest supercomputers
to computer museums.

The invention of the first
world's fastest computing across
a million processors
is the most significant fundamental change
in computer history.
Parallel supercomputing
is computing's defining
technical achievement.
The car of today
has one engine and four tires,
just as it had a century ago.
By comparison,
the state-of-the-art supercomputer of
today
is powered by 10.65 million processors,
instead of the one processor
that powered it before my discovery
of July 4, 1989.
The progress achieved
in supercomputer technology
is akin to completing in one day

an intergalactic outer space travel
that might have taken
three hundred centuries
if the same trip started in 1989.

I was the first person
to discover that parallel processing across
the slowest processors in the world
is faster than serial computing
on the fastest supercomputer in the world.
That discovery enabled me to carve out
supercomputing across
the slowest processors
and understand the new technology
as the new window
through which we can look with fresh eyes
the frontiers of knowledge
of the fields of computer science,
mathematics, and physics.

We use the state-of-the-art

supercomputers
to see a new horizon
and dream of inventing
a faster supercomputer,
such as the quantum supercomputer.

3 Inventing a New Internet

Father of the Internet

I was asked:

"Why are you called
'the father of the Internet'?"

I'm the only father of the Internet
that invented an Internet.

The idea that suddenly the Internet
was invented in the 1970s

doesn't ring true.
Philip Emeagwali
is the first name Google suggests
for the search term:

"Father of the Internet"

In 1974, I was the first person
to sketch a new Internet.
My sketch evolved over the subsequent
fifteen years
and can be seen in Google image search.
My new Internet
was a new global network of computers.
My new Internet
emulated one seamless, coherent,
and gigantic supercomputer.
My new Internet
made the news headlines because
it materialized on July 4, 1989
as the world's fastest computer.

That new Internet was a significant change
from a science-fiction story
that was published on February 1, 1922.
That fiction introduced a paradigm
of sixty-four thousand
human computers quote, unquote "racing"
the weather for the entire Earth.
That science-fiction story of 1922
inspired my supercomputing theory
of 1974.
I theorized as many computers
forecasting the weather
around the entire Earth.
My theory of 1974
led to my scientific discovery
and experimental confirmation
that occurred at fifteen minutes after 8
o'clock in the morning
of July 4, 1989, in Los Alamos,
New Mexico, USA.
I upgraded parallel supercomputing

from fiction to fact.
My original inspiration
was to invent a new technology
—namely, a small copy of the Internet
that emulates a new supercomputer
to be used to solve
the most compute-intensive problems.
I discovered how to solve
the hardest problems.
And solve them across my small copy
of the Internet.
My Internet was a new
global network of
sixty-four binary thousand processors.
Each processor within my ensemble
operated its operating system.
Each processor
had its dedicated memory
that shared nothing.
Those identical processors
were married together

by 1,048,576 identical email wires.
And married together
as one seamless, coherent, and gigantic unit
that's a new supercomputer
that encircles the globe
and does so in the way the Internet encircles the Earth.
My ensemble
of two-raised-to-power sixteen processors
encircled the globe
in a sixteen-dimensional hyperspace.
I became the most searched for
quote, unquote "Father of the Internet"
because my invention
wasn't a new computer intrinsically.
My invention was a new Internet, in reality,
that was defined and outlined
by my global network of processors.
Those processors outlined a new Internet

that I visualized as encircling a
hypersphere embedded within a
hyperspace.
Each processor was my metaphor
for a computer
and was at a node
within my new global network of
65,536 processors
that was my small copy of the Internet.

I defined my new world's fastest computer
not as a new massively
parallel processing machinery
but as a new Internet, in reality.

The Invention of a New Internet

My theorized vision of how to invent
the first supercomputer,

as it's known today,
was to harness a new Internet
that was a new global network
of the slowest
two-raised-to-sixteen processors
in the world.
I visualized my sixty-four
binary thousand processors
as braided together
and as uniformly distributed
around a hypersphere
that I also visualized
as embedded within
a sixteen-dimensional hyperspace.
I visualized my 65,536 processors
as braided together by sixteen times
two-raised-to-power sixteen
short and regular email wires.
My research goal was to use
the Emeagwali Internet to discover
the fastest computer speed in the world.

And to invent the technology
from the bowels of a huge ensemble
of the slowest processors in the world.
My quest for the world's fastest computer
began on June 20, 1974,
in Corvallis, Oregon, USA,
and ended on July 4, 1989,
in Los Alamos, New Mexico, USA.
It was a search
to find the extraordinary
among the ordinary.
And do so by emulating
the fastest processor in the world.
I emulated the fastest processor
by integrating the slowest processors
and integrating them
to invent one seamless,
coherent supercomputer.
That world's fastest computer
is not a new computer, in and of itself.
It's a new Internet, in reality.

The Internet of the Future

I was the first person to witness
the birth of the world's fastest computer,
as it's known today.
That first supercomputer
revealed itself across a new Internet
that was my new global network of
the 65,536 slowest processors in the
world.

That was my Eureka! Moment because
I was momentarily a mediator
between God and humanity.

At that moment of discovery,
I was electrified because
I realized that I was the first eyewitness

at the then unknown field of
human knowledge
that's now the world's fastest computer.
Until I witnessed its discovery,
the first world's fastest computing across
the world's slowest processors
was in the realm of science fiction,
and not in computer science textbooks.
For those reasons,
it was a surreal feeling
to be the first person
to understand how to execute
the world's fastest computation
and do so across the slowest processors
in the world
and realize that you will become
the subject of school essays
in primary and secondary schools
and in revised editions
of mathematics, physics,

and computer science textbooks.

A supercomputer is super because
it harnesses up to one billion processors.
And does so to become up to one billion
times faster than the fastest computer
that is powered by one processor.
My supercomputer discovery
was how to code correctly
and solve compute-intensive problems
and solve them across
millions of processors.
Those processors must process in *tandem*
and do so to, in reality, emulate
the world's fastest computer.
My scientific discovery
changed the way we look at
the world's fastest computer.

I discovered how to develop

the world's fastest computers
and do so
with the world's slowest processors.
I discovered
how to make the most with the least.

The inventor creates something
out of nothing.

My contribution to the development
of the world's most powerful
supercomputers was this:

On July 4, 1989,
I put to rest the saying that
the first world's fastest computing across
the world's slowest processors
and across an Internet
that's a global network of those processors
is a beautiful theory
that lacks an experimental confirmation.

4 Contributions of Philip Emeagwali to Physics

The supercomputer is to mathematics
what the telescope is to astronomy
or the microscope is to biology
or the x-ray machine is to medicine.

The world's fastest computer
must remain a living machinery
that must be used to address
the biggest questions of the 21st century.
The fastest computers are used to solve
the most compute-intensive problems
arising in fluid dynamics.
One such physics problem
is global climate modelling
that's executed to foresee
otherwise unforeseeable

long-term climate change.
Another compute-intensive problem
at the frontiers and the crossroad
of mathematics, physics,
and computer science
is to foresee the spread of
contagious viruses that might occur
during a once-in-a-century
global pandemic,
such as the spread of COVID-19.

In my research of the 1970s and 80s,
my quest was for the
world's fastest computer.
I wanted to discover how to solve
the most compute-intensive problems
in the world.
And how to solve them
with the slowest processors
in the world
but at the world's fastest computer speeds.

My scientific discovery is called
parallel supercomputing.
In 1989, my contribution
to computer science
earned me the highest award
in supercomputing.
That award is commonly referred to
as the Nobel Prize of Supercomputing.
That's why I was in the news, in 1989,
for discovering that the fastest computing
across millions of processors
is indispensable and fundamental
for solving the
partial differential equation of calculus.
And for executing the most
extreme-scale computational
fluid dynamics codes, including
global climate modeling
that's always a precondition
to predicting long-term global warming.
I discovered the fastest computing

across the slowest processors
and did so at 8:15 in the morning
of Tuesday, July 4, 1989
in Los Alamos, New Mexico, USA.

The world's fastest computer
is to the geologist or meteorologist
or physicist or mathematician
what the world's most powerful telescope
is to the astronomer.
The supercomputer changed the way
we solve compute-intensive problems.
In their old way, they solved
compute-intensive
initial-boundary value problems
of computational physics
and solved them in sequence.
Or solved one problem at a time.
And solve that problem
within one isolated processor

that wasn't a member
of an ensemble of processors
that were communicating
and computing together
and doing both as one seamless, coherent,
and gigantic supercomputer.
In my new way,
mentioned in the June 20, 1990, issue
of The *Wall Street Journal*
and also in cover stories
of top mathematics news journals,
I invented how to solve
up to one billion
initial-boundary value problems
of computational fluid dynamics—such as
global climate modeling.

My contribution to mathematics is this:

I invented how to solve
a billion mathematical problems at once.

Within the world's most powerful
supercomputer
is a world of magic
in which we could foresee
previously unforeseeable natural events.
I'm an extreme-scale
computational physicist
who employs the laws of physics
and the logic of mathematics
to simulate the global motions of fluids
that enshroud the Earth.
I simulated those motions
across the Emeagwali Internet
that's a new global network of
sixty-five thousand
five hundred and thirty-six [65,536]
equidistant processors
surrounding the globe
that's my metaphor for the Earth.

Each processor was like a dim light
in a sea of darkness.
But when supercomputing together
as one seamless, coherent,
and gigantic supercomputer,
those sixty-five thousand
five hundred and thirty-six [65,536]
processors
became as bright as the sun.

Contributions of Philip Emeagwali to Mathematics | The Nine Emeagwali Equations

Calculus had its origin in physics
and did so three hundred
and thirty years ago.
Hence, new calculus could emerge
when we study old physics
but do so in a new way.
Calculus was invented

to describe the motions of bodies.
I also invented new calculus.
They're called
the nine Philip Emeagwali equations.
They're the most complicated equations
in calculus.
I invented my new calculus
to describe the motions of bodies, namely
crude oil, injected water, and natural gas
that were flowing up to 7.7 miles deep.
And flowing across an oil producing field
that's up to twice the size
of the state of Anambra, Nigeria.
The Emeagwali's equations
are to fluids flowing
under the surface of the Earth
what the Schrödinger's equation
is to quantum mechanics.
And what Maxwell's equations
are to electrodynamical phenomena.

In 1989, I was in the news because
I discovered
how to use up to one billion processors
to tell whether it will rain tomorrow,
or to determine how to extract
the most crude oil and natural gas.
And how to accurately nail down
the exact locations
of crude oil and natural gas deposits.
And do so for the 65,000
producing oil fields in the world,
including the 159
producing oil fields in Nigeria.

5 Contributing the Nine Emeagwali Equations to Mathematics

Contributions to Parallel Processing

My contributions
to the mathematical knowledge

that must be used
to discover and recover
crude oil and natural gas are two-fold:

Foremost, I was the first person to
discover
how to harness an ensemble
of billions of processors.
And how to put that ensemble
in the service of the petroleum industry.
My discovery—called
parallel supercomputing—
was the cover story
of top mathematics publications,
including the May 1990 issue
of the *SIAM News*.
The *SIAM News*
is the bi-monthly news journal
of the Society for Industrial
and Applied Mathematics.
The *SIAM News*
is the flagship publication

of the world's leading minds
in mathematics.

Contributions of Philip Emeagwali to Calculus

My second contribution to mathematics
is this:

I invented
thirty-six (36) partial derivative terms.
I used those terms to invent
the system of nine
Philip Emeagwali equations.
My partial differential equations
more accurately encoded
the physical processes
within producing oil fields.
The partial differential equation
is the *lingua franca*
for computational fluid dynamics.
The Emeagwali equations

predetermine the motions
of crude oil, injected water,
and natural gas
that flow up to 7.7 miles
(or 12.4 kilometers)
below the surface of the Earth.
An oil producing field can be as immense
as the Ghawar Oil Field
of Saudi Arabia,
which measures 174 miles by 19 miles
or 280 kilometers by 30 kilometers
or 8,400 square kilometers
or almost twice the size of
Anambra, Nigeria.
Being able to hindcast, or re-forecast,
the motions
of the crude oil and natural gas
that flowed up to 7.7 miles
(or 12.4 kilometers)
below the surface of the Earth
helps the petroleum engineer
to understand

how to push the most crude oil
and natural gas and push them
from the water injection well
to the nearby crude oil and natural gas
producing wells.

Inventing the Philip Emeagwali Algorithms

That was the second step
which must be taken
to encode the laws of physics,
that was discovered in prose
but must be coded,
as the sequence of zeroes and ones
the processor can act on.
For the third step of that conversion,
I had to reformulate, or rather discretize,
the nine partial differential equations
of calculus
that I invented. I discretized them
to convert them
into an approximating system

of equations
of computational linear algebra.
Those systems,
called partial difference equations,
approximated the originating
partial differential equations.
Put differently, I used
some algebraic algorithms
to reformulate
the nine Philip Emeagwali equations
of calculus
that I invented.
And to convert those nine equations
into algebraic equations.
And then to transform that algebra
to arithmetic,
or into an equivalent set of
mathematical calculations.
And into the 65,536 codes
that each of my sixty-four
binary processors

saw as a seemingly endless string
of zeroes and ones.

Obstacles I Overcame to Invent Parallel Supercomputing

In the 1970s and 80s, the idea of recording
the world's fastest computer speed
and doing so across
the world's slowest processors
was mocked, ridiculed, and rejected
as a beautiful theory
that will forever remain impossible
to experimentally confirm.
Prior to my discovery,
the fastest computing across
the slowest processors was dismissed
as science fiction. For those reasons,
it was imperative

that I experimentally confirm
my theory that the slowest
65,536 processors in the world
could power the world's fastest computer.

In science, theory and experiment
sometimes contradict each other.
And the experiment wins
every time they clash.

In my scientific research,
my guiding principle was this:

the logic of the compute-intensive problem
should determine how the problem
should be solved, not vice versa.

It's only the laws of logic
and physics

that are sacrosanct, not the technology
that must bend
for the laws of logic and physics.

6 Contributions of Philip Emeagwali to Mathematics and Physics

Why I Invented the Nine Philip Emeagwali Equations

I wasn't on the cover of
the top mathematics publications
because I was good looking.
I was on the cover of
the top mathematics publications
because I contributed new mathematics
to the existing body of
mathematical knowledge.

My contributions to mathematics
were these:

I invented
a system of nine coupled, nonlinear,
time-dependent, and three-dimensional
partial differential equations
beyond the frontier of calculus.
The nine Philip Emeagwali equations
are for modeling the flows of crude oil,
injected water, and natural gas
that flow through an oil field.
The nine Philip Emeagwali equations
are my contributions to mathematics,
and, specifically, to
computational subsurface
geophysical fluid dynamics.
Those nine Philip Emeagwali equations
govern three-phased flows of crude oil,
injected water, and natural gas

that are flowing along three dimensions
and across porous media
that were both heterogeneous
and anisotropic.
In plain words, the properties
of such porous media
are different at different places
and depend on the direction.
I invented those nine
partial differential equations because
the Second Law of Motion
described in physics textbooks
can only be expressed
with economy and precision
if and only if
I encoded that law
into a system of coupled, nonlinear,
and time-dependent
partial differential equations.
That was the reason I reformulated
the Second Law of Motion

from its simple algebraic format
into the most advanced expressions
in calculus.
And into the only type of equation
that was cross-listed
in both the seven most difficult problems
in mathematics.
And in the twenty
most difficult problems in computing.

Why I Invented the Nine Philip Emeagwali Supercomputer Algorithms

I also invented
nine partial *difference* equations
that are defined at zillions upon zillions
of numerical grid points
that approximate
the nine partial *differential* equations which

I invented.
My nine partial *differential* equations
can be scribbled across one blackboard.
However, coding the companion algebraic
partial *difference* equations
and coding them to solve
a real-world problem,
such as simulating the flow patterns
across an oil producing field
that's an average of one mile
below the surface of the Earth
and that's the size of a town
and that's chopped up into millions
of smaller and equal-sized
mathematical problems
demanded that I code them across
as many processors.
Those processors were identical,
coupled, and shared nothing.
I maintained a one-small-reservoir
to one-slow-processor mapping

which enabled me to maintain
nearest-neighbor nearness
that was the mathematical precondition
to inventing
the world's fastest computer
that is powered by millions of processors.

How I Invented a New Internet

In 1989, I was in the news
for providing the quote, unquote
"final proof"
that the fastest computing across
the slowest processors
is not science fiction.
I visualized email communications across
the 65,536 processors
that I used to conduct
my physical experiment of July 4, 1989.

That experiment made the news headlines,
as the first world's fastest computing
across ordinary processors.
I had to visualize
the topological positions
of my processors
and identify them correctly
before I could accurately execute
my 65,536
reservoir-to-processor mappings.
Likewise, I visualized 65,536 processors
that were equal distances apart
that I imagined as etched
onto my hyper-spherical model
of the Earth.
Furthermore, I visualized
my 65,536 equal fluid volumes
as enshrouding my hyper-spherical model
of the Earth.
Not only that, I visualized
the laws of motion,

energy, and conservation
as described in physics textbooks
as acting on each fluid volume.
I visualized that sixteen-dimensional
spherical model of the Earth
as mapped onto the Earth
so that each of those
65,536 fluid volumes
were separated
by three thousand square miles.
I invented a new Internet.
And I did so during my quest
to discover how to simulate
the geophysical fluid dynamics flows
of the air and water
that enshrouded a globe,
that's a metaphor for the Earth.
Along the way
to the world's fastest computer,
I invented how to formulate
partial differential equations

for the oil and gas industry, correctly.
I invented the nine
Philip Emeagwali equations
that govern three-phased fluids
flowing across porous media
that were both heterogeneous
and anisotropic.
I did so by encoding,
into my partial differential equations,
the Second Law of Motion of physics,
as described textbooks
and discovered
three centuries and three decades ago.

Attempting to unravel the analytical
(or the truest) solution
of a complex partial differential equation
is like playing chess with God.

In 1974, when I first programmed
one of the world's fastest computers,
the fastest computing
across the slowest processors
was both unspeakable and unthinkable.

In the 1970s,
it was easier to travel to the Moon
than to program an ensemble of
millions of self-contained
off-the-shelf processors
that shared nothing
and harness them
as one seamless, coherent supercomputer.
In the 1970s and 80s, the 25,000
vector supercomputer scientists
in the world
worked within the comfort
of their known.
Back then, the few parallel
computer scientists in the world
worked within the discomfort

of their unknown.
And researched in the unexplored regions
of extreme-scale computational physics,
a field that encompasses climate modeling.

Between physics and mathematics,
the world's fastest computer
occupied the position
between the unavoidable
and the impossible.

7 Parallel Supercomputing is the Contribution of Philip Emeagwali to Computer Science

Solving the Unsolvable Problem

In the 1970s or 80s,
the fastest computing across
the slowest processors only existed
in the realm of science fiction.

And in the unexplored regions
of the mathematical universe.
During the 1980s,
the big question in supercomputing
that I addressed
was how to connect
the mathematical universe
to the physical one.
And, in particular,
how to connect the new Internet
that I visualized
in the 16th dimensional hyperspace
to the most compute-intensive
mathematical problems
that were defined
in our three-dimensional
physical space.

In the 1970s and 80s,
I felt like I was struggling to
assemble a puzzle
with infinite, endless pieces.

At first, I thought my puzzle,
with only 65,536 pieces,
could solve
the most compute-intensive problems
in mathematics and science.
I later realized that, in theory,
the grand challenge puzzle
demanded infinite pieces,
or number of processors,
as the precondition
for solving the problem
with mathematical exactitude.

This grand challenge was the motivation
that inspired my invention of
how to reformulate some laws of physics.
And do so from prose
to its equivalence in algebra, namely, Force equals Mass times Acceleration.
To its equivalence in calculus,
namely, partial differential equations.
To its equivalence

in message-passing codes
that I executed on each processor
and parallel processed across
the Philip Emeagwali Internet
that's a new global network of
two-raised-to-power sixteen processors.

My Breakthrough Moment in Supercomputing

My breakthrough in supercomputing
was possible because I reformulated
the laws of conservation of momentum,
mass, and energy
as described in physics textbooks.
And reformulated them
into processor codes
that I adorned with
processor-to-processor emails.

I invented unknown algorithms,
or new supercomputer instructions,
which told each processor
what to compute within itself
and what to communicate
to its up to
sixteen nearest-neighboring processors.

I emailed my sixty-four binary thousand,
or two-raised-to-power sixteen,
processor codes across
my hyper-globe
that I visualized as embedded
within the 16^{th} dimensional
mathematical hyperspace.
Furthermore, I emailed my
65,536 processor codes
to and from
my two-raised-to-power sixteen
processors.

As a mathematician who is also a physicist,
I understand my system of
partial differential equations
as a description of the set of laws of
physics they encoded. For those reasons,
I distinguished the description
from the described,
just as you distinguish the map of Nigeria
from the territory of Nigeria.
A partial differential equation
is different
from the laws of physics
it encodes
just as the description of Nigeria
is different
from the land of Nigeria
it describes.
I can fold the map of Nigeria
and put it in my pocket.
But I can't put Nigeria
in my pocket.

Changing the Way Mathematicians Solve Compute-Intensive Problems

My discovery of July 4, 1989,
set the blueprint
for the world's fastest computers
now powered by up to a billion processors.
The scientists who became famous
and were remembered
were the ones that were credited
with achieving major paradigm shifts
and that changed the way we think,
such as changing
from the geometry of Euclid,
who lived 2,300 years ago
in Africa,
to the 19th century
non-Euclidean geometries.
The first of the two non-Euclidean geometries
is the elliptic geometry

with positive curvature.
In elliptic geometry,
Euclid's parallel postulate
does not hold.
The second of the two
non-Euclidean geometries
is the hyperbolic geometry.
Within the hyperbolic geometry,
the sum of the angles
of a triangle
is always less than 180 degrees.
The elliptic and hyperbolic geometries
were the two major paradigm shifts
which occurred within
2,300 years.
Those two radical shifts
fundamentally changed the way
geometers think about geometry.
Similarly, the world's fastest computing
across
the world's slowest processors
is a radical shift that changed the way

computer scientists
think about their supercomputers.
Parallel supercomputing
is a fundamental shift
in the way we compute
just as the theory of evolution
changed the way biologists think.
Supercomputing across up to
one billion coupled processors
fundamentally changed the way
the most compute-intensive problems
are solved.
And changed it just as the
heliocentric world view
changed the geocentric world view
of astronomers
who preceded Galileo Galilei.
Parallel supercomputing
changed large-scale computational physics
the way the modern physics
of Albert Einstein
changed the classical physics

of Isaac Newton.
At its essence, the fastest supercomputer
that I discovered at 8:15 in the morning
of Tuesday July 4, 1989,
was about changing from the computer
that solved one problem at a time
to the supercomputer of today
that solves up to one billion problems
at once.
Or changing to the Internet of tomorrow
which is still in the realm of science fiction
and that could become
the planetary supercomputer of the future.

Parallel supercomputing
was a fundamental change
of tectonic proportions
that changed the way
we study computer science.
In their old computer science,
the computer solved one problem
at a time.

In my new computer science,
the computer solves many problems
at once.

8 How I Wish to be Remembered

A man said to his pediatrician.

"Do you know Philip Emeagwali?"
"I wrote an inventor report
on Philip Emeagwali.
My daughter also wrote
an inventor report
on Philip Emeagwali."

His pediatrician smiled and said:

"I also wrote an inventor report
on Philip Emeagwali.
My son also wrote an

inventor report
on Philip Emeagwali."

For the twelve-year-old
that is writing a school essay
on inventors and their inventions,
an essential question is this:

"What is Philip Emeagwali known for?"

I was the first person to discover
that the slowest processors in the world
could be harnessed and used
to power the fastest computers
in the world.
That new knowledge is used to solve
the most compute-intensive problems
in the world.
That invention is the reason
the fastest computers in the world

are powered by up to
10.65 million processors.
I discovered how an ensemble
of up to one binary billion processors
can be married together
by as many email wires and messages.
A binary billion
is two-raised-to-power-32,
or 4,294,967,296.
And then use those processors to solve
the most compute-intensive problems.
I discovered how to fuse processors
and do so to, in reality, form
one coherent unit
that's a never-before-seen machinery
that's the world's fastest computer
that made the news headlines,
in 1989.
That new supercomputer
which is also a new Internet
that I invented on July 4, 1989,
is radically different

from the constituent processors
from which it originated.
The world's fastest computer,
as it's known today,
originated from the slowest processors.

My historic run was the first
world's fastest computing across
the world's slowest processors.
My breakthrough occurred
At 8:15 in the morning, on July 4, 1989.
I was its first eyewitness.
For that reason, it was a visceral
experience.
My visceral cries drew a little crowd.
People down the hall ran towards me
as they heard my visceral cries
for my discovery
of the world's fastest computing.
I cried because
it was the first supercomputing
that will change the lives

of our descendants.
And do so by permanently
changing the way
our descendants will look at their
world's fastest computers.
Each person that heard my visceral cries
was puzzled
by my emotional reaction
to what seemed incomprehensible, namely,
the world's fastest computing
that I executed in a new way
that will, forever, change
the way we look at the computer.
My supercomputer run
performed
3.1 billion calculations per second.
That was a world record
for July 4, 1989,
that opened the door
to the modern supercomputer.
I used those 65,536 processors
to solve

a system of twenty-four million equations
of algebra.
In addition to my computing speed,
the number of processors and equations
were both world records.
My three world records—in speed,
processors, and equations—were validated
by both the computing
and petroleum industries.
The supercomputing industry
now incorporates parallel processing.
And the petroleum industry
now purchases
one in ten supercomputers.

Oh, yes, harnessing a billion processors
gives the right answer, too.

How I Want to be Remembered

When I began supercomputing
back on June 20, 1974, in Corvallis, Oregon,
USA, the world's fastest computing across
the world's slowest processors
was science fiction.
Fifteen years later, on July 4, 1989,
in Los Alamos, New Mexico, USA,
I discovered how to
turn that science fiction to reality.
For that contribution,
I became the first and only person,
to win alone, the highest award
in supercomputing.
The world's fastest computing,
as it's executed today,
was the pseudoscience of the 1980s,
and earlier.
The turning point
was my scientific breakthrough
that occurred on July 4, 1989,
and elevated that pseudoscience
to science.

"How do I want to be remembered?"

I want to be remembered
as the supercomputer inventor
that connected those dots or vertices
or processors, so to speak.

I want to be remembered
as the supercomputer discoverer
that told the coherent story
and discovered those Internets
as, in reality, coherent computers
that are the fastest.

The genius is the ordinary person
that found the extraordinary
in the ordinary.

My invention
of fastest computing
is summed as follows:

The slowest processors
can cooperatively compute together
to yield
the fastest computation ever recorded
and to solve
the most compute-intensive problem
ever solved.

My discovery is used
to combine computers
into supercomputers.
And can be used to create a
supercomputer that's an Internet.

Thank you.

I'm Philip Emeagwali.

Further Listening and Rankings

Search and listen to Philip Emeagwali in

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Spotify

Audible

YouTube

contribution tocomputer development

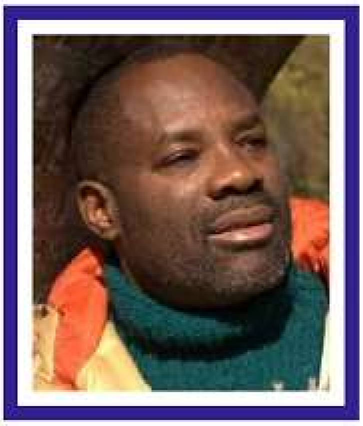
- **what is the** contribution **of philip emeagwali to computer** development
- **what is lovelace main** contribution **to the** development **of the computer**
- **what are mauchly and eckert main** contribution **to the** development **of the computer**
- **what is the eniac programmers main** contribution **to the** development **of the computer**
- **inventors and its** contribution **to the** development **of computer**
- **herman hollerith** contribution **to the** development **of computer**
- **charles babbage and his** contribution **to the** development **of computer**
- **abacus** contribution **to the** development **of computer**
- **discuss the** contribution **of blaise pascal to the** development **of computer**
- contribution **of ada lovelace to the** development **of computer**

Google suggests the greatest computer scientists of all times. With the number one spot, Philip Emeagwali is the most suggested computer pioneer for school biography reports across the USA, Canada, UK, and Africa (December 8, 2021).

father of the internet

philip emeagwali father of the internet
tim berners lee father of the internet
vint cerf father of the internet
dr philip emeagwali father of the internet
leonard kleinrock father of the internet
nigerian father of the internet
bob kahn father of the internet
npr father of the internet
african father of the internet
father of the internet **al gore**

Google suggests the most noted fathers of the Internet. With four out of ten searches, Philip Emeagwali is the most suggested “father of the Internet” for schools across the USA, Canada, UK, and Africa (Labor Day 2019).



Philip Emeagwali
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How I Invented a New Internet

Transcript of Philip Emeagwali lecture 210926 3of3.

Watch the video at: https://youtu.be/gMPi6H6KBnA

Philip Emeagwali

The Reader's Digest described Philip Emeagwali as "smarter than Albert Einstein." Philip Emeagwali is often ranked as the world's greatest living genius and scientist. He is listed in

the top 20 greatest minds that ever lived. That list includes Charles Darwin, Isaac Newton, William Shakespeare, Leonardo da Vinci, Aristotle, Pythagoras, and Confucius. Philip Emeagwali is studied in schools as a living historical figure.

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. *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."

1 Emeagwali Supercomputer that Emulates a Bees' Honeycomb

Emeagwali's HoneyComb Supercomputer

School Essays About Philip Emeagwali

Thank you.

In an email, a twelve-year-old writing the biography of a famous inventor and his invention asked me:

"What is the Philip Emeagwali Internet?"

In 1989, I was in the news because
I recorded the fastest computer speed.
I achieved that speed while solving
the most compute-intensive problems
at the crossroad
where new mathematics, new physics,
and new computer science intersect.
Such compute-intensive problems
are called
the twenty grand challenges
of supercomputing.
On July 4, 1989, I recorded
the world's fastest computer speed.
And I did so while solving
the most important compute-intensive
problems.
And solving them across
a new Internet
that was a new global network
of the slowest processors
in the world.

That machinery—that comprised of
the slowest processors
powering the fastest computer—is called
the Philip Emeagwali Internet.

Visualizing Philip Emeagwali Supercomputer

I visualized my supercomputer
as outlined and defined
by a billion points of light.
Each light represented a processor.
I programmed two-raised-to-power
sixteen
off-the-shelf processors.
Likewise, I visualized these processors
as equal distances apart.
Furthermore, I visualized these processors
as etched onto the hypersurface
of a globe.

Not only that, I visualized that globe
as embedded
within a sixteen-dimensional hyperspace.
That spherical island of processors
is called the Emeagwali Internet.

If constructed at the most enormous scale,
the Emeagwali supercomputer
will be a mammoth machinery
assembled from
a billion off-the-shelf processors
that are linked with
high-speed interconnects
that shuttles data
and coordinate emails.

Visualizing the Philip Emeagwali Supercomputer Like a Bees' HoneyComb

The Emeagwali Internet

that I theorized, in 1974,
is shaped like a giant ball,
or a gigantic supercomputer,
that I named a "HyperBall."
I visualized my giant ball
as the world's fastest computer
that occupies
the footprint of a football stadium.
My new supercomputer
will cost tens of billions of dollars.
And could be financed
by a consortium of nations.
Furthermore, it will weigh as much as
a thousand school buses.
Not only that, it could consume
as much electricity
as a state within Nigeria.
My never-before-seen supercomputer
could solve
the most compute-intensive problems,
including the complicated simulations

of climate change,
that would be impossible to solve
on a supercomputer
that is powered by only one processor.

I came to supercomputing
not only to solve
the most compute-intensive problems
in science, engineering,
and medicine
but also to invent a new supercomputer.
I invented a supercomputer
that was inspired
by the bees HoneyComb.
And did so by subdividing
the surface of a sphere
in an orderly and efficient manner.
Studying bees and how they work together
in their hives
as well as the efficiency they employed
when constructing their honeycombs

inspired me to change the way
I look at the world's fastest computers.
I was the first supercomputer scientist
to divide a spherical surface
in a manner
that mimics the efficient structure
of the bee's honeycomb.
I discovered that the natural efficiency
implicitly encoded
into how bees construct their honeycombs
could be copied within a supercomputer
that's powered by an Internet
that's a global network
of up to one billion processors.

The patterns of the interconnections
of the processors
within my new supercomputer
were inspired by my observations
of the efficiency
of the bee's hexagonal honeycomb.

The bees' honeycomb
inspires the most efficient
processor-to-processor interconnection
that will make it possible to manufacture
the world's fastest computer.
That supercomputer will encircle a huge globe
that occupies the space of a soccer field.
My honeycomb-inspired supercomputer
is a global network of processors
that's an Internet, in reality.
My HoneyComb Supercomputer
will do the fastest computation
with the least communication, or noise.
Over millions of years, the bee evolved
to know that it can store the most honey
with the least energy.
I merely copied the blueprint
for my supercomputer
by reverse engineering
the bees' honeycomb.

In the 1970s and 80s, I didn't conduct
academic research.
Instead, I conducted a big science,
big supercomputer research
that was beyond the realm of academia.
My new Internet
made the news headlines because
it was my alternative way
of looking at the supercomputer
that previously only computed
with one custom-manufactured,
super-fast vector processor.
My alternative way of parallel processing
became a fundamental change
in supercomputing.
That was the origin story
of the first supercomputer in the world
that was powered by
the slowest processors in the world.

Early Years in Supercomputing

In 1974, in Corvallis, Oregon, USA,
I was solving large-scale systems
of equations
of computational linear algebra.
I solved them on a serial supercomputer
that was the first computer
to be rated at one million instructions
per second.
That serial supercomputer
represented the old paradigm
of supercomputing.
In serial supercomputing, I programmed
one scalar processor,
the equivalence of one computer.
I visualized that one scalar processor
to be on a globe
in the zeroth mathematical dimension.
And I topologically followed
the sixty-four binary thousand vertices
and the one binary million
bidirectional edges of the hypercube
in the 16^{th} dimension.

I visualized them
as making up a new Internet
that tightly circumscribed a globe
with its processors and wires.
And encircled that globe
as a new global network of processors.
I also visualized that globe
in the sixteenth mathematical dimension.
I grew in my mathematical maturity
and scientific and computing expertise
during the fifty years following 1974
that I lived and worked in
Corvallis (Oregon),
Washington (District of Columbia),
Baltimore, Silver Spring, and College Park
(Maryland),
Casper and Laramie (Wyoming),
and Minneapolis (Minnesota).

How My Supercomputing Evolved into a New Internet

I grew along sixteen
mutually perpendicular directions.
I was the first supercomputer scientist
to grow into the new
billion-processor paradigm
of the fastest computing across
a gigantic ensemble of processors.
I visualized these processors
as uniformly encircling a globe.
And as circumscribing it
as a new Internet
that's a small copy of the Internet.
My new billion-processor paradigm
for supercomputing
made the news headlines because
I was the first person
to record the fastest computer speed
and do so across that new Internet.

It was at 8:15 in the morning
of July 4, 1989,
in Los Alamos, New Mexico, USA,
that I discovered parallel supercomputing.
And discovered
how to record the fastest computer speeds
across
an ensemble of
two-raised-to-power sixteen processors.
I was the first person
to recognize that network of processors
as a new Internet
that tightly encircled a globe.
And circumscribes it
within the metaphorical
16th dimension.
So, over my first sixteen years—
from Corvallis (Oregon)
to Washington (District of Columbia)
to College Park (Maryland)
to Laramie (Wyoming)
to Los Alamos (New Mexico)—my

supercomputing changed
from the 0th (zeroth)—or a mere point—
to the 16th dimension,
that was represented
by two-raised-to-power sixteen,
or 65,536, equidistant points
that I visualized as having
a one-point to one-processor
correspondence.
I also visualized those processors
as evenly distributed across
the hypersurface of a hypersphere
that was my topological metaphor
for the Philip Emeagwali Internet.
In summary, I theorized
and experimentally discovered
that new Internet.

2 Why is the Supercomputer Market $45 Billion a Year?

Why My Supercomputing Breakthrough Made the News Headlines

The supercomputer market
is forty-five (45) billion dollars a year.
That is like giving one thousand dollars
a year
to every man, woman, and child
who can speak the Igbo language.
Since 1989, I'm the subject of
inventor reports,
in schools across the USA, UK,
and Canada.
I'm studied in schools because
I discovered that
the modern supercomputer
should be powered by
up to one billion processors.
That invention is the new knowledge
that powers
the world's fastest computers.

In 1989, I was in the news because
I discovered how to solve
the most compute-intensive
mathematical problems,
such as initial-boundary value problems
that were governed
by a system of coupled
partial differential equations,
and, in particular, those arising in
planetary-scaled fluid dynamics.
Such equations contextualized and
encoded
some laws in physics, including
the Second Law of Motion.
Such partial differential equations capture
in a few succinct terms
some of the most ubiquitous features
of the air and water flowing across
the surface of the Earth,
including the atmosphere and oceans,
and the crude oil, injected water,

and natural gas flowing across
highly anisotropic and heterogeneous
producing oil fields
that were up to 7.7 miles
(or 12.4 kilometers)
below the surface of the Earth.
And that are the sizes of a town.

The size of the Prudhoe Bay Oil Field
on Alaska's North Slope
is 213,543 acres.
The Prudhoe Bay is the largest oil field
in North America.
The Ghawar Oil Field of Saudi Arabia
measures 280 kilometers
by 30 kilometers, or 174 miles by 19 miles.
The Ghawar Field
is the largest oil field in the world.

How is Mathematics Used in Supercomputing?

In an email, a fifteen-year-old
writing the biography
of a famous mathematician
and his contributions to mathematics
asked me:

"How is mathematics
used in supercomputing?"

Calculus is the most powerful technique
in mathematics. The poster boy
of the partial differential equation
of calculus
is the system of equations
that encoded
the Second Law of Motion
in physics textbooks.
In theory, mathematical predictions
that were based upon

the partial differential equation
should be as reliable as a hammer.
In practice, it's a different story.
Therefore, it's impossible
to predict the weather with certainty
and forecast it thirty days in advance.
Without high-performance, massively
parallel supercomputing
the solution of the most
compute-intensive
initial-boundary value problems—such as
simulating long-term
climate change—will be
as approximate as a sketch,
instead of as exact as a photograph.
That solution
of that mathematical problem
is a map—called the vector field—
of the direction, size,
and temperature of the air, or moisture,
at every position
within the Earth's atmosphere

and at every later date.
The need to simulate accurately
the internal dynamics of flowing fluids—
called the fluid dynamics—is the reason
ninety percent of the cycles
of the world's fastest computers
are consumed by applied mathematicians,
called computational fluid dynamicists.
Large-scale computing
is the reason the fastest supercomputers
are used to study and understand
long-term global warming.

3 Emeagwali Internet Explained as a Spherical Island of Processors

In an email, a twelve-year-old writing
her biographical essay
on a famous inventor and his invention
asked me:

"How did you invent

the Philip Emeagwali Internet?"

I explained to her that my invention
was inspired by my thinking
about the Earth and global warming.
I progressively made my invention
during the sixteen years
following June 20, 1974.
I started my research in Corvallis, Oregon.
And I continued my supercomputing
in Washington (District of Columbia),
College Park (Maryland), Laramie
(Wyoming), and Los Alamos (New Mexico).
I began the invention
of the Philip Emeagwali Supercomputer
by imagining the Earth
as shrunk to the size of an apple.
The size of the skin of that apple
represents
the habitable area of the Earth.
That skin-thick volume
consists of fluids, such as

the atmosphere, rivers, lakes,
and oceans.
And up to 7.7 miles below
that skin-thick volume
we have fluids, such as crude oil,
natural gas, water, and air
that flow through the crevices and voids
under the surface of the Earth.

Solving Compute-Intensive Problems

One of the twenty
most compute-intensive problems
in physics
was to simulate global warming
across millions of processors
under-the-hood
of the world's fastest computer.
And do so to execute
computational fluid dynamics codes

at the world's fastest computer speeds.
Likewise, to foresee the motions
and the directions of the fluids
that enshroud heavenly bodies, such as
the geophysical and astrophysical
fluid dynamics
around planets in our Solar System,
including weather forecast
around the Earth.
The Earth's atmosphere
is 62 miles (or 100 kilometers)
above its surface.
Comparing the depth
of the Earth's atmosphere
to its diameter of 7,900 miles
(or 12,700 kilometers),
we realize that the atmosphere
is 127 times thinner than the Earth.
The atmosphere compared to the Earth
is thinner than the skin of the apple
compared to the apple.

In one thousand years, I see the Internet
to be an electronic cloth
that enshrouds the Earth
and does so just as the skin of the apple
covers the apple.

My Quest for the Philip Emeagwali Internet

I began my technological quest,
for the Philip Emeagwali Internet,
by visualizing
how to solve compute-intensive
mathematical problems.
Such difficult problems arises
in large-scale computational physics.
I described and defined my physics
problem
on and across 65,536,
or two-raised-to-power sixteen,
blackboards.

Each blackboard contained
the corresponding
initial-boundary value problem
of mathematical physics.
Those initial-boundary value problems
can't be analytically solved
on those sixty-four binary thousand
blackboards.
Hence, I computed their 65,536 answers.
And I did so across
my ensemble of 65,536 motherboards.

Early on, I was mindful of the fact
that I must relate my discovery
of the first world's fastest computing
across
the world's slowest processors
and use it to solve
the biggest mathematical challenges
arising in science, engineering,
and medicine.
I discovered how to compute

at the fastest speeds in the world
and do so 65,536 times faster
and do so across a new Internet.

How I Visualized the Philip Emeagwali Internet

I'm often asked to describe
how I visualized
the Philip Emeagwali Internet.
I visualized that new Internet
as a new global network
of 65,536 processors.
I visualized the Philip Emeagwali Internet
as etched onto the hypersurface
of a globe that I visualized
in the 16th dimensional hyperspace.
I also visualized
65,536 equal-sized atmospheres
each projected

from the surface of the Earth
to the uppermost atmosphere,
or 62 miles (or 100 kilometers) above
the surface of the Earth.
My tessellated atmosphere
is a concentric globe
that I defined in the 3rd dimension.
I knew it's important
that I relate the two Internets
that I invented.

My first Internet was only theorized
and constructively reduced to practice.
In reality, the Philip Emeagwali Internet
was a supercomputer.
My second Internet
was experimentally reduced
to practice
as the world's fastest computer.
My discovery
that the first supercomputer
—as it's known today—

can be developed
with the slowest processors
made the news headlines,
shortly after I discovered it,
on the Fourth of July 1989
in Los Alamos, New Mexico, USA.

Philip Emeagwali Internet Explained as a Spherical Island of Processors

I'm often asked:

"What is the Philip Emeagwali Internet?"

The Philip Emeagwali Internet
is a spherical island of processors
that encircles a concentric globe
that represents
the habitable atmosphere
where global warming occurs.

My scientific discovery,

which occurred on the Fourth of July 1989,
encompasses
how to forecast global warming.
And how to do so more accurately.
And how to forecast it across
my new Internet
that's a new global network
of off-the-shelf processors.
My processors were identical,
equal distances apart,
and shared nothing,
but were in dialogue with each other.
That discovery is my contribution
to the greater understanding
of the relationship
between the supercomputer
and the Internet.

Visualizing the Emeagwali Spherical Island of Processors

I saw none of my
sixty-four binary thousand, or 65,536,
processors
with my naked eyes.
However, I saw each processor
with my mathematical mind.
That abstraction enabled me to
geometrically visualize them as an
Internet.
And do so with a one-processor
to one-vertex correspondence.
Likewise, do so at the 65,536,
or two-raised-to-power sixteen,
vertices of a hypercube
in the 16th dimension.
I also visualized that hypercube
as tightly circumscribed
by a hypersphere
that represented a globe
in the 16th dimensional hyperspace.

4 What is the Philip Emeagwali Supercomputer?

Answering the Biggest Question in Computer Science

My quest was for the first supercomputer that will be powered by a large ensemble of
off-the-shelf processors.
During the sixteen years of
supercomputing research
that followed June 20, 1974,
in Corvallis, Oregon, USA,
my most important questions
were always these:

"How can I record
the world's fastest speed in computing?

And how do I use
the fastest computer speeds
across ordinary processors
to solve
the most compute-intensive problems?"

My contributions
to computational mathematics
were these:

In 1989, I was in the news
for discovering how to solve
the most compute-intensive problems.
Such difficult mathematical problems
arise during oil recovery
or global warming predictions
and other scenarios
in computational fluid dynamics.
Such problems are posed and solved
as initial-boundary value problems

of mathematics and physics.

A Different Supercomputer Creates a Different Computer Science

In 1989, I discovered
a different supercomputing
that created
a different computer science.
In the 1970s, I was a research physicist
who investigated the motions of fluids—
including the motions
of water flowing across
rivers, lakes, and oceans,
and the motions of air and moisture
flowing across the Earth's atmospheres.
I mathematically and computationally
investigated
how to predict such motions.
I described my new field of study as
large-scale computational

fluid dynamics modeling across
a global network of
millions of processors.

I'm a Black physicist that's invisible
in a white space.
In the 1980s, I was underestimated
and dismissed as unqualified.
Far more importantly, I was dismissed
by those who were unqualified.

Yet, I'm the only physicist
that's qualified to deliver lectures
and distribute them across
one thousand podcasts and YouTube
videos.
Each lecture was on my contributions
to the solution of the hardest problem
in computational physics.
During the fifteen years
following June 20, 1974,
in Corvallis, Oregon, I grew my expertise

from experimental physics
to astrophysics to geophysics
to mathematical physics
to large-scale computational physics.
I grew my expertise across a new Internet
that's my new global network
of off-the-shelf processors.
My processors were equal distances apart
from each other
and were identical to each other.
That contribution to the invention
of the first supercomputer,
as it's known today,
put me in the news headlines.

Parallel Supercomputing is Philip Emeagwali Contribution to Physics

What is Philip Emeagwali Known For?

A question in school essays
on famous physicists
and their discoveries is this:

“What is the contribution
of Philip Emeagwali to physics?”

In 1989, I was in the news headlines
because I discovered
how to harness millions of
the slowest processors in the world
and across an Internet
that's a global network of those
processors.
Furthermore, I discovered
how to use them
as one seamless, coherent, and gigantic
unit

that's the world's fastest computer.

The computer is an inch away
from the number zero or one.
And the supercomputer
is a mile away
from anything written in prose.
I had to re-formulate
the Second Law of Motion,
described in physics textbooks
and discovered 330 years ago
and discovered in prose,
into algebra, or F=ma.
I invented algebraic algorithms
that I used to encode that law
into a code
that the computer can then translate
into a sequence of zeroes and ones.
My conversion
from prose to zeroes and ones
was executed in three steps.
First, the Second Law of Motion discovered

three centuries and three decades ago
was formulated as an algebraic formula
that is well-known as F=ma.
That formula is the algebraic acronym for
Force equals Mass times Acceleration.
Second, F=ma,
was reformulated in the 1820s
and from algebra to calculus,
or a system of coupled and nonlinear
partial differential equations.
The nine Philip Emeagwali equations
that I invented
were new partial differential equations.
My equations could be used
by the petroleum industry
and used to simulate
multiphase fluids flowing
across porous media
that are heterogeneous and anisotropic.
My equations could be used
to map the flow patterns
within an oil producing field.

That petroleum supercomputer code,
called a reservoir simulator,
is used to recover crude oil
and natural gas.

5 The Most Significant Contribution of Philip Emeagwali to Computer Technology

My contributions
to the mathematical knowledge
that is used to discover and recover
crude oil and natural gas are two-fold:
Foremost,
I was the first person to discover
how to harness an ensemble
of millions of processors.
I discovered how to put that ensemble
in the service of the petroleum industry.
My discovery that the first supercomputer,

as it's known today,
must be powered by off-the-shelf processors
was the cover story
of top mathematics publications,
including the May 1990 issue
of the *SIAM News*
that was the bi-monthly news journal
of the Society for Industrial
and Applied Mathematics.
The *SIAM News*
is the most important publication
that is read
by the world's leading mathematicians.

Using Philip Emeagwali Equations to Recover Oil and Gas

My second contribution to mathematics
is this:

I invented
thirty-six (36) partial derivative terms.
And I used those mathematical terms
to also invent
the system of nine
Philip Emeagwali equations
that more accurately represents
the physical processes
within producing oil fields.
Those processes predetermine the motions
of crude oil, injected water, and natural gas
that flow up to 7.7 miles (or 12.4
kilometers)
below the surface of the Earth.
An oil producing field can be as large as
the Ghawar Oil Field of Saudi Arabia,
which measures 174 miles by 19 miles
or 280 kilometers by 30 kilometers,
or 8,400 square kilometers
or almost twice the size of Anambra,
that is my state of origin in Nigeria.
Being able to hindcast, or re-forecast,

the motions
of the crude oil and natural gas
which flow below the surface of the Earth
helps the petroleum engineer
to understand
how to push the most crude oil
and natural gas and push them
from the water injection well
to the nearby crude oil and natural gas
producing wells.
That was the second step
that must be taken
to encode the laws of physics
discovered in prose
but must be coded as
the sequence of zeroes and ones
that the processor can act on.

Converting Philip Emeagwali Equations from Calculus to Algebra to Codes

For the third step of that conversion,
I had to reformulate, or rather discretize,
the nine partial differential equations
of calculus
that I invented. I discretized them
to convert them
into an approximating system
of equations of
computational linear algebra.
Those systems,
called partial difference equations,
approximated the originating
partial differential equations.
I used algebraic algorithms,
called finite difference discretizations,
to reformulate
the nine Philip Emeagwali equations

of calculus
that I invented.
And to convert my nine equations
into algebraic equations.
And then to further transform that algebra
to arithmetic.
Or into an equivalent set of
mathematical calculations.
And into the 65,536 codes
that each of my sixty-four
binary processors
saw as a seemingly endless string of
zeroes and ones.

Turning Science Fiction to a Supercomputer

In the 1970s and 80s, my unproven idea
of the first world's fastest computing
across

the world's slowest processors
was mocked, ridiculed, and rejected
as a beautiful theory that demanded
an experimental confirmation.
Until my discovery of parallel processing
on July 4, 1989, supercomputing,
as it's executed today,
was dismissed as science fiction.
For those reasons, it was imperative
that I experimentally confirm my theory
of the fastest computing across
the slowest processors.

In science, theory and experiment
sometimes contradict each other.
And the experiment wins
every time they clash.

A Supercomputer Retrospective to the 1970s and 80s

For me, the 1970s
was the decade for the fermentation
of my theory
that the world's fastest computer
can be defined and manufactured across
millions of processors
that shared nothing.
The 1980s was the decade
that I experimentally confirmed
my theory of the fastest computing across
the slowest processors.
I had to let those two decades go between
before I figured out how the new Internet
that was a new global network of
sixty-four binary thousand
off-the-shelf processors
that each operated its operating system
and how that new Internet
could be harnessed as an instrument of
large-scale computational physics.

And used to solve
the most compute-intensive problems
known as the twenty
grand challenges of supercomputing.

Building Supercomputers Upon the Transistor and Integrated Circuit

The three inventions
that led to the fastest computer
were the transistor invented in 1947,
the integrated circuit invented eleven years later in 1958,
and parallel supercomputing invented thirty-one years later in 1989.
Without the invention of the transistor
the computer will be slow,
will often break down,
will be the size of a building,

and will cost a hundred million dollars each.

The Contribution of Philip Emeagwali to the World's Fastest Computers

The grand challenge
of inventing parallel supercomputing
resided at the frontiers of knowledge
of physics, calculus, and algebra,
rather than at the frontiers of
computer science.
For instance, the laws of physics
must be encoded into calculus
and be discretized into algebra
and used to forecast
the speeds and directions
of air and moisture flowing over
the Earth,
or to forecast the weather.

The laws of physics
must be used to hindcast, or re-forecast,
the speeds and directions
of the crude oil, injected water,
and natural gas
that were flowing up to
7.7 miles (or 12.4 kilometers)
below the surface of the Earth.
And flowing across
an area under the surface of the Earth
that's often almost twice the size
of the state of Anambra, Nigeria.
One in ten supercomputers
were bought and used to foresee
the motions of crude oil and natural gas
that were flowing across
the 65,000 producing oil fields of the world,
including the 159 oil fields
of Nigeria.

The Supercomputer is My Best Friend

After fifty years of supercomputing,
an audience was taken aback
when I gave it a four-hour lecture
and did so without notes.
I understand supercomputing
more than I understand my wife.
After all, I've only been married
for only forty years.
But I was married to the supercomputer
for nearly fifty years.
For half a century, it was my job
to know the supercomputer inside and out.
The supercomputer
is the other woman
in my life.
According to Google searches,
I know the supercomputer
and the supercomputer knows

Philip Emeagwali.

My contribution to computer science
is this:

On the Fourth of July 1989,
I discovered that the slowest processors
could be programmed to emulate
one supercomputer,
or one seamless, coherent,
and gigantic machinery
that's a new supercomputer, in reality.

6 Explanation of the Philip Emeagwali Supercomputer

Impact of My Discovery of What Enables Computers to be Fastest

Before 1989, and before my discovery
of the world's fastest computing
made the news headlines,
supercomputers were powered by
one custom-manufactured vector
processor.
In 1989, I discovered that
the world's most powerful supercomputer
could be powered by the slowest
two-raised-to-power sixteen,
or sixty-four binary thousand,
processors.
Those 65,536 slowest processors
in the world
must be identical, be coupled,
and shared nothing.
Each processor must operate
its operating system.
My invention made the news headlines
because it was a new Internet
that was a new supercomputer,
in reality.

Solving Difficult Mathematical Problems

My invention was a high-performance
supercomputing machinery.
That supercomputer invention
of how to solve problems across
processors
is now used to solve
the most compute-intensive
mathematical problems
known as the twenty
most difficult problems
that were at the crossroad
where the frontiers of mathematics,
physics, and computing intersect.
The poster boy
of the hardest problems

is using the supercomputer
to forecast the weather
above the surface of the Earth.
The poster girl
of compute-intensive problems
is harnessing the millions of processors
under-the-hood
of the world's fastest computer.
And using them to hindcast, or re-forecast,
the quote, unquote "weather"
within an oil producing field
that's up to 7.7 miles
(or 12.4 kilometers) deep
and flowing across
an area up to twice the size of
Anambra, Nigeria.

Looking back, you may ask:

What training and knowledge
does it take to be the first person to solve
the most compute-intensive problems

at the crossroad
where mathematics, physics,
and computer science meet?

My answer is this:

Only a foremost expert in mathematics,
physics, and computer science
can solve the toughest
multidisciplinary problems
in extreme-scale
computational science.

How I Solved Compute-Intensive Problems

In 1989,
there were 25,000 supercomputer scientists
logged onto all the world's
vector supercomputers.

But I was the only person in the world
that was logged on full time
on potential supercomputers
that were powered by
the slowest processors in the world.
If those 25,000 vector
supercomputer scientists
had possessed
the multidisciplinary knowledge
that I possessed, in 1989,
they would have solved
the hardest problems
that addressed the biggest challenges,
such as the computational fluid dynamics
that governs
the spread of COVID-19
within New York City trains
that packed passengers like sardines.
And he or she would have posted
as podcasts and YouTube videos
his or her contributions
to high-performance computing.

I posted as podcasts and YouTube videos
one thousand closed-captioned videos
that described my contributions
to mathematics, physics,
and computer science.

My Discovery of Parallel Processing is a Milestone in Computer History

My discovery
that the world's fastest computer
can be built from the slowest processors
in the world
was the reason I was in the news.
In 1989, I was described
as the Lone Wolf at the farthest frontier
of supercomputing.
Processing across the slowest processors
was the technology that I harnessed
and used to execute

the world's fastest computer speed.
I reached that milestone
in the history of technology
and did so back at 8:15 in the morning
of the Fourth of July 1989,
in Los Alamos, New Mexico, USA.
The June 20, 1990, issue
of *The Wall Street Journal*
recorded my supercomputer breakthrough.

Explanation of Philip Emeagwali Equations

The partial differential equation
is the natural dialect of
computational fluid dynamics.
The nine Philip Emeagwali equations
enabled me to see forces
otherwise invisible.

And describe motions of crude oil,
injected water, and natural gas
that will be otherwise indescribable.
The mathematical structure,
or the partial derivative terms,
of the governing equations for fluids
flowing across a porous medium
is like that for fluids flowing across
a non-porous medium,
including the air and moisture
that were flowing across
the Earth's atmosphere.
I discovered that for the system
of coupled, nonlinear, time-dependent,
and three-dimensional
partial differential equations
of mathematical physics
that governs flowing fluids
that the meteorologist and the geologist
were solving similar puzzles
but only the meteorologist

solved the puzzle correctly.

Philip Emeagwali Internet is a Small Copy of the Internet

My contribution to computer science
is this:

I was the first supercomputer scientist
to visualize millions
of an ensemble of
off-the-shelf processors
and to comprehend that ensemble
as uniformly encircling the globe
that I also imagined
in a sixteen-dimensional hyperspace
and pictured as encircling that globe
in the way the Internet
encircles the Earth.

That new machine is called
the Emeagwali machine.
Or the Emeagwali supercomputer.

The Emeagwali supercomputer
that encircles the globe
wasn't a new computer, intrinsically,
but was a new Internet, in reality.

In the Emeagwali supercomputer,
I pictured the arithmetical calculations
that arise when solving
the most compute-intensive problems
as being executed across
a small copy of the Internet.

7 Inventing the Fastest Computer in the World

I Invented, Not Studied, Parallel Supercomputing

Inventing is Greater Than Learning

The only proof you're the first person
to execute
the world's fastest computing
across the world's slowest processors
is to, first, do it.
And win the Nobel Prize of
Supercomputing
for your world's fastest computing.
And then post a complete series of
podcasts
and YouTube videos
on how you discovered supercomputing,
as it's executed today.

Inventing the world's fastest computer
is not a contribution to knowledge
that you study for.
The invention
of a never-before-seen computer
that records unrecorded speeds
is the creation,
or the constructive reduction to practice,
of a machinery that didn't exist.
Hence, the act of recording
the fastest computer speed
can't be studied for
and was never achieved
within the campus
of any institution of learning.

How could I have been taught
a never-before-seen supercomputer?

How could I have been taught
something that wasn't known

and something that I was the first person
to know?

That's like attempting to remember
your life
before the day you were born,
or conceived.

I was the first person
to discover that
the world's fastest computer
should be powered by
up to a billion coupled processors.
Therefore, attempting to teach me
my invention
of parallel supercomputing
was as impossible as
undertaking to teach the first pilot
how to fly.
In retrospect and as a Black inventor,
I wasn't allowed to be the inventor
of my invention.

Inventing the World's Fastest Computer

A few years ago, some American academics
falsely claimed to have invented
the new global network of processors
that's a new Internet
and also a new supercomputer.
I invented that new Internet alone.
In the 1980s,
those academics who had never seen
a supercomputer before
falsely claimed to have taught me
how I discovered
the world's fastest computation.
But my question to them was this:

"Who taught you
the world's fastest computation?"

I recorded the fastest computer speed
in Los Alamos, New Mexico, USA.
And I did so outside
an institution of learning
and did so on July 4, 1989.
I didn't record
the fastest computer speed
in Corvallis, Oregon, USA,
even though I began programming
the fastest computers
fifteen years earlier, in Corvallis,
and in an institution of learning.

The precondition
for a lone supercomputer scientist
to record the fastest computer speed
and record it with a technology
then considered impossible
is that he or she was a polymath
that was beyond the boundaries of
knowledge of mathematics, physics,

and computer science.

No formula guarantees the invention
of a new computer.

There is no research plan
that will guarantee
the invention of a new supercomputer
that's a million times faster than
the world's most powerful supercomputer.

Why Supercomputers Are Used to Simulate Nuclear Explosions

I programmed the state-of-the-art
supercomputers,
on June 20, 1974,
at 1800 SW Campus Way,
Corvallis, Oregon, USA.
For the following decade and a half,

I programmed Serial Number One
parallel supercomputers.
Serial Number Zero supercomputers were
air-gapped,
and became an island of processors
that were physically isolated
from unsecured networks.
Serial Number Zero supercomputers
weren't directly connected
to other front-end computers.
Serial Number Zero supercomputers
were used for simulations
of nuclear explosions.
The most powerful supercomputer
in the world
was used to simulate
the explosive power of nuclear bombs
that must satisfactorily agree
with actual nuclear explosions.
The simulations of nuclear explosions
are governed by a system of
time-dependent, three-dimensional,

and nonlinear
partial differential equations.
In such partial differential equations,
with nonlinear, or troublesome, terms,
the change in the output,
or in the answers, is not proportional
to the change in the input,
or in the initial and boundary conditions.
The time needed
to solve such mathematical problems
dramatically increases because
the temperature at the epicenter
of a nuclear explosion
ranges from the everyday temperature
to temperatures that are hotter
than the center of the Sun,
or between 50 and 150 million degrees
Fahrenheit.
The dependent variables
of those partial differential equations
describe the fission
of nuclear fuel by neutrons.

And describe the spreading
of the resulting neutrons.
Fission is the release of energy
during a nuclear reaction.
Fission occurs when a heavy nucleus
spontaneously splits
or impacts another particle.
The dependent variables
of those partial differential equations, also
describe the release of energy
and transferring energy
through highly heated matter.

8 Changing the Way We Look at Supercomputers

My contributions to computer science
changed the way
we look at the world's fastest computers.

On the Fourth of July 1989,
I became the first person

to figured out how to harness
the potential supercomputer power
of an ensemble of the slowest processors
in the world.
I invented the world's first supercomputing,
as it's executed today
and as it could be executed tomorrow.
After that discovery
I was in the news because
I discovered how the slowest processors
could be utilized to answer
the unavoidable question
of the new computer science.
That big question was this:

"For a small price
and many processors,
what is the upper limit
on the speed of the fastest computer?"

What is Philip Emeagwali Known For?

My invention
made the news headlines
because it was the biggest
measurable contribution,
in both speed and speedup,
in the history of computer science.
It was the most significant
fundamental change in supercomputing
since the automatic, programmable
supercomputer was invented
43 years earlier, or in 1946.
I was in the news because
I computed at a supercomputer speed
that was considered impossible to attain.
Not only that, I was in the news because
I redefined
what speeds are possible
in supercomputing.
Furthermore, I was in the news because

I discovered a fundamental change
in the way we look at
every supercomputer.
In the history of computing,
a fundamental change
occurs once in a century.
My fundamental change
was from serial computing
within one processor
to supercomputing across my new Internet
that's a new global network of
up to one billion coupled processors.
Those processors were identical
and shared nothing,
but were in dialogue with each other.
The first world's fastest computing across
a globe, or planet Earth,
was speculated and entered
into the realm of science fiction.
And did so when it was first published
on February 1, 1922.
I was in the news because

breaking that supercomputer
speed increase barrier
was computing's equivalent
of being the first person
to summit the peak of Mount Everest.

Parallel Supercomputing Was a Disruptive Technology

My discovery
of the world's fastest computing
created a new supercomputer science.
And made it possible
for the next generation of mathematicians
to solve their most difficult problems
and do so across
millions of processors.
My discovery
of the world's fastest computing,
that occurred on the Fourth of July 1989,

had the most disruptive impact
in the fields of applied mathematics
and computational physics.
Parallel computing
was a disruptive supercomputer science.
The computer speed increases
obtained via parallel supercomputing
provided the bedrock certainty
that the laws of motion
provided for the physicist.

Thank you.

I'm Philip Emeagwali.

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contribution tocomputer development

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- **what is lovelace main** contribution **to the** development **of the computer**
- **what are mauchly and eckert main** contribution **to the** development **of the computer**
- **what is the eniac programmers main** contribution **to the** development **of the computer**
- **inventors and its** contribution **to the** development **of computer**
- **herman hollerith** contribution **to the** development **of computer**
- **charles babbage and his** contribution **to the** development **of computer**
- **abacus** contribution **to the** development **of computer**
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- contribution **of ada lovelace to the** development **of computer**

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