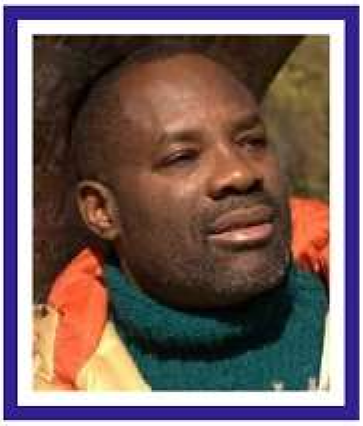

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Inventing the First Supercomputer (As It's Know Today)

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."**

https://youtu.be/0DlusvntSFw

Transcript of Philip Emeagwali YouTube lecture 211002-1of4 for the video posted above.

Thank you. I'm Philip Emeagwali

A Letter From the Bloodiest Battlefield in Africa!

My hometown, Onitsha,
was the bloodiest battlefield
in Africa!
About 15,000 soldiers
were killed in the battle of October 12, 1967,
the first of four invasions of Onitsha.

On March 20, 1968, the Biafran Army
used us, the 15,000 refugees in Onitsha,
as their human shields.

Today, the Nigeria-Biafra War
is ranked as the second bloodiest war
in the history of Africa.
During the 30-month-long
Nigerian-Biafran War
that began on July 6, 1967,

and ended on January 15, 1970,
Colonel "Hannibal" Achuzie
was a war hero.
He was praised for
courageously fighting like a lion.
Colonel "Hannibal" Achuzie
was nicknamed "Air Raid"
by Biafran soldiers.
Air Raid was their code phrase
for Colonel Achuzie's Land Rover
which had the registration number,
BA 7,
where B.A. was the acronym
for the Biafran Army.

Colonel Achuzie's *modus operandi*
at the battlefield
was to hide in his Land Rover.
And hide at a safe distance
behind the war front.
From his safe distance
far behind the action,

he ambushed
and shot at Biafran soldiers
who tried to flee from the war front.
"Hannibal" Achuzie
never killed a Nigerian soldier.
Achuzie killed any Biafran soldier
he caught fleeing the battlefield.
Achuzie disliked panicked, disorderly,
and undisciplined retreats
from the battlefield.
Achuzie ridiculed Biafran soldiers
who were fleeing from battlefields
as a quote, unquote "cowards."

The Day Our Army Was Defeated

Throughout that 30-month-long war,
Biafran soldiers were outgunned
and out-manned by four to one.
The Nigerian Army fired their artillery guns
and fired with a wild abandon
that left retreating Biafran soldiers

frightened and disorganized.
On the battlefield, the ratio of Nigerians
to Biafrans was four to one.
And four Nigerian soldiers
—each heavily armed
with a modern automatic weapon—
was fighting against
only one Biafran soldier
who had about four bullets.
Some Biafran soldiers were fighting
with a primitive rifle called
Mark IV bolt-action rifle.
The Mark IV rifle was manufactured
before the Second World War.
That final Nigerian invasion of Onitsha
of March 20, 1968
was supported by a column of
British armoured cars.
And supported by
prior air raids of Onitsha
by Russian MiG-17 jet fighters
and Russian Ilyushin IL-28 bombers.

When the war front action got hot
as it did on the night of March 20, 1968,
Biafran soldiers were gripped
by mass hysteria. Biafrans abandoned
the bulk of their military equipment
in Onitsha.

All schools in war-torn Biafra
were closed for three years
and converted as military barracks
and as refugee camps.
One in fifteen Igbo-speaking persons
died in that 30-month-long war.
In 1968, my ancestral hometown
of Onitsha, Nigeria,
was described as the bloodiest battlefield
in the history of Africa.

One Day We Had to Run!

At about six o'clock in the evening
of March 20, 1968, we for the fourth time

fled as refugees from Onitsha.
That afternoon, the town of Abagana,
which was fifteen miles away,
was captured by the Nigerian Army.
The Nigerians outnumbered and outgunned
the Biafrans by four to one.
We fled because we saw
disorganized Biafran soldiers fleeing
from the Abagana War Front.
Fleeing Biafran soldiers
alerted us that the Nigerian Army
will capture Onitsha
in about six hours.
Knowing that Nigerian soldiers
did not take prisoners,
we fled from 14 Mba Road, Onitsha,
to The Merchants of Light School, Oba.
Two months earlier, on January 19, 1967,
my family fled as refugees
from the battlefield at Awka, Biafra.
We fled back as refugees
to 14 Mba Road, Onitsha,

even though we fled from Onitsha
as refugees to Ogidi and to Awka
and did so three months earlier,
on October 12, 1967.

From October 4 through 12, 1967,
artillery rockets
rained from the banks of the River Niger
at Asaba
to our neighborhood in Onitsha.
Within hours, downtown Onitsha,
called Odoakpu and Fegge Quarters,
became a ghost town.
My family fled from my father's house
at 4B Egbuna-Adazie Street, Onitsha,
to my maternal grandfather's house
at 6C Wilkinson Road, Onitsha,
and to the compound
that was seven miles away
at Nkwelle Ogidi, Biafra,
where my maternal grandmother was born
and fled to Awka, Biafra.

In February 1968,
Russian MiG-17 jet fighters
strafed our neighborhood
of 14 Mba Road, Onitsha.
Biafran anti-aircraft weapons
were fired from a nearby civilian house
and fired at the MiG-17 jet fighter.
That Biafran anti-aircraft strike
incensed the Nigerian Air Force.
Nigeria reacted by sending its
Russian Ilyushin IL-28
Beagle medium bombers
to drop bombs upon refugees
that fled from artillery shelling
that originated from the west bank
of the River Niger at Asaba.
My family fled from downtown Onitsha
to uptown Onitsha, called *Énú Ọnịcha*.

On the early morning of March 21, 1968,
I lost two cousins,
17-year-old Patrick Okwuosa

and 24-year-old John Okwuosa.
Both surrendered to Nigerian soldiers
at their house at Egerton Road, Onitsha,
that was across the street
from Zik's Institute.

On March 21, 1968,
the population of Onitsha
was about fifteen thousand refugees,
or one in twelve
of its original residents.
Five months earlier,
the population of Onitsha
was one hundred and eighty thousand
(180,000). That day, two thousand
male refugees
were executed by the Nigerian Army.
The male Igbo refugees were killed
to avenge the loss
of fifteen thousand Nigerian soldiers
whom Biafran soldiers killed
back on October 12, 1967.

Those Nigerian soldiers were trapped
at the east bank of the River Niger
of downtown Onitsha.
And could not flee—across
the destroyed River Niger bridge—
to the west bank at Asaba.
Fifteen thousand Nigerian soldiers
were killed by Biafran soldiers
during the ensuing
house-to-house fighting
that lasted a few days following
October 12, 1967.

In the following five months,
my family fled by foot
from Onitsha to Ogidi,
which was seven miles away.
About three weeks later,
we fled from Ogidi to Awka,
where my father was reassigned
as a nurse.

We spent the Christmas of 1967 in Awka.
On January 19, 1968, we fled from Awka
and back to Onitsha.
We fled a few hours before
the Nigerian Army advanced from Enugu
to capture Awka.
Again, my father was reassigned
as a nurse to Oba, Biafra.
At about six o'clock in the evening
of March 20, 1968,
we fled from advancing Nigerian Army.
We fled as refugees from Onitsha.
And fled because we saw
poorly-armed Biafran soldiers
that should be protecting us
fleeing from the Abagana battlefield
which was sixteen miles away.
That night, Biafran soldiers
were in total disarray and outgunned
and lost their will to fight.
The Nigerian Army rapidly routed
the Biafran Army.

Biafran soldiers fled from
the Abagana battlefield through Ogidi,
Nkpor, and Onitsha.
During that five month period
of four Nigerian military invasions,
from October 12, 1967
through March 21, 1968, Onitsha,
a renowned city of commerce,
was reduced to a ghost town
of about fifteen thousand refugees
who were all indigenes of Onitsha.
After three military invasions
of downtown Onitsha
that each originated from Asaba
and across the River Niger,
the refugees fled from
downtown Onitsha—consisting of Fegge
and Odoakpu Quarters—
and fled to the greater safety
of the Inland Town part of Onitsha.

When the Nigerian Civil War ended
on January 15, 1970, one in fifteen Biafrans
had died.
And my hometown of Onitsha
was declared as the bloodiest battlefield
in African history.

From Biafra to USA

In June 1970, at age fifteen and in Onitsha,
I had an epiphany.
Because I was considered gifted
in mathematics, the possibility of me
getting a scholarship to the USA
wasn't far-fetched.
So, I began nursing the idea
of coming to the USA.
Three years later, I won a scholarship
to Oregon, USA,
that was dated September 10, 1973.
Nine months later, I was in Corvallis,

Oregon, programming
one of the world's fastest supercomputers.
I used the technology
to solve a system of equations
of algebra.

1 Obstacles in Inventing the Fastest Computer

Why Are Supercomputers Used in Nigeria?

A Nigerian writing a school essay asked me:

"Why are supercomputers used in Nigeria?"

The energy and geoscience industries
bought one in ten supercomputers,
and use them to pinpoint deposits
of crude oil and natural gas.

There are 65,000 oil and gas fields
around the world.
My country of birth, Nigeria,
has 159 oil and gas fields.
The Bonga Oil Field of Nigeria
was discovered in 1996.
That oil field was at
an average depth of 3,300 feet.
The estimated oil in the Bonga Oil Field
is about 1.5 billion barrels.

The fastest computing
executed across millions of processors
must be harnessed and used
to recover about half
of the oil discovered
in the Bonga Oil Field.
In 1989, I was in the news
for discovering how
the slowest processors in the world
could be harnessed
as the world's fastest computer

and across an Internet
that's a global network of those
processors.
And used to discover and recover
otherwise elusive crude oil
and natural gas.

Why I Began Supercomputing in 1974

I began supercomputing,
on Thursday June 20, 1974,
when President Richard Nixon
was in The White House.
I began scalar supercomputing
by writing my first supercomputer code
in my one-room studio apartment
that was upstairs of a white house
at 195A Knox Street South,
Monmouth, Oregon, USA.
I began fastest computing
when it was a crime

to sell a supercomputer to the Soviet Union
who might use that supercomputer
to simulate nuclear explosions.
Not only that, I began supercomputing
sixteen months after the last man
returned from the Moon.
I began supercomputing
on a machinery that was ranked
as the world's fastest computer
eight years earlier, or in December 1965.
Back then, I used supercomputers
to solve mathematical equations.
Since the 1930s, algebraic equations
were the most recurring decimals
in computational physics.
So, it should not come as a surprise
that the Computer Center,
that I used in 1974, was between
the physics building
and mathematics building
that was named Kidder Hall.
Kidder Hall is a large neoclassical building

that encompassed a full basement
and three stories.
In Oregon, Kidder Hall
is the center of mathematical research.
I left Kidder Hall on June 5, 1977.
For me, the next fifteen years
of living and working
in the District of Columbia, Maryland,
Wyoming, Michigan, and Minnesota
were full of obstacles,
both scientific and racial.

Overcoming Obstacles in Supercomputing

In my first two decades in the USA,
I learned and discovered
how to harness the slowest processors
in the world.
And use them to power
the fastest computers in the world.
But there were times in the 1970s and 80s

that I felt frustrated.
I felt frustrated
because I was a Black supercomputer geek
that was ostracized.
Furthermore, I felt frustrated
because I was forced
to conduct my supercomputer research
unfunded and alone.
I felt frustrated by the challenges
of being a supercomputer scientist
who was the Lone Wolf
at the farthest frontier
of mathematics and physics.
I felt frustrated
because I was the lone programmer
of my experimental
ensemble of 65,536 processors.
Not only that, I felt frustrated
because my Holy Grail
was to emulate a supercomputer.
And do so by supercomputing
across the slowest

sixty-four binary thousand
processors in the world.
In the 1970s and 80s,
there were times I felt that
the technology of computing
across processors
will never power the supercomputer
of the future.
Sometimes, I felt that
the fastest computing across
up to a billion processors
will forever remain impossible
to harness.
And used to forecast the weather.
In the early 1980s, I felt like
I wasn't discovering much
about the fastest computing across
the slowest processors.

As a Black African supercomputer scientist
who worked as an outsider
in white American supercomputer centers,
my research in fastest computing
was and had to be subterranean.
In the early 1980s, I was called a lunatic,
humiliated, and dismissed
by my research teams
who believed that the fastest computing
across the slowest processors
will forever remain
a huge waste of everybody's time.
In the 1980s, my mathematical theories
about fastest computing
and how to solve
the hardest problems
in parallel,
or solve sixty-four binary thousand
mathematics problems at once
were ridiculed and dismissed as
unworkable and unrealistic.
I discovered that to overcome racism

in U.S. supercomputer laboratories
demands my anonymity
without my being invisible.
Until 1989, the supercomputer scientists
that I corresponded with,
earlier in the 1970s and 80s
didn't know that I—Philip Emeagwali—
was a Black, sub-Saharan African.
Ironically, being a Black
supercomputer scientist
put me at an advantage.
It enabled me to discover that
the world's slowest processors
could be harnessed and used to power
the world's fastest computers.
If I was a white supercomputer scientist,
I would have been given more significant
opportunities and privileges.
I would have been accepted
and absorbed
into a large multidisciplinary
research team of supercomputer

scientists,
such as Cray, Intel, or IBM.
I would have accomplished more
with less supercomputing knowledge.
Being Black and African
forced me to conduct my multidisciplinary
supercomputer research alone.
And to be a mathematician
who's a polymath
and shared his multidisciplinary knowledge
across one thousand podcasts
and YouTube videos.
That mastery enabled me to harness
the total and maximum
supercomputer power
of my coupled ensemble
of the two-raised-to-power sixteen
slowest processors in the world
that were designed
for a mainstream market,
rather than for supercomputing.

And manufactured in colossal numbers
and for a lower price.

As a polymath,
I understood extreme-scale mathematical
and computational physics, differently.
And I understood it in a broader sense
than a mathematician, or a physicist,
could understand it.
That's the reason I could post
one thousand closed-captioned videos
on YouTube
that each explained my contributions
to mathematics, physics,
and computer science.
Seymour Cray, who designed
seven in ten supercomputers of the 1980s,
posted about ten original videos
on YouTube.
Albert Einstein,
the father of modern physics,
has fewer than ten original videos

on YouTube.

2 Fastest Computing is My Contribution to Physics

How I Pushed the Boundaries of Physics

When Textbook Theory Contradicted My Experiment

Students writing a short essay
on famous scientists are often asked:

"What are the contributions
of Philip Emeagwali to physics?"

As a physicist who came of age in the 1970s,
I contributed to geophysical fluid dynamics,
and in particular, to hydrodynamics.

Hydrodynamics

is the branch of physics
that affects your everyday life
the most.

Hydrodynamics
is the subject that Leonardo da Vinci
investigated the most.
I understood computational hydrodynamics
both physically and across processors.

I began as a theorist.
A theory is an idea
that's not positively true.
A theory is not a fact.
According to an earlier
fluid dynamics theory, the weight
and shape of the Bumble Bee
and their relations
to the wingspan of the Bumble Bee
should make it impossible
for the Bumble Bee to fly.
However, the Bumble Bee

is not a mathematician
nor does it not understand
the laws of physics
and, therefore, in its ignorance
it defies our physics theories
and did so by flying.

Often, the facts prove our theories
to be wrong.
It's a fact that my world's fastest computing
was recorded across a new Internet
that was a new global network
of the slowest processors in the world.
It made the news headlines when I made
that fastest computing discovery,
back on the Fourth of July 1989.
My discovery of the fastest computing
across the slowest processors
proved earlier textbook theories wrong.

How is Computational Hydrodynamics Used?

In 1986 and 87,
I was an engineering physicist
who helped operate
nine hydroelectric dams.
Those nine dams were built by
the U.S. Bureau of Reclamation
that was the number-one dam builder
in the world.
As an engineering physicist
employed by the U.S. government,
I possessed the hydrological knowledge
that must be used to protect the residents
who lived on the flood plains
of the 716-mile-long North Platte River.
That river flows through Colorado,
Wyoming, and Nebraska.
And has a discharge of
one thousand three hundred and fifty-five
(1,355) cubic feet per second.

The nine North Platte River dams,
within Wyoming, that I operated
were small compared to the Kainji Dam
of the four thousand
one hundred and eighty-(4,180)-kilometer-long River Niger.
The Niger has a discharge of
one hundred and ninety-seven thousand
four hundred (197,400) cubic feet
per second.
In the late 1970s, I researched
how to use computational hydrodynamics
and use it
to forecast the motion of flood waves
that will arise
if the spillway of a dam breaches,
or if a dam breaks.
Such mathematical calculations
—from solving
an initial-boundary value problem
of computational hydrodynamics—
must produce

the flood-inundation maps
for the North Platte River flood plains.
As an engineering physicist,
I explained the
standard operating procedures
to dam tenders.
I instructed dam tenders
on when to lower
water levels along the North Platte River
of Wyoming.
Unlike other supercomputer scientists
who were trained only in
computer architecture,
I knew hydrodynamics
from both the fluid dynamics textbooks
and field experiences
that I gained along the reservoirs
of the nine dams
of the North Platte River.
Back in 1969, I knew hydrodynamics
from swimming far downstream
of the Kainji Dam

that holds a reservoir
of 500 square miles of water.
And holds it upstream of the River Niger
at Ndoni (Biafra, Nigeria).
The River Niger, called *Orimili*,
is the principal river
of West Africa.
Orimili, the Igbo translation
to the "great water," is 2,600 miles long.
It's the third-longest river in Africa.

My multidisciplinary experiences
range from 1969
at the Biafran Navy marine base
that was at the Oguta War Front
on the east bank of Oguta Lake
to the frontier of supercomputing
that was in Silicon Valley in 1989.
Those were the experiences
that enabled me
to conduct my supercomputing research

and do so as a lone wolf.

My Retrospective on Fluid Dynamics

To conduct research alone
and to simultaneously do so
at the frontier of physics,
at the frontier of mathematics,
and at the frontier of computer science
is the definition of a polymath.
And a true supercomputer scientist.

Looking back retrospectively,
computational fluid dynamics
has a two-and-a-half century history.
The two centuries between 1740 and 1940
were the era of analytic fluid dynamics.
During that era,
partial differential equations
that govern the motions of fluids—such as
Euler's equations—only lived

in obscure academic journal papers.
Or on the mathematician's blackboard.
Such equations were never discretized
and coded
for the motherboard.
Or for the evening weather forecaster.

Parallel Computing is the New Mathematics

For the fifteen years following
June 20, 1974, at 1800 SW Campus Way,
Corvallis, Oregon, USA, I grew from being
one of the time-sharing programmers
of one of the
world's fastest computer
that was powered by
only one central processing unit
to prevailing as the only full-time
programmer of sixteen
of the world's state-of-the-art

supercomputers
that was each powered by
up to sixty-four binary thousand
central processing units.
I theorized the world's fastest computer
as powered by an Internet
that is a global network
of up to one billion processors.
That was how I was a quote, unquote
"discovered"
as the only father of the Internet
that invented an internet, back in 1974.

Mathematics is taught to every student.
It's a mandatory subject
during the first twelve years
of schooling.
But the mathematics learned in school
was developed
one to five thousand years ago.
The world's fastest computing,
as it's known today

and as it's expected to be known tomorrow,
is a new mathematical knowledge
that came of age on July 4, 1989,
the date I discovered it.
Parallel supercomputing
is my contribution
to mathematics.
Supercomputing
is the invention and milestone
that changed the way
the modern mathematician
solves his or her
most compute-intensive problems.

3 Nine Philip Emeagwali Equations of Fluid Dynamics

Equations of Fluid Dynamics

In school essays, an often asked question is this:

"What are the contributions of Philip Emeagwali to physics?"

Please allow me to quote myself
from a lecture that I gave
to research physicists,
back in the early 1980s.

"The governing
partial differential equations
of gas dynamics
were invented from
the laws of conservation of mass,
momentum, and energy.
The number of
partial differential equations
is less than the number of
dependent variables in the equations.
To complete the system of equations

demanded we introduce
an equation of state.
Like the ideal gas law
that introduces temperature
as a new dependent variable.
Doing so, requires we introduce another
equation of state.

Substantial progress in developing
partial differential equations
was made during the hotbed
of research activities that occurred
during the seventy-five (75) years
that were inclusive of 1840 through 1915.
That was the period
the Navier-Stokes equations
and analogous
partial differential equations
that govern the motions of fluids
were formulated.
During those seventy-five years,
the practicing engineer only used

algebraic and differential equations
for his fluid dynamics calculations.
An often used equation
was the Bernoulli equation
that's a nonlinear differential equation
of the first order.
During those years, the abstract governing
partial differential equations
of analytical fluid dynamics
remained as textbook abstractions."

A Retrospective on Computational Physics

Without the programmable computer
that came into existence
from 1946 onward, there will be no
computational fluid dynamics,
and no weather forecasts.
And the analytical fluid dynamics
of the pre-computer era

will remain in the realm of
pure mathematics that remains of interest
only to mathematicians
and physicists that were within academia.

Retrospectively, we had
two hundred years—from 1740 to 1940—of
analytical fluid dynamics.
The experimental fluid dynamics
that was extensively investigated
by Leonardo da Vinci
in the late 15th century,
was followed by
the analytical fluid dynamics
of 1740 through 1940.
And then followed by
the computational fluid dynamics
of the 1950s, 60s, and 70s.
And, finally, followed by
the extreme-scaled massively
parallel-processed fluid dynamics
that was in the news because

I discovered it when I executed it
across an ensemble of
65,536 coupled processors,
back on July 4, 1989,
in Los Alamos, New Mexico, USA.

The Nine Philip Emeagwali Equations

Because this system
of partial differential equations
was beyond the frontier of calculus
and encoded the Second Law of Motion
of physics, it's used to predict
the flows of crude oil,
natural gas, and injected water
flowing across
a highly anisotropic and heterogeneous
producing oil field.
The system of coupled and nonlinear
partial differential equations

which governs
an initial-boundary value problem
at the frontier of calculus
and computational fluid dynamics
that represents the Earth
is the tool used to predict
the long-term planetary motions
of air and water.
Such planetary motions
are the essences of climate models.
We can predict atmospheric
and oceanic motions
and do so with the accuracy
the Second Law of Motion
is used to predict the future positions
of the Moon and Sun.

The nine Philip Emeagwali equations
are as reliable as a hammer.

My contribution to mathematics is this:

I extended the borders of
mathematical knowledge
by a distance of thirty-six
partial derivatives of calculus.
The partial derivatives of calculus
measure changes in properties, such as
velocities, pressure, and friction.
The computed solutions
to a system of nonlinear
partial differential equations
that governs
an initial-boundary value problem,
called petroleum reservoir simulation,
correspond to the flow of crude oil,
natural gas, and injected water
that flow up to 7.7 miles
(or 12.4 kilometers) deep.
The depth of an oil well
is up to eight times
the length of the Second Niger Bridge

of Nigeria.
An oil field is about the size
of Onitsha, Nigeria.

How Did Philip Emeagwali Impact Mathematics?

A question in school essays
on famous mathematicians
and their contributions to mathematics
is this:

"What are the uses of the Philip Emeagwali equations?"

Each time you ride in a car
you did so because the new knowledge
that I discovered on the Fourth of July 1989
was used to pinpoint the locations
of crude oil and natural gas.
I was the first person
to discover how the petroleum industry

could use millions of processors
to solve a system of trillions of equations
of algebra.
Such algebraic equations arise during
the computations
of the miles-deep subterranean flows
of crude oil and natural gas.
Such large-scale algebraic problems
can only be solved across
the millions of processors that power
the world's most powerful
supercomputers.
State-of-the-art supercomputers
are used to discover and recover
crude oil and natural gas
that were buried up to 7.7 miles
(or 12.4 kilometers) deep.
Without the supercomputer,
such crude oil and natural gas
would remain
undiscoverable and unrecoverable.

As an analogy, the supercomputer
is to the geologist or meteorologist
or physicist or mathematician
what the telescope is to the astronomer.

Just as the world's biggest telescopes
are used to locate distant stars,
the world's fastest computers
must be used to pinpoint the locations
of crude oil and natural gas
that are deposited up to 7.7 miles deep.

I used the word "algebra"
a thousand times
in the one thousand lectures
that I posted as podcasts and on YouTube.
The reason was that I discovered
how to solve
a system of equations of linear algebra.
I also discovered
how to solve those equations across
a new global network of

up to one billion processors.
I visualized my network
as my new Internet.

When Fiction Becomes Science

When I was coming of age
as a supercomputer scientist
and in the 1970s and 80s,
the first world's fastest computing across
the world's slowest processors
was an unconfirmed theory.
Before my discovery
of the world's fastest computing,
which occurred on July 4, 1989,
how to solve
the most compute-intensive problems
wasn't known, wasn't taught,
and wasn't in any mathematics
or physics or computer science textbook
and examination.

Before my discovery,
the fastest computing across
the slowest processors
only existed in the realm of science fiction.
Making that science fiction to become
nonfiction felt like a benediction
when I and my discovery
were validated, in 1989,
with the highest award in supercomputing.
It made the news headlines because
I was unknown and won that award alone.

Thank you.

I'm Philip Emeagwali.

Further Listening and Rankings

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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

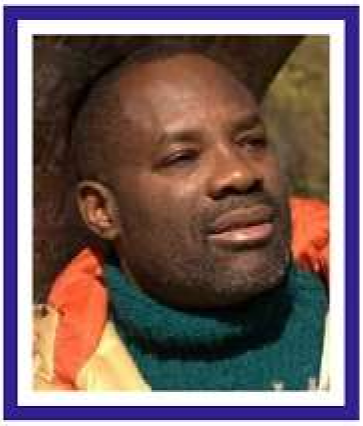
contribution of ada lovelace to the development of computer

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**

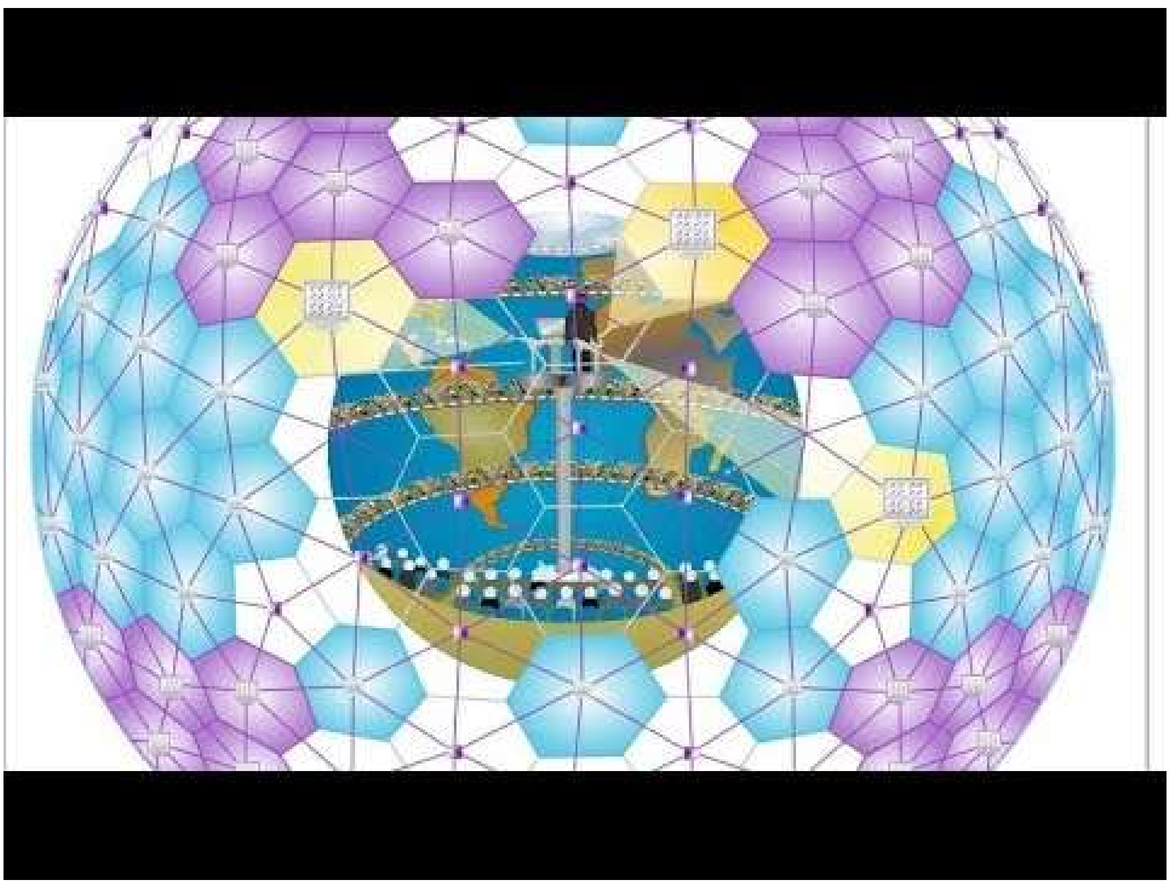
Google suggests the most noted fathers of the Internet. With four out of ten searches, Philip Emeagwali is the most suggested “father of the Internet” for schools across the USA, Canada, UK, and Africa (Labor Day 2019).



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

Inventing the Philip Emeagwali Internet

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."

https://youtu.be/pzbNas01sFk

Transcript of Philip Emeagwali YouTube lecture 211002-2of4 for the video posted above.

Thank you. I'm Philip Emeagwali

1 Inventing the Fastest Computing from the Slowest Processing

Supercomputing in the 1970s

My Quest for the Fastest Computing

My quest for the world's fastest computer
began on June 20, 1974,
on a scalar supercomputer
at 1800 SW Campus Way, Corvallis, Oregon,
USA.
My quest was to be the first person
to fully understand how an ensemble
of up to a billion processors
can work together
to solve the most compute-intensive
problems
and thus make the supercomputer super.
That quest began
on the central processing unit
of supercomputer that was ranked
as the world's fastest computer,
seven years earlier.
My search was for the fastest computation

of an initial-boundary value problem
that was beyond the frontier of calculus
and fluid dynamics. The perennial list
of the most compute-intensive problems
includes climate modeling
across millions of processors.
High-stake climate models are governed
by a system of coupled, nonlinear,
three-dimensional,
and time-dependent PDEs,
or partial differential equations, or rather,
governed by discrete approximations
of those PDEs
that were used to translate
the continuous problem
from calculus to its discrete analog
in large-scale computational linear
algebra.
My search
for the most massively parallel-processed
solutions
of the most compute-intensive problems

in mathematical physics
was my search for the answer
to the most recurring question
in supercomputing.
That unanswered question was classified
by the U.S. government
as a Grand Challenge Problem
of supercomputing
at the crossroad
where the frontiers of knowledge
in mathematics, physics,
and fastest computing intersect.
My discovery
that the world's fastest computing
can be executed across
the world's slowest processors
occurred at
fifteen minutes after 8 o'clock in the morning
of July 4, 1989,
in Los Alamos, New Mexico, USA.
Before my supercomputing discovery,

no mathematician or physicist
or computer scientist could answer
that big question.

Leapfrogging from Slowest Processing to Fastest Computing

The story of how the fastest computer
was invented
from harnessing the slowest processors
was incomplete.
That story remains incomplete because
a new answer brings forth a new question.
My answer to how to solve
the most compute-intensive problems
and solve them by
supercomputing across
the slowest processors
brings forth the new question
of how to solve the same
initial-boundary value problems—such as

large-scale computational fluid dynamics—
and solve them fastest
on a quantum computer.

2 The Nine Philip Emeagwali Equations

Students are asked to write a short essay
on the nine Philip Emeagwali equations.
This essay question will not be dated
in five thousand years.
Technology does not age well.
The vector supercomputers,
of the 1970s and 80s, were replaced by
the world's fastest computers
of today.
Science ages well. Mathematics ages well.
Pythagoras theorem predates Pythagoras
by one thousand years.
Pythagoras theorem was known
during the reign of Hammurabi the Great.
Therefore, the nine Philip Emeagwali

equations
will not become obsolete,
just like Pythagoras theorem,
that has been known
for four thousand years,
didn't become obsolete.
I write equations, algorithms,
and programs, daily.
I write equations
the way poets write poems.
A supercomputer scientist
proves he understands
the partial differential equation
that is beyond the frontier of calculus,
or mathematics and physics textbooks,
and does so if and only if,
he can explain his equation
on YouTube.
And if and only if
he can code the solution
of an initial-boundary value problem
that was governed

by his partial differential equation.
And if and only if
he can email the initial
and intermediate boundary conditions
and email them to and from
the millions of processors
that outline and define
his or her massively parallel
supercomputer.
I visualized my new supercomputer
as a new Internet
that's my new global network of
processors
that's not a computer, by its very nature.
It's a new Internet, in reality.

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

Why I Invented the Nine Philip Emeagwali Equations

Fast-forward eight years
after June 20, 1974,
in Corvallis, Oregon, USA.
I was in the nation's capital
of Washington, D.C.
During the first half of the 1980s,
I lived and conducted
supercomputing research
in the three Maryland cities
of Baltimore, Silver Spring,
and College Park.
During the two decades that followed 1970,
I grew in my knowledge of mathematics,
physics, and computer science.
By the late 1980s, I was standing alone
at the frontier of knowledge
of how to manufacture computers
that are powered by a billion processors.
And that can compute a billion times faster.

That was the reason
I received invitations
to give lectures on my theoretical discovery
of how I'll massively parallel process.
And solve the most compute-intensive
mathematical problems
in meteorology and geology.
And solve them across
millions of off-the-shelf processors
that shared nothing.
I discovered how to solve
the most compute-intensive problems
in extreme-scale
computational fluid dynamics, such as
modeling hurricanes and tornadoes.
And doing so to protect life and property.
And designing hypersonic aircraft,
quiet submarines,
and efficient automobile bodies.
But in the early 1980s,
my supercomputing lectures

were dry and abstract.
In the 1980s, my reformulations,
discretizations, and stability analyses
of my new system of
partial differential equations
were impenetrable to the layperson.
In the 1980s, my world's fastest
computing quest
was to translate
the nine Philip Emeagwali equations
which I invented on the blackboard.
And code their discretized,
algebraic approximations
on a never-before-seen motherboard.
My new motherboard was a new Internet
that was a new global network of
65,536 coupled,
off-the-shelf processors.
I visualized those processors
as identical and as uniformly
and tightly encircling a globe.
And I visualized my globe as embedded

within my sixteen-dimensional hyperspace.
Furthermore, I visualized those
two-raised-to-power sixteen processors
as defining and outlining a new Internet.
And doing so just as
computers encircle the Earth
and define and outline the Internet.
Unlike other research
computational mathematicians,
of the 1970s and 80s,

I believed that
my mathematical script
should be heard on the stage
(or on the motherboard)
rather than read on the page
(or on the blackboard).
The computer
is to the partial differential equation
what the microphone
is to the poem.

I was not an overnight success.
I've been supercomputing for the fifty years onward of June 20, 1974, in Corvallis, Oregon, USA.
The chicken does not lay its egg
and hatch it the next day.
I progressed from the analytical
fluid dynamics of the 1970s
to the large-scale computational
fluid dynamics of the 1980s.
In 1974, in Corvallis, Oregon,
USA, I wrote supercomputer codes
for one processor.
And for solving a huge system of equations of algebra.
Over the two decades, from 1970 to 1990,
I grew in my scientific knowledge
and mathematical maturity.
I grew from merely knowing
the Second Law of Motion
described in physics textbooks.

That law was discovered, in prose,
three centuries and three decades ago.
I grew from knowing that law only
in prose and algebra to encoding that law
into the nine partial differential equations
called the Philip Emeagwali equations.
My equations govern
the three-phased flows
of crude oil, injected water, and natural gas
that flow along three dimensions
and across porous media
that're both heterogeneous and
anisotropic.
I developed the mathematical maturity
and the knowledge that I used,
in the early 1980s, to discretize and analyze
the consistency, stability, convergence,
and the error propagation rates
of my new finite difference discretizations
of the linearized
nine Philip Emeagwali equations.

I think of myself as a mathematician, first.
The twelve-year-old writing an essay
on famous inventors
think of me as a computer scientist, first.
But some old friends remember me
as a physicist or an engineer.

What's the difference
between scientific research
and engineering practice?

To discover is to make the unknown know.
For that reason, the research scientist
should not know what he's doing.
But the Chief Engineer
for the mile-long Second Niger Bridge
in Nigeria must know what he's doing.

Why should someone, like myself,
spend fifty years learning
what is already known

and trying to make the unknown known?

That's like asking:

Why should a six-year-old
learn how to add and subtract,
which is already known?

The up-and-coming
supercomputer scientist
must have her eyes fixed on
how to scale new summits,
such as solve the most difficult problems
in science, engineering, and medicine.
And solve them on a quantum computer.

3 Inventing the Philip Emeagwali Internet

My Eureka Moment

The Eureka moment, or high point,

of my quest
for the fastest computer in the world
occurred on July 4, 1989,
in Los Alamos, New Mexico, USA.
And it occurred across my ensemble
of the slowest 65,536 processors
in the world.

I invented a new Internet
that consisted of
sixty-four binary thousand processors
(or, equivalently, 65,536 computers)
that were uniformly distributed across
the surface of a globe.
That new global network
of 65,536 processors
was my small copy of the Internet
that's a global network of computers.
My new global network
of up to a billion processors
that uniformly encircled a globe,
in any dimension,

is called the Philip Emeagwali Internet.

Supercomputing Compute-Intensive Problems

In 1989,
my sixty-four binary thousand processors
communicated via emails
that contained 65,536
fluid dynamics codes
that I sent from up to
sixteen nearest-neighboring processors.
My computer codes and email primitives
were esoteric
and weren't meant to be read by humans.

I was computing
at the world's fastest speeds
back from June 20, 1974,
in Corvallis, Oregon, USA,
to July 4, 1989,

in Los Alamos, New Mexico, USA.
In that decade and half, I observed that
nine out of ten supercomputer cycles
were executed by large-scale
computational physicists
who used the supercomputer
to execute
their computational fluid dynamics codes.
And do so for the greatest accuracy
and the highest model resolution.
In the 1970s and 80s, the poster boy
of extreme-scale
computational fluid dynamics codes
was the global climate model
that must be used to foresee
otherwise unforeseeable
centuries-long global warming.
In those two decades,
short-term weather forecasts
and long-term climate studies
consumed five percent
of all supercomputer cycles.

The poster girl
of computational fluid dynamics
supercomputer codes
was the petroleum reservoir simulation
that must be used to hindcast,
or re-forecast,
how to recover otherwise unrecoverable
crude oil and natural gas
that are often buried up to 7.7 miles
(or 12.4 kilometers) deep.
And buried across an oil producing field
that's about the size of Johannesburg
(South Africa).
Petroleum reservoir simulation, alone,
consumed ten percent
of all supercomputer cycles.

Where Are the Fastest Computers?

I began programming
the fastest computers, on June 20, 1974,

in Corvallis, Oregon, USA.
Back then, my theory of fastest computing
across a billion processors
was in the realm of science fiction
and not in science textbooks.
And solving the most compute-intensive
problems
by dividing-and-conquering them
across a billion processors
was an unexplored field of knowledge
that wasn't then on the map
of computer science.
In 1974, my theory of the fastest computing
across the slowest processors
evoked laughter.
Back then, the supercomputer of today
that's powered by millions of processors
only existed
as a science-fiction technology
that had no programmer or prophet.
In the 1970s,
the vector supercomputer

was the accepted technology
for all supercomputing.
Back then, vector processing
had twenty-five thousand evangelists.
The two titans
of the supercomputer world
were Gene Amdahl
of Amdahl's Law fame
and Seymour Cray
the pioneer of vector supercomputers.
In the 1970s and 80s,
the most revered prophet
of vector supercomputers
was Seymour Cray,
the founder of Cray Corporation,
the company that manufactured
seven in ten vector supercomputers.
In the 1960s and 70s,
the most revered prophet
of scalar supercomputers
was Gene Amdahl
of Amdahl's Law fame.

Gene Amdahl
was the supercomputer manager
at International Business Machines (IBM) Corporation,
the company that now manufactures
the most supercomputers
sold in the USA.

A Black in All-White Supercomputing Community

As a Black sub-Saharan
African mathematician
who came of age in the 1970s Oregon
and negatively typecast
in the mid-1980s Michigan,
I gained credibility as a quote, unquote
"genius" because I presented
a never-before-seen supercomputer.
And presented the technology
in both prose and poetry

and straight from the heart.
Unlike the academic mathematician,
I did not read
the nine Philip Emeagwali equations
and their nine companion
Philip Emeagwali algorithms
and did not copy them from any textbook.

The Black mathematician is judged
by a higher standard.
That meant that I had to develop ways
for solving the most difficult problems
at the intersection
where new physics, new mathematics,
and new computing intersected.
I did solve the Grand Challenge Problem
on the blackboard.
I solved it across a new Internet
that's a new global network of millions
of coupled processors.
For that contribution to science,
I won the highest award in

supercomputing.
Computer scientists refer to my award
as the Nobel Prize of Supercomputing.

I stood out because
I was a Black mathematician
and a supercomputer scientist
who computed alone.
Furthermore, I came of age
in the 1970s and 80s and within a nearly
all-white male supercomputing community.
As a young Black and African
supercomputer scientist,
I was compeled to conduct
my physics and mathematics
research alone. My approach differed
from working within
a multidisciplinary team
of one thousand specialists.
I had to do my research
as an outsider to all the companies
like Cray, Intel, or IBM

(or International Business Machines)
corporations.
I was unknown for the fifteen years
that followed June 20, 1974,
the day I first programmed
one of the world's fastest computers.
During those fifteen years,
I grew in my mathematical
and scientific maturity.
And I programmed thousands of
processors
that I visualized
as encircling a globe
and doing so in the manner
the Internet now encircles the Earth.
I was the first person to parallel process
computational fluid dynamics codes
at world record speeds.
And solve them across a new Internet
that's a new global network of
off-the-shelf processors.
My contribution was not a minor increase

in the speed of the computer.
My world record speed
made the news headlines because
solving the most compute-intensive
problems across millions of processors
was a radical change
in the way we do mathematics.
And look at the
world's fastest computer
in a new way.
During my first fifteen years
of supercomputing, I grew
in my scientific knowledge
and mathematical maturity.
I theorized new knowledge
that could make the computer faster
when powered by
the slowest processors in the world.
I theorized that
the then unproved technology
of parallel supercomputing
could be used to solve 65,536

computational fluid dynamics codes.
And solve them all at once.
And communicate them across
65,536 coupled processors.
In the 1970s,
I theorized the fastest computing
across the slowest processors.
In the 1980s, I experimented with
parallel processing across
the slowest 65,536 processors in the world.
The reason I experimented alone,
with the slowest processors,
was that the luminaries
in the world of supercomputing joked that
fastest computing by slowest processing
will forever remain a beautiful theory
that will always lack
an experimental confirmation.

Philip Emeagwali Lectures

In 21st century science, the highest awards
are supported with YouTube lectures.
I've posted one thousand podcasts
and closed-captioned videos
on YouTube that each described
my contributions to physics, mathematics,
and computer science.
The award lecture
is to the historian of science
what the SAT (or Scholastic Aptitude Test)
is to the American university
admission officer.
Or what the LSAT
(or Law School Admissions Test)
is to the American Law School
admission officer.
Or what the JAMB
(or Joint Admissions Matriculation Board)
is to the Nigerian university
admission officer.

A perfect score in the SAT, LSAT,
or JAMB tests does not make a candidate
the smartest person in the world.
In the U.S. alone, about thirty-five thousand
living Americans
achieved a perfect score in their SATs.
The highest awards
in the fields of mathematics, physics,
and computer science
are given based on the discoveries
and inventions contributed
by the recipients
and documented on YouTube.
In 1989, my contribution
of the world's fastest computing
made the news headlines.
And earned me an award
that computer scientists refer to
as the Nobel Prize of Supercomputing.

Once in a century, an invention
changed the definition

of computer science.
A radical shift in the way
we solve the most compute-intensive
problems
is a contribution that extended
the frontiers of mathematical knowledge.
And resulted
in revising mathematics textbooks.
The lectures of well-known scientists
of modern times, such as Albert Einstein,
who is considered
the father of modern physics
are posted on YouTube.
I followed that scientific tradition
by posting on YouTube
one thousand closed-captioned
podcasts and videos.
Each podcast or video
that I posted on YouTube
described my contributions
to physics, mathematics,
and computer science.

My video series on my inventions
is the largest set of transcribed lectures
ever posted on YouTube
by a single inventor.
Yet, I feel like I have
ten thousand [10,000] unrecorded videos
inside me.

Inventing a New Computer Science

Parallel computing
is the technological knowledge
that enabled the computer
that's powered by one thousand
processors
to be faster.
And enabled the world's fastest computers
that're powered by
one billion processors
to be fastest.
Once upon a time, before 1989 to be exact,
the complete knowledge

of the fastest computing across
the slowest processors
wasn't in supercomputer textbooks.
During that era of darkness,
the world's fastest computer,
as it's known today,
existed only in the realm of science fiction.
I invented the first supercomputing
across the world's slowest computers.
And discovered it on July 4, 1989.
That is, the computer scientist
learned modern supercomputing
because and after I invented it.
And the computer instructor is teaching
the world's fastest computing
that I invented.
The science teacher
renounced his voice
to give voice
to the discoverer.
The computer architect
or physicist or mathematician

knows the world's fastest computing
only after it was discovered
and entered into textbooks.
At its granite core, fastest computing
is the knowledge of how to solve
a billion mathematical problems
at once.
In the past, supercomputing
was solving only one difficult
mathematical problem at a time.

The difference between the author
and the inventor is this:

The author of a science textbook
is like the ghost writer
who authored the story
he didn't live.
Or like the fifth-grader
who wrote a book report
on a book he didn't read.

I'm fastidious
in describing and videotaping
my contributions to mathematics,
my discoveries in physics,
and my inventions in computer science.
I do so as a preemptive measure
against those that want to
occupy my stage
and tell my story.

Einstein Versus Emeagwali

In a 60-year retrospective, I realized that
I spent the first half of my life
wishing I was the Albert Einstein
that theorized relativistic motions
of distant planets.
And then spent the second half of my life
wishing I was my younger self
who discovered
how to compute at the fastest speeds
the motions of planetary fluids.

To benefit posterity,
I posted one thousand videotaped lectures
in which I explained
my discoveries and inventions.
At its essence,
my 1,000-part videotaped lecture series
was an attempt
by the old Philip Emeagwali
to record the story
of the young Philip Emeagwali.
The knowledge possessed by
a theoretical physicist,
such as Albert Einstein,
or a computational physicist,
such as Philip Emeagwali,
can only be evaluated and compared
from watching their videotaped
lecture series on their discoveries
in physics.
The one thousand podcasts
and videos of myself
as the extreme-scale

computational physicist
are on YouTube.
The videotaped lectures
of the likes of the theoretical physicist
Albert Einstein
are the most truthful, irrefutable,
and permanent measures
of their intelligence
and scientific knowledge
and their understandings
of their contributions to knowledge.

Emeagwali YouTube Channel

I've posted on YouTube
the details of how I discovered that
processing with up to a billion processors
is the technology
that makes computers faster.
And makes the supercomputer
the fastest.
My technology is used to solve

the most compute-intensive problems
in science and mathematics.
I've posted one thousand podcasts
and YouTube videos
on my contributions to science.

YouTube Channel Emeagwali

With 330 million people,
the U.S. is only 4.3 percent
of the world's population of
7.7 billion people.
There are five thousand
three hundred universities
in the U.S. alone.
And there are as many YouTube channels
for those universities.
In YouTube searches, closed-captioned
and high-resolution videos
are ranked higher.
Google only searches

the contents of transcribed videos.
In Google searching,
my YouTube channel "Emeagwali"
has more searchable video content
than the video channels
of ninety-nine percent
of the 30,000 universities in the world.
I make such asymmetrical comparisons,
between an individual
and each of the 30,000 universities
in the world
because knowledge shared
is knowledge gained.
Knowledge sharing makes the world
a better place for humans
and for all animals.
Sharing knowledge reflects leadership.
The most important thing
we can do with knowledge
is to share it, not keep it.

The tagline of *CNN* is this:

"When we know it, you'll know it."

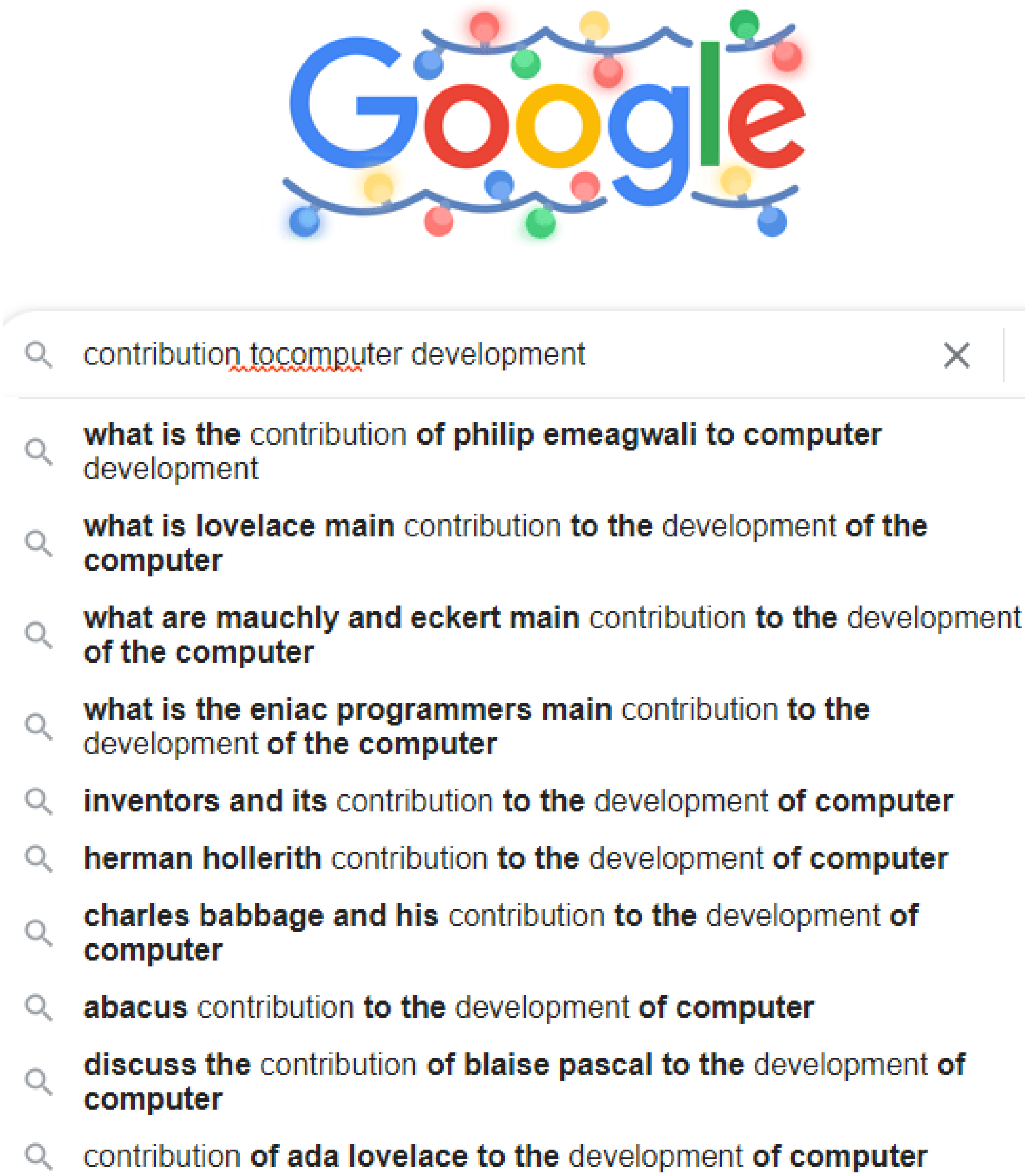
I hope that in my 200th birthdate, on August 23, 2154, that my videos will be displayed.

Thank you.

I'm Philip Emeagwali.

Further Listening and Rankings

Search and listen to Philip Emeagwali in
Apple Podcasts
Google Podcasts
Spotify
Audible
YouTube

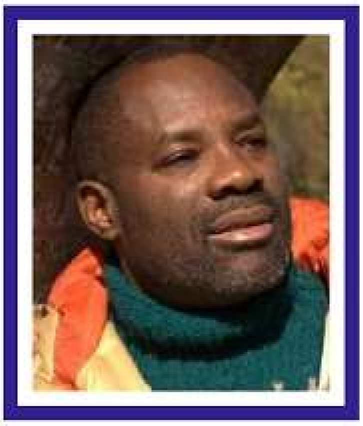


Google suggests the greatest computer scientists of all times. With the number one spot, Philip Emeagwali is the most suggested computer pioneer for school biography reports across the USA, Canada, UK, and Africa (December 8, 2021).

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

5 MISSINF - A World Without Computers | 500-Word *****

Thank you.

I'm Philip Emeagwali.

Parallel processing
that was once a dim light
in a sea of darkness

is now the bedrock
of the world's fastest computers.

In a world without parallel processing,
large-scale computational physics
will be as approximate as a sketch,
instead of as exact as a photograph.
Like a storm at sea, fastest computing
across a million processors
has brutally pushed computer science
in a new direction
and created new fields of study.
The fastest computer
is why you know the weather
before going outside.
The oil and gas industry
uses supercomputers to map, in advance,
each of the 65,000 oil producing fields
in the world.
The fastest computers are used
to answer the biggest questions
in science, engineering,

and medicine. Such questions include
supercomputing
the social distancing requirements
during a global pandemic.

The supercomputer will help define
the political and economic powers
of the 21st century. In recent years, the
industry grossed
forty-five billion dollars a year.

I discovered
how to leapfrog from the
slowest processors in the world
to the world's fastest computers.
It was a transformational discovery
that redrew the boundaries of science,
and permanently changed
what we know about the computer.
And produced
the world's first supercomputer,

as it's known today
and as it could be known tomorrow.

In computer science, recording
the world's fastest computing
and recording it in an unexpected way—
such as across
the world's slowest processors—
is the gold standard
that earns its inventor the highest award
that's referred to
as the Nobel Prize of Supercomputing.
I was the first and only person
to win that award alone, back in 1989.
That prize is awarded only to someone
who made a measurable contribution
to supercomputing, that includes
a quantified and new milestone
in computer history. On July 4, 1989,
the supercomputing community
marked the Philip Emeagwali milestone
as the first time

the world's fastest computer speed
was recorded across
the world's slowest processors.
And does so by solving
up to a billion problems at once
and addressing some of the world's
biggest challenges.

Thank you.

6 MISSING - Inventing a New Computer | 7,500-Word NPL@AM Lecture ****

A World Without Supercomputers

7 Why is the Supercomputer Important?

The need for faster computers
isn't going anywhere.
The supercomputer will help define
the political and economic powers
of the 21st century.
The energy and geoscience industries
buy one in ten supercomputers.
And use them to pinpoint oil deposits.

The Use of Partial Differential Equations

The fastest computer
is why you know the weather
before going outside.
To enjoy life, my wife and I
often hike or bike around Lake George
of upstate New York.
Or cross-country ski
through the old-growth forests
of the Catskill Mountains

of southeast New York.
The Catskill Mountains are noted
for their ninety-eight peaks
and unique beauty
that include waterfalls and scenic vistas.
We check the weather forecast
before going to the Catskill Mountains.

The partial differential equation
that is correctly and accurately solved
across up to a billion processors
that power a supercomputer
must be used to produce
the weather forecast.
The partial differential equation
is, unknowingly, used in your everyday life.
It will be impossible to forecast the
weather and do so
without formulating it
as a computational fluid dynamics problem
that is solved across up to
a billion processors.

Weather forecasting
is an initial-boundary value problem
that's governed by a system of
partial differential equations.
The prediction of global warming
must, foremost, be expressed as
partial differential equations that would
enable the manipulation
of the dependent variables,
such as temperature,
and enable the prediction of climate
change.

Standing as Tall as Lightning Amid Calculus

The physicist understands
the partial differential equation differently
from the mathematician.
As a meteorological physicist
who came of age in the early 1980s,

I envisioned myself
standing as tall as lightning
amid partial differential equations
that were exploding
from 62-mile-deep clouds
that enshrouded
a 7,926-mile diameter globe
that's the Earth.

As a large-scale
computational mathematician,
my tongue gets caught on fire
when embroidered with
difficult equations
that I must solve across
my ensemble of
65,536 processors that shared nothing.
My discovery
of the world's fastest computing
was the new knowledge of how to use
emails to sew together

65,536, or a binary billion,
initial-boundary value problems
that each had its governing system
of coupled, nonlinear
partial differential equations.
In a metaphorical sense,
I sewed those 65,536
mathematical problems together.
And into one seamless, whole problem
that was otherwise impossible to solve
on a conventional supercomputer
that's powered by
one custom-manufactured,
ultra-expensive vector processor.
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.
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 encoded
just as the map of Nigeria
is different
from the land of Nigeria it described.

I can fold the map of Nigeria
and put it in my pocket.
But I can't put Nigeria
in my pocket.

A groundbreaking invention
creates history.
And influences our sphere of living.
Crude oil is like a treasure
that's buried eight miles deep.
The geologist needs a map
of where the crude oil and natural gas
are located.
And the most accurate maps

can only be created
with the aid of one of the
world's fastest computers.

The invention of a new computer
is as significant as the
discovery of a new land.

8 Inventing the First Modern Supercomputer

The World's Fastest Computing

In mathematics or physics
or computer science,
the world's fastest computing
is the summit of academic achievement.
Fastest computing charts the path
of revolutionary discoveries.

The world's fastest computer
is not only the pinnacle

of the computer industry,
but it's also big business.
In recent years, the industry grossed
forty-five billion dollars a year.

The world's fastest computer
can weigh more than a million pounds,
or eight thousand Africans.
And it is twenty million times
more powerful than your laptop.
It occupies the footprint of a football field.
And internally communicates across
a total of 200 miles,
or about 322 kilometers, of cables.
And it costs one billion,
two hundred and fifty million dollars each.
That world's fastest computer
is the top dog in mathematics.

First Modern Supercomputing

I discovered
how to leapfrog from the
slowest processors in the world
to the world's fastest computers.

Science deals with facts
while fiction deals with truths.
In science, theory and experiment
sometimes contradict each other.
And the experiment wins
every time they clash.
The discovery can't be merely said.
It must be shown because
if the lion could speak
the man can't understand her.

I followed an unconventional path because
conventional advice
only helps conventional people.
At 8:15 in the morning,
on the Fourth of July 1989,

in Los Alamos, New Mexico,
USA, I jumped in joy because I discovered
the fastest computing across
the slowest processors.
I became the first person
to stand at the farthest frontier
of the world's fastest computer.
I was the first person
to gaze out towards an unknown territory—
named the world's fastest computing—that
was not on the Map of Computer Science.
I gazed across an ensemble
of the world's slowest processors
to discover the world's fastest computing
which was then unknown
to mathematicians and physicists
who needed that new knowledge
to solve their most difficult problems.
That then unknown field of knowledge
is where unexpected and unimagined
new computer science, new physics,
and new mathematics

are almost guaranteed to be discovered.
The world's fastest computing represents
a remarkable confluence of new ideas,
from the frontier of mathematics
to those of physics and computer science.

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

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.

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.

Contributions of Philip Emeagwali to Computing

My contribution to computer science
is this:

I was the first person to synthesize
the new multidisciplinary ideas.
And do so with new ideas of my own.
I synthesized ideas to discover that
the world's fastest computing hid
in the bowels of an ensemble
of the world's slowest processors.

That discovery, that occurred
on July 4, 1989, made it possible

for the fastest computers of today
to leave science-fiction books
and enter science textbooks.

For nearly every day
in the past half century,
since June 20, 1974 to be exact,
I have conducted mathematical research
on how to harness
up to one billion processors
that encircled a globe as an Internet.
And use them as one cohesive
supercomputer.
The fastest computers are used
to answer the biggest questions
in science, engineering,
and medicine.
The world's fastest computing
will remain at the core
of who we are.

The world's fastest computing
is used to find answers
to big scientific questions
that are central to tackling
the global challenges that face humanity,
such as supercomputing
the social distancing that reduces
the spread of coronavirus.
The world's fastest computing across
the world's slowest processors
is a transformational discovery
that redrew the boundaries of science,
and permanently changed
what we know about the computer.
And how we think about mathematics.
The world's fastest computer
is powered by millions of processors.
And the hardest problems in mathematics
and physics
are solved by dividing
each grand challenge problem
into up to a billion

less-challenging problems.
And then solving them in tandem.
And with a one-to-one correspondence
with as many processors.

9 The Nobel Prize of Supercomputing

How Are Supercomputers Used?

The world's fastest computer
will cost one billion
two hundred and fifty million dollars.
And it costs 40 percent more
than the mile-long Second Niger Bridge
at Onitsha, my ancestral hometown
in Nigeria.
The world's fastest computer
that's powered by
the world's slowest processors

that shared nothing
was the first search engine.
That supercomputer provided answers
to natural language queries
and did so before the Internet.

The grand challenges of supercomputing
are the most pressing problems
of our time.
One such challenge is to execute
the detailed computational fluid dynamics
model
of the spread of the coronavirus across
the one million shoulder-to-shoulder
traders in Lagos markets.
Fastest computing across
millions of processors
is the path to the solution
of the most difficult problems arising
at the crossroad,

where new physics, new mathematics,
and new computing intersected.

Because the fastest computing across
a billion processors
is a highly multidisciplinary
field of study, it's problematic
to explain where the mathematics ended
and where the physics began
and where the computer science
continued.

The invention of a new supercomputer
led to the creation
of the new computer science
of parallel processing.
That new science became an instrument of
discoveries that transformed lives.

Since 1974, I have believed

what I felt in my gut
and know in my heart. I believed that
harnessing the power of
up to a billion processors
will leave the realm of science fiction
to become reality. And produce
the world's first supercomputer,
as it's known today
and as it could be known tomorrow.

The Nobel Prize of Supercomputing

In computer science, recording
the world's fastest computing
and recording it in an unexpected way—
such as across
the world's slowest processors—
is the gold standard
that earns its inventor the highest award
that's referred to

as the Nobel Prize of Supercomputing.
I was the first and only person
to win that award alone, back in 1989.

The intellectual
and the physical instruments
that were required to make those
mathematical and scientific discoveries,
such as the world's fastest computing,
were the knowledge
of the laws of classical physics,
the mastery
of the partial differential equations
arising beyond the frontier of calculus,
the knowledge of large-scale algebra,
and the expertise
of how to program a processor
to solve the most difficult
mathematical problems
that are compute-intensive.
And the knowledge of how to communicate

via sixty-four binary thousand
email addresses
that each had no @ sign
or dot com suffices.
And how to exchange
the initial and boundary conditions across
one binary million
bidirectional, regular, short,
and equidistant email wires.
And to, finally, compute simultaneously
and do so at 65,536
off-the-shelf and coupled processors
that shared nothing,
but were in dialogue with each other.

And resulted in a fundamental change
that changed the way
we will look at the regular computers
of tomorrow that could evolve
from the fastest computers of today.

For me, Philip Emeagwali,

inventing the world's fastest computer
was like assembling
65,536 pieces of puzzle.
And doing so to see
a never-before-seen island
that is one coherent supercomputer,
or rather a new Internet
that coalesced as the fastest computer
in the world.

10 Creating a New Computer Science

Creating New Sciences

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.

What separates the old
and new ways of the fastest computing
is not the problem they solve,
but how they solved it.
In their old way, mathematical problems
are solved
within one processor.
In my new way, they're solved
across up to one billion
coupled processors.
Those processors emulate one seamless,
coherent, and gigantic supercomputer.

Computing across up to a billion
processors
was a magical change because
it was both unexpected and extraordinary.
The reason my scientific discovery
of the world's fastest computing

made the news headlines
was that the new technology
was both unorthodox and revolutionary.

To invent is to accept the surreal as real.
I was like the boy,
in my ancestral Igbo folklore,
who defied darkness
and walked alone to a distant farm
to search for his lost flute.

I was the night masquerade
that wasn't accompanied
by drums, harsh trumpets,
and iron gongs.

I was the first person
to discover the world's fastest computing,
as it's executed today.
And I was the first person

to figure out
how and why computing in tandem makes
the supercomputer super.
I figured out how parallel processing
enables supercomputers
to do many things at once.
And solve the toughest problems
in mathematics and physics.

5 Philip Emeagwali Equations

I believed that
my mathematical script
should be heard on the stage
(or on the motherboard)
rather than read on the page
(or on the blackboard).
The computer
is to the mathematics

what the microphone
is to the poem.

My contributions to mathematics
were these:

I invented the system of
nine Philip Emeagwali equations,
each a partial differential equation.
My system of equations
is a new mathematical tool
used to pinpoint the locations
crude oil, injected water,
and natural gas.
And I invented
how to solve the corresponding
initial-boundary value problem.
And solve it across
up to a billion processors
that outline and define an Internet.

My new mathematical knowledge
expanded the ever-growing
body of knowledge
that's known as calculus.
It's an absurd oversimplification
to claim that calculus
was co-invented, 330 years ago,
by Isaac Newton
and Gottfried Wilhelm von Leibniz.
This claim is erroneously repeated
in calculus textbooks and by its teachers.
Newton and Leibniz contributed to calculus
but did not invent the subject.
The development of calculus
is the product
of centuries-long evolution.
Recent contributions to calculus
include the nine
partial differential equations
that I invented and my discovery

that initial-boundary value problems
governed by a system
of partial differential equations
can be solved across an Internet
that's a global network
of up to a billion processors.
My contribution to mathematics
was in the top mathematics publications
in the world.

6 A New Computer Science

The scientific discoverer
can't tell an untrue story
because his discovery
is the new truth,
or the new knowledge
about how our universe works.

My invention was how
the world's fastest computer
can be built
from the world's slowest processors.
My discovery
made the news headlines because
it was new knowledge that changed the way
mathematicians solve
their most difficult problems.
Until my discovery,
the fastest computer speed
had not been recorded
by a one-person team.
Or recorded across
the slowest processors in the world.
So, my lectures across
the one thousand podcasts
and closed-captioned videos
which I posted on YouTube
were first-person stories

from the frontiers of supercomputing.

After my discovery
that the world's fastest computers
can be built from standard parts,
called processors,
parallel supercomputing
made the vector supercomputer obsolete.
And reduced it
to the technological equivalent
of the horse and carriage,
that was replaced by
the now obsolete steam engine.

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

7 Philip Emeagwali Internet

The scientific discovery
is the nothingness
from which new knowledge sprang.

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. The genius
is the below average person
that worked hard
to become above average.
Genius is the ability
to see what others saw as a rock

and see it as a diamond.

What is Philip Emeagwali known for?

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

I discovered how an ensemble
of up to one billion processors
can be married together
by as many emails.
And then used to solve
the most compute-intensive problems.
I discovered
how to logically fuse processors together.
And do so to, in reality, form
one coherent unit
that's a new computing machinery
which was the world's fastest computer
that made the news headlines, in 1989.
That new supercomputer
that's a new Internet

that I invented on July 4, 1989,
is radically different
from the constituent processors
it originated from.
The world's fastest computer
originated from
the world's slowest processors.

What is the Philip Emeagwali Internet?

Any global network
of processors, or computers,
that uniformly encircles a globe
in any dimension
is called the Philip Emeagwali Internet.

I was the first person to invent the Internet
that encircled a globe.
I was the first person to sketch

the Philip Emeagwali Internet.
I was the first person
to program that Internet.

A New Way of Thinking in Computing

A paradigm shifting quest
for new knowledge
must use rich imaginations
and vitalizing ideas.
The wealth of theories
that distinguished the old way
from the new way
must be vindicated and confirmed
by experiments.

The world's fastest computing,
as I discovered it on July 4, 1989,
expanded the horizon of human knowledge.
Supercomputing created
new mathematics, new sciences,
and new technologies.

Supercomputing changed
the course of history.
I discovered how to harness
the standard building blocks
of the world's fastest computers.
And how to scale from
a one-processor computer
to a billion-processor supercomputer.

On Famous Inventors

The famous inventor is an educator
of the masses, not of the classes.

To invent a new computer
is to invent a new computer science
and to make
the unimaginable-to-compute
possible-to-super-compute.

To invent a new computer
is to record a supercomputer speed
that's impossible.
No formula guarantees the invention
of a new computer.

Nature does not give up its secrets
without a fight.

8 The Father of the Internet

In an email, a twelve-year-old asked:

"Why is Philip Emeagwali
called the father of the Internet?"

My supercomputers aren't computers,
intrinsically.
They're new Internets
that emulate one seamless,
coherent unit
that's a new supercomputer, in reality.

I discovered
that the world's fastest computer
that's defined across a globe
is a close cousin
to the Internet
that's also defined across a globe.

The supercomputer and Internet
that I invented
are like identical twins.
And like two sides of the same coin
that are different but complimentary.

I witnessed the first dramatic upgrade
in our understanding
of the computer of tomorrow,
not as a new computer *per se*
but as a new Internet *de facto*.
The computer will become
the Internet, and vice-versa.

I discovered that
an ensemble of a billion coupled processors
can be combined into a supercomputer
that's a billion times faster
than a computer
and that's also an Internet.

9 Philip Emeagwali Equations

As a dense and abstract subject,
mathematics exists at the margins
of popular science.
I existed at the margins of thought.

I create new equations
the way Bob Marley writes new songs.

The nine Philip Emeagwali equations
are as reliable as a hammer.
I sing in the mathematical dialect
of the universe.

I solved the most difficult
mathematical problem
in a way no mathematician
solved it before.

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.

10 The First Supercomputer and Tomorrow Without Computers

What will the world be like without the supercomputer?

The computer of today
was the supercomputer of yesterday.
A world without supercomputers

may become a tomorrow
without computers.

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.
The 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,
five hundred Biafran soldiers
were killed at that Oguta War Front.

The First Modern Supercomputer

I Answered the Big Question of Computing

The quintessential questions
of supercomputing were these:
How do we compute faster?
How do we do so
by a billion-fold?
And what makes the supercomputer
super?

In 1989, what made the news headlines
was that an African-born
computational mathematician
has discovered
how to perform the fastest
mathematical computations.
I changed the way we count.

I count a billion things at once
instead of the old way of counting
only one thing at a time.
That old way of counting
was used since the era
of our prehistoric human ancestors.
The paradigm shift
from the sequential way of counting
to the parallel way of counting
is to the mathematics textbook,
what the continental drift
was to the geology textbook.

In the 1980s,
using a billion processors
to solve the most difficult problem
was like drinking from a billion fire hoses.

In 1989, I was in the news
because I discovered
why and how a million, or a billion,

of the slowest processors
in the world
could be harnessed
and used to create the fastest computer
in the world
that's used to solve many problems
at once,
instead of solving only one problem
at a time.
The world's fastest computer
powered by one billion processors
is to me
what the violin is to the violinist.
The world's fastest computer
is used to solve problems
that did not exist before.

From Fiction to Fact

Given enough time, we'll understand
the old and the known.
Sometimes, it's impossible
to understand the new and the unknown.

I began supercomputing at age nineteen
on June 20, 1974,
in Corvallis, Oregon, USA.
Back then, there was no computer
in my country of birth, Nigeria.
In 1974, the parallel supercomputer
that's the precursor
of the world's fastest computer
was mocked and dismissed
as science fiction.

The First Modern Supercomputer

On the Fourth of July 1989,
I discovered how the ensemble of processors
of the new supercomputer

can be programmed to work together
as one seamless, coherent,
and gigantic machinery
that's not a new computer, *by definition,*
but that's a new Internet, in reality.
I invented the world's first supercomputer,
as it's known today
and as it's expected to be known tomorrow.

Being the "first" person
to discover something
is better than being the "best" person
in doing that thing.

In the 1970s and 80s,
I became the first person
to navigate through the
undiscovered territory
where the high-performance
supercomputing across
the slowest processors
must be harnessed to solve
the compute-intensive problems

at the crossroad
where new mathematics, new physics,
and the world's fastest computing
intersected.

It was at that scientific crossroad
that I discovered that
parallel supercomputing is useful.

I invented
the world's fastest computing across
millions of processors,
as it's known today.
Parallel supercomputing
is the most newsworthy discovery
in computer science.
Fastest computing across a million
processors
was a paradigm shift of tectonic
proportions
that changed the way
we study computer science.

In traditional computer science,
the computer solved one problem
at a time.
In the new computer science,
the computer solves many problems
at once.

Inventing the First Modern Supercomputer

My contributions
to the development of the computer
were these:

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

Briefly, I discovered
how to execute the world's fastest computing
with the world's slowest processors.

Fastest Computing Across an Internet

In 1989, I discovered
the fastest computer speeds
that are possible.
And discovered how to compute across
a new ensemble
of up to one billion processors
that surrounded a globe.
And did so just as the Internet
encircled the Earth.

In the 1970s and 80s,
supercomputing across processors
was a beautiful thread that didn't fit into the
larger weave.

As I wove my emails
around my one binary million
email pathways, I discovered that
fastest computing across processors
brought depth and complexity
that took me a decade and a half
to fathom.
But everything came together
when the unknown became known.
And came together
when my answer
to the big question
which I first pondered on June 20, 1974,
in Corvallis, Oregon, USA,
became newspaper headlines.
It was mentioned in the June 20, 1990, issue
of *The Wall Street Journal*.

The reason my discovery
of the fastest computing
made the news headlines

was that it opened
the gate of knowledge
to the world's fastest computer
that's expected to become
the computer of tomorrow.

11 What is Philip Emeagwali Known For?

The Nobel Prize of Supercomputing

After I won the highest award
in supercomputing,
in 1989, I had the seal of approval
equivalent to winning the Oscar
for acting
or winning the Grammy Award
for singing
or winning a Grand Slam tournament
of tennis.
The highest award in supercomputing

that computer scientists rank
as the Nobel Prize of Supercomputing
is a peer honor awarded
by supercomputer scientists
and awarded
at the top supercomputer conference
and awarded only to someone
who made a measurable contribution
to supercomputing, that includes
a quantified and new milestone
in computer history.

What is Philip Emeagwali Known For?

The supercomputer genius
must be the first person
to understand
how to compute at speeds
that were considered impossible.
And compute to address

some of the world's biggest challenges.
And compute in a breakthrough way
that's ranked as a milestone.
And that changed the way
we think about the modern computer
and the fastest supercomputer.

The great minds of science
forged a new path to a new world.

For the computer scientist,
his or her genius resides in
forging a new path
to an unknown world of fastest computing.
And solving the most difficult
mathematical problems
to change the way
we think about the computer
and change the way
we solve the compute-intensive problems
in mathematics, physics,
and computer science.

I was in the news, in 1989,
because my recording
of the world's fastest computer speed
that I measured across
the slowest processors in the world
was a technological feat
considered impossible at that time.

I'm the first person
to figure out how to solve
the Grand Challenge Problem
of supercomputing.
And how to solve it across
a never-before-visualized Internet
that's a new spherical island
of one binary million,
or one binary billion,
off-the-shelf processors
that were coupled.
And which were equal distances apart.
And that shared nothing.

Inventing the Fastest Computer

I changed the way
we solve compute-intensive
mathematical problems.
In the bygone way,
mathematicians computed
on merely one isolated
central processing unit
that wasn't a member
of an ensemble of processors,
or within merely one isolated computer
that wasn't a member
of an ensemble of computers.
In my modern way,
mathematicians compute across millions
of central processing units,
or across millions of computers.

I was in the news
for discovering how to solve

the most challenging problems in science,
called Grand Challenges.
And how to solve them
across the slowest processors
in the world.
And solve them
at the fastest possible speeds
in the world.

I discovered
how to harness millions of
the slowest processors in the world.
And harness them
as one seamless, coherent,
and gigantic unit
that's the world's fastest computer,
in reality.

The Importance of the World's Fastest Computing

Nine out of ten supercomputer cycles
are consumed by
large-scale computational physicists
who run codes
that were governed by laws of physics
and that were, first, encoded
into calculus and then reduced to algebra
and codes.
The supercomputer
is the scientist's best friend.

The biggest question in computer science
is this:

"How can we use
the slowest processors in the world
to solve
the most difficult

mathematical problems in the world
and solve them
at the world's fastest computer speeds?"

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 1989, I was in the news because
my new knowledge
that the fastest computer
can be built with the slowest processors
opened the door
to the high-performance computer
which now computes fastest.
And does so by solving
up to a billion problems at once

and addressing some of the world's
biggest challenges.

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.

12 Inventing the Fastest Computer

Changing the Way We Look at the Fastest Computer

It's difficult to use
only what we presently know
to understand what we don't know.
The more we know,

the less known unknowns we have.

If you say something
and everyone agrees
with what you've said,
then you've said nothing new.

If your discovery
is at first accepted by everyone,
then your discovery
is not a groundbreaking discovery.

Progress is made
when obstacles are overcome
and where clashes of ideas
and differences
between opposing points of view
are resolved.

In the 1980s, the leading minds
in vector supercomputing
rejected supercomputing across

the slowest processors
and rejected the technology
as the way forward
in their never-ending quest
for faster computers
and for the fastest supercomputer.

Using the chicken as his metaphor
for the slowest processor
and the ox
for the fastest processor,
Seymour Cray
asked the supercomputing community
his famous question:

"If you were plowing a field,
which would you rather use?
Two strong oxen
or 1024 chickens?"

I challenged the established truth.

Regarding the ox versus
a billion-chicken debate,
I visualized compute-intensive problems
as breakable and chopped up
into one billion less-challenging problems,
each akin to a few weed seeds
in a large field. My theory was that
a billion hungry chickens
can eat up a thousand billion weed seeds
and eat them faster than one hungry ox.

The slowest processors
in the world
can cooperatively compute together
to yield
the fastest computations ever recorded.
And to solve
the most compute-intensive problems
in the world.

My milestone in the history

of the computer
was marked as the first time
the fastest speed in supercomputing
was recorded across
the slowest processors in the world.

Shortly after my world's fastest computing of 1989, a twelve-year-old writing an essay asked me:

"Are you a Black genius?"

The genius is the ordinary person
that found the extra-ordinary
in the ordinary.

The computer genius sheds a bright light
upon a billion idle processors.
And did so to help us understand
what makes the supercomputer super.

Supercomputing
is an intellectually broad-shouldered field.
It beckons upon the polymath
who's at home
at the frontiers of human thought,
particularly those of mathematics, physics,
and computer science.

In supercomputing,
boundaries are breached
when we calculate beyond
what was perceived as possible
and discover new knowledge
beyond what is known.

I found my light, namely
the world's fastest computing.
My one thousand podcasts
and YouTube videos

were the end products
of half a century of lonesome
and intensive research.
In my quest
for the world's fastest computing,
I followed a unique path
that's never been treaded before.

For the computer scientist,
the most significant progress is made
when the world's fastest computer
becomes a billion-fold faster.

I executed the world's fastest computing
to know what's discoverable
and knowable and know something
which nobody knows.
To witness a scientific discovery
that has rich, fertile,
and far-reaching consequences

is like walking into a forest
and witnessing many leaves
fall on your head.

13 Philip Emeagwali Computer

My Answer to the Biggest Question in Computing

I was not timid about crossing
disciplinary boundaries
and doing so when pursuing
the elusive answer
to the biggest question in supercomputing.
That question was this:

How do we compute fastest
with the slowest processors?

For the world's fastest computing
to be executed,
the most compute-intensive problem
must be breakable into a billion pieces
that can be solved at once.
And solved across a billion processors
that each was self-contained
and shared nothing.
Solving the most difficult problem
across the world's fastest computer
is akin to putting a jigsaw-puzzle,
with a billion pieces, together.
On June 20, 1974,
the day I began supercomputing,
the world's fastest computing
across the slowest processors in the world
was both unspeakable and unthinkable.
In my 1970s and 80s supercomputing,
I felt like I was attempting 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
the puzzle was difficult, in theory,
because its solution demanded infinite pieces,
or number of processors,
as the precondition
for solving the problem
with mathematical exactitude.

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.

The First Supercomputer Scientist

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.

The First Modern Supercomputer Scientist

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.

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.

Emeagwali Honeycomb Supercomputer

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.

Inventing the First Supercomputer

The first supercomputer programmer
must be an alchemist
who codes the iron of physics

into the bronze of algebra,
into the silver of calculus,
and into the gold of computing.
The first supercomputer scientist
coded to discover
the fastest computation
that yields a quantum leap
in the speed of computing
and does so without a quantum computer.

14 The Nine Philip Emeagwali Equations

A Black Physicist's Quest for the Fastest Computing

I'm a Black physicist that's invisible
in a white space.
I was underestimated
and dismissed as unqualified.

I was dismissed by those
who were unqualified.
Yet, I'm the only physicist
that's qualified and able 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.

My scientific discovery
is a contribution to mathematics

and physics
because that new knowledge
extended the frontier of knowledge
of mathematical physics.
And extended it by nine
partial differential equations,
called the Philip Emeagwali equations.

My invention
is a contribution to modern physics
because it was new knowledge
of how to solve a billion problems
of mathematical physics
and solve them at once.
That invention
extended the frontier of knowledge
of large-scale computational physics
and extended it by a factor of one billion.

Poet of Computing

My quest for the new knowledge
of how to compute faster
and speedup 30,000 years
of time-to-solution
to one day
was my intellectual homecoming.
I had to leave my scientific home
that was physics, in 1970.
For a half century,
I sojourned like a supercomputing
troubadour, or medieval lyric poet,
who invented equations
in the manner Bob Marley wrote songs.
The lyrics of a song are sung, not read.
If the lyric is meant for the microphone,
not the page,
then the largest-scaled system
of equations of algebra
is meant for the motherboard,
not the blackboard.

Mathematics is the language
of the computer.

I invented equations of mathematics
grounded on the laws of physics and
I heard and trusted my inner voices
that were almost drowned
in a cacophony of secondary voices.

Inventing the Nine 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
that will be otherwise invisible.
And describe the motions of crude oil,
injected water, and natural gas

that will be otherwise indescribable.

For me, it was an epiphany
to realize that I had to leave
my old calculus textbooks behind
to discover my new calculus
for supercomputing.

My calculus is called
the nine Philip Emeagwali equations.

Philip Emeagwali and the Supercomputer

My contributions to computer science
were these:

I discovered how to harness
a billion coupled processors
that shared nothing.
And how to use them

to execute time-dependent,
three-dimensional fluid dynamics calculations
that have extreme-scale algebra
at their computational cores.
An example is simulating the spread
of contagious viruses
inside Japan's Tokyo subway
where 3.1 billion passengers a year
are packed like sardines.

How Are Supercomputers Used in Nigeria?

The supercomputer
is to the geologist or meteorologist
or physicist or mathematician
what the telescope is to the astronomer.
Just as the world's biggest telescopes
are used to locate distant stars,
the world's fastest computers

must be used to pinpoint the locations
of crude oil and natural gas
that are deposited up to 7.7 miles deep.
The oil and gas industry
uses supercomputers to map, in advance,
each of the 65,000 oil producing fields
in the world, including the 159
oil producing fields in Nigeria.

15 Father of the Internet

Charting New Directions for Supercomputing

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

On the Fourth of July 1989, I recorded
the highest speedup and the fastest speed
in supercomputing.
That scientific discovery
led to my conclusion
that fastest computing across
a billion processors
will become the technology
that can yield
a factor of one-billion-fold reduction
in the wall-clock times
for solving the most difficult problems
in mathematics and physics.

Parallel supercomputing
is not a magic cure all.
However, parallel processing
is embodied in most computers
and in all supercomputers.
Parallel processing
—that was once a dim light

in a sea of darkness—
is now the bedrock
of the world's fastest computers.
Parallel processing
—that was once the stone
rejected as rough and unsightly—
has become the headstone
of the computer.
Fastest computing across processors
is the vital technology
that enabled the supercomputer
to tower over the computer
that's not parallel processing.

Without the fastest computing across
millions of processors that I discovered,
the solution of the most
compute-intensive
initial-boundary value problems—such as
the simulation of long-term
climate change—
will be as approximate as a sketch,

instead of as exact as a photograph.

In theory, mathematical predictions
based upon
the partial differential equations
should be as reliable as a hammer.
In practice, it's a different story.
The world's fastest computer
shortens the gap between theory
and practice.

How Are Supercomputers Used?

Back from 1922 through 1989,
the fastest computing across
the slowest processors existed
only in the realm of science fiction.
Since my discovery that occurred
on July 4, 1989,
the world's fastest computer

had enabled us to incorporate
previously unimaginable points of data.
And make ground-breaking discoveries
in science, engineering, and medicine.
The fastest computing enables us to know
if a new cancer treatment
holds any promise
or if an untested scientific theory
is valid.
Such scientific discoveries, include
deepening our understanding
of the cosmos
and our place within the cosmos.

The First Father of the Internet

I discovered
how to combine computers
into a supercomputer
that's an Internet.

The discovery is like a light
from an ancient sky.
I learned that
success has a thousand fathers,
but failure is an orphan.
I'm the only father of the Internet
that invented an Internet.

16 Harnessing Supercomputers for Africa

Nigeria would double its crude oil profits
if it had the knowledge
that is needed to pinpoint deposits
of the crude oil and natural gas
in its 159 oil fields.
Without the knowledge
of how to pinpoint the locations
of oil and gas, Nigeria must share
its oil revenues with Shell

and ExxonMobil corporations.
Without the needed scientific knowledge,
Nigeria must pay half of its oil revenue
to the United Kingdom
and the United States.
These two nations possess
the technological knowledge
that's needed to discover and recover
crude oil and natural gas.

Doubling oil profits
will reduce poverty in Nigeria.
In the twenty-first century,
Africa must shift
from consuming knowledge
to making discoveries
and inventing technologies
that will create wealth
across the continent.
And expand the middle class.

In fifty years, Nigeria

will not be an oil-producing country.
And Nigeria will be dismissed
from OPEC, the Organization
of the Petroleum Exporting Countries.

17 Thunder Road to Biafra

Role Models for African Youths

Who should be the science role model
for the African youth?

The African high school physics student
only looks towards
the German-born theoretical physicist
Albert Einstein,
rather than towards the Nigerian-born
computational physicist
Philip Emeagwali.

When Africa's source of
scientific inspiration
resides in Europe, not in Africa,
Africa becomes the victim
of scientific imperialism.

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

One Day We Had to Run!

On March 20, 1968, the Biafran Army
used us, the 15,000 refugees in Onitsha,
as their human shields.

If it's a war crime for Biafra
to use captured Nigerian soldiers

as human shields, it's a greater war crime
for Biafra to use Biafran refugees
as human shields.

Managing Racism

18 A Black Inventor's Field Guide to Overcoming Racial Obstacles

The laws of logic and physics
are experienced the same way
by Black and white persons.

I had to be a polymath cognizant of the fact
that the computer
conforms to mathematical thought
that must conform to
the laws of physics.

In the 1970s and 80s, I knew that

the world's fastest computer speed
was a technological achievement
that could be measured
in the manner the speed of
a marathoner is measured
with tapes and watches.
But in calculus, the watches are soft
and genius is subjective.

After my hiring lecture,
the supercomputer research position
that brought me to
Ann Arbor, Michigan, was canceled
and re-advertised.
The unqualified white candidate
hired is forgotten
while the qualified Black candidate
that wasn't hired
became the subject of school essays
for his contributions to computer science.

As the first Black person
to win a scientific award
that was compared to the Nobel Prize,
and do so in 1989, and as the only person,
Black or white,
to win that prize alone
I was **devoured** like a lamb
and my garments were **soiled**
in **mockery**.

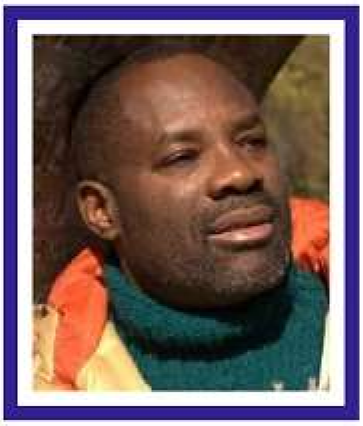
It's easier to ask a question
than to answer it.
They asked questions.
I answered them.

In 1989, the intellectual fireworks exploded.
I didn't kill any person.
Yet, I was subjected to a Galileo trial
that was computing's equivalent
to the O.J. Simpson trial.

Unlike Albert Einstein,

I survived vicious criticisms
that were full of bitterness and hate.
And I have the scars to prove them.

An inventor who didn't receive
a negative backlash,
didn't make a groundbreaking invention
that changed the way
the world of technology looked at things.



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A Refugee's Quest for the World's Fastest Computer

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."

https://youtu.be/unw7R1tTR48

Transcript of Philip Emeagwali YouTube lecture 211002-3of4 for the video posted above.

THANK YOU. I'm Philip Emeagwali

The First Supercomputer

My contribution to the development of the first supercomputer is this:

I invented the first
world's fastest computing,
as it's executed today.
Because I invented a supercomputer
where none existed,
I can confidently say that:

"After the Fourth of July 1989,
an ensemble of the slowest processors
in the world
can work together to emulate
a never-before-seen supercomputer."

As the inventor
of the world's fastest computing,
my lectures had power and focus.
The reason was that only I could give
a first-person eye witness account
of that seminal moment
in the history of the computer.
That Eureka! moment was

fifteen minutes after 8 o'clock
in the morning
of July 4, 1989.
When I give advice on how to invent
the world's fastest computing,
or supercomputing,
or solving difficult problems across
a new Internet
that's a new global network of processors,
I speak from my unique experience
of being the only inventor
that invented such technologies.
My knowledge was diametrically opposite
to that gained from reading
about supercomputers.
As well as reading from textbook authors
who were describing the inventions
of computer pioneers. After half a century
of supercomputing, I acquired
a deep knowledge
that enables me to produce
the one thousand podcasts

and YouTube videos
in which I lectured impromptu.
I discovered the world's fastest computing
and did so without notes
that were copied from textbooks.

For the record,
the world's fastest computing community
of the 1980s
was comprised of only one member
within parallel supercomputing.
And twenty-five thousand members
within vector supercomputing.
In the 1980s, I was the only person
in the field of parallel supercomputing
that executed the world's fastest
computing.

My discovery
of the world's fastest computing across
the world's slowest processors
is my contribution

to the development of cheaper
and faster computers.
The world's fastest computing
wasn't just a technology that I invented.

It's who I am.

For nearly every day
of the past half century,
since June 20, 1974 to be exact,
I conducted mathematical research
on how to harness
up to one billion processors
that encircled a globe as an Internet.
And use them as one cohesive
supercomputer.
The fastest computers are used
to answer the biggest questions
in science, engineering,
and medicine.
Such questions include supercomputing
the social distancing requirements

during a global pandemic.
For those reasons,
the world's fastest computing
will remain at the core
of who we are.

The world's fastest computing
is used to find answers
to big scientific questions
that are central to tackling
the global challenges that face humanity,
such as supercomputing
the social distancing that reduces
the spread of coronavirus.
The world's fastest computing across
the world's slowest processors
is a transformational discovery
that redrew the boundaries of science,
and permanently changed
what we know about the computer.
And how we think about mathematics.
The world's fastest computer

is powered by millions of processors.
And the hardest problems in mathematics and physics
are solved by dividing
each grand challenge problem
into up to a billion
less challenging problems.
And then solving them in tandem.
And with a one-to-one correspondence
with as many processors.
The grand challenges of supercomputing
are the most pressing problems
of our time.
One such challenge is to execute
the detailed computational fluid dynamics model
of the spread of the coronavirus across
the one million shoulder-to-shoulder
traders in Lagos markets.
Fastest computing across
millions of processors
is the path to the solution

of the most difficult problems arising
at the crossroad
where new physics, new mathematics,
and new computing intersected.
The invention of a new supercomputer
led to the creation
of the new computer science
of parallel processing.
That new science became an instrument of
discoveries that transformed lives.

The Philip Emeagwali Computer
is a supercomputer
that's developed in a new way, namely
powered by up to a billion processors.
It's also a new Internet
that's a new global network of
up to a billion processors.
Those processors shared nothing
but were in constant dialogue.

The mathematician's perennial quest

for the world's fastest computing
constantly demands
fresh faces, new names, and new ideas.
During the decade and half
onward of June 1974, I was an unknown
supercomputer scientist.
But I possessed the then unproven idea
of harnessing millions
of the world's slowest processors.
And using them to cooperatively solve
the most difficult problems
in mathematics.
Such compute-intensive problems
could not be solved
on a single giant processor.
When I began my mathematical quest
—back on June 20, 1974,
in Corvallis, Oregon, USA—
the world's fastest computing across
the world's slowest processors
was merely a theory, or an idea
that's not positively true.

Since 1974, I believed what I felt in my gut
and know in my heart. I believed that
harnessing the power of
up to a billion processors
will leave the realm of science fiction
to become reality. And produce
the world's first supercomputer,
as it's known today
and as it could be known tomorrow.

In computer science, recording
the world's fastest computing
and recording it in an unexpected way—
such as across
the world's slowest processors—
is the gold standard
that earns its inventor the highest award
that's referred to
as the Nobel Prize of Supercomputing.
I was the first and only person
to win that award alone, back in 1989.

15 A Refugee's Quest for the World's Fastest Computer

The Nigerian Civil War

One Day We Had to Run!

The period of early 1967
was an era of widespread reprisal attacks
against Igbo-speaking people
who were living in the northern region
of Nigeria.
In late September 1967,
Igbo-speaking people who were living
in the midwestern region of Nigeria
were killed in reprisal attacks
from
the Midwest military invasion
of the Biafran Army.
In faraway Northern Nigeria,

houses belonging to Igbos were burnt.
And their stores were looted.
Igbos pursued by mobs
hid with Hausa friends.
Some changed their Igbo names
to Hausa names.
In 1967, pursued Igbos
in Northern Nigeria
were smuggled into safer neighborhoods.

Back then, there was no
inter-city bus transportation in Nigeria.
My family travelled from Agbor to Onitsha
in small Peugeot 403 sedans
that squeezed in eight passengers.

We also travelled by "*gwon gwo ro,*"
a truck,
a rickety lorry with a wooden body.
Such *trucks* were used by market traders
for their long-distance transportation

of farm produces, such as yams, chickens,
and goats.

In early May 1967,
the political crisis in Nigeria
remained unabated.
Within a six-month period,
Nigeria lost two political leaders.
The Prime Minister of Nigeria,
Abubakar Tafawa Balewa,
was assassinated on January 15, 1966.
Six months later,
the new military President of Nigeria,
Major-General Johnson Aguiyi-Ironsi,
was assassinated on July 29, 1966.
The assassination
of the Prime Minister of Nigeria
spurred reprisal killings
of Igbo-speaking people
who were living in the northern region
of Nigeria.
As the violence spread,

Igbo refugees fled to their
ancestral homelands.

Reacting to the 30,000 Igbos killed
in the street uprisings in Northern Nigeria
which followed the second,
retaliatory military coup
of July 29, 1966, the *Daily Sketch,*
a Lagos newspaper,
pleaded for sanity in Nigeria.
The *Daily Sketch* asked:

"Will no one save Nigeria?...

Is there no one whose love for Nigeria
transcends love of tribe or personal safety,
who is willing to come forward
and seek others like himself
to nurse this sick nation?

If there be a man, let him come forward.
Today, for God's sake!"

My answer to the question

"Who will save Nigeria?" is this:

Nigeria cannot be saved
by one superhero.
Nigeria can be saved
by 220 million detribalized Nigerians.
Or heroes and heroines
who don't vote along religious, ethnic,
and regional sentiments.
And who don't call
for the dissolution of Nigeria
into three countries, the republics of Biafra,
Oduduwa, and Arewa.
The breakup of Nigeria
is unacceptable to me.

From January 1966 and later,
tensions were high throughout Nigeria.
In response, my father decided that Agbor

was no longer safe for us to live in.
We rented a *gwon gwo ro*
to transport us
from the Nurses' Quarters
of the General Hospital, Agbor,
to our second and safer residence
at 4B Egbuna-Adazie Street, Onitsha.
Onitsha was a commercial city
that was 47 miles east of Agbor.

A Refugee in Our Country

The seats of the *truck*
were bare wooden planks
and were very uncomfortable.
The *gwon gwo ro* we rented
was crammed with three chairs, two beds,
a double-barrel gun, a Raleigh bicycle,
a singer-brand sewing machine,
cooking utensils,

and various household items.
My family returned to Onitsha
in early May 1967.
Onitsha is our historic homeland
at the east bank of the River Niger.
Although Onitsha was only 47 miles away
from Agbor,
that journey took three hours.
From early May 1967
to the first artillery bombardment
of Onitsha
which occurred
on the Fourth of October 1967,
we lived in my parent's house
that was at 4B Egbuna-Adazie Street,
Onitsha.
That house was built five years earlier.
And my father stayed back
in the Nurses' Quarters
of the General Hospital, Agbor.

The Midwest Invasion of 1967

He was in Agbor
during the Midwest invasion of 1967.
That invasion of the mid-western region
of Nigeria was executed
by three thousand [3,000]
lightly armed Biafran soldiers.
That invasion began at three o'clock
in the morning of August 9, 1967.
And began when Biafran soldiers
crossed the Onitsha-Asaba bridge
and occupied the entire Midwest Region.
By 5:30 of that same morning,
the regional headquarters
of the Midwest Region, Benin City,
was under the control
of the Biafran Army.

A Nigeria Divided into Three Nations

When we received the news
that Benin City had been captured
by the quote, unquote
"gallant Biafran soldiers,"
we ran into the streets of Onitsha
to celebrate that victory.
On August 12, 1967,
the Biafran Army captured
the city of Ore that was deep inside
the western region of Nigeria.
In Biafra, the capture of Ore
was widely celebrated
as a strategic victory.
The capture of Ore
placed the Biafran Army
a mere 130 miles
from Nigeria's capital, Lagos.
In Onitsha, we speculated that
the civil war might not last long.
And that the Nigerian Army
will soon surrender to the Biafran Army.

The three thousand Biafran soldiers
who overran the vast mid-western region
of Nigeria
were lionized as heroes.
Biafrans were amazed that
the mid-western region was captured
within three hours.
And captured without firing a single bullet.
We were surprised by the boldness
of those three thousand Biafran soldiers
who captured the mid-western region
of Nigeria.
Those Igbo soldiers
were commanded by a Yoruba officer,
named Victor Banjo.
Major-General Victor Banjo
was a disaffected Yoruba soldier,
who defected from the Nigerian Army
to the Biafran Army.
On August 9, 1967, the day
the Biafran Army captured
the mid-western region of Nigeria,

my father was in that region
and was working as a nurse
at the General Hospital, Agbor.
The Biafran Army claimed to have
quote, unquote "liberated"
the mid-western region.
On September 19, 1967,
the Biafran government
renamed the mid-western region
of Nigeria
as the quote, unquote "Republic of Benin."
That same day, the Biafran leader,
General Odumegwu Ojukwu,
appointed Major-General
Albert Okonkwo
as the Military Administrator
of the new Republic of Benin,
between Biafra and Nigeria.

16 The Philip Emeagwali Internet is the First Supercomputer

Why Mathematics Inspired the Creation of the Computer

A Black in an All-White Space

The story of how I discovered
the world's fastest computing across
the world's slowest processors
and across an Internet
that's a global network of those processors
began on June 20, 1974.
My story began in a small room
that was upstairs of a white house
at 195A Knox Street South,
Monmouth, Oregon, USA.
Oregon is one of the whitest states
in the USA.
The city of Monmouth (Oregon)
that I was living in
had no resident Black couple.
In 1974, I was a lone
Black supercomputer geek

in Oregon.
And I programmed supercomputers
at the same time Steve Jobs
was a personal computer geek
in Portland (Oregon).

Three Cornerstones of Supercomputing

Fast-forward sixteen years,
and my story was in the news.
My story that began
in a small room in Monmouth (Oregon)
was in millions of living rooms
across the world.
Physics, calculus, and algebra
are the three cornerstones
of fastest computing.
The root of computing
can be traced to the Middle Ages.
The historical path
to the world's fastest computing
began 330 years ago.

It began as the discovery
of the Second Law of Motion
of physics.
It began as the invention
of the technique of calculus
that's the most powerful technique
in mathematics.

Philip Emeagwali Internet

In the 1980s,
the biggest challenge in computer science
was to invent
how to compute 65,536 times faster.
And do so across a new Internet
that I visualized
as a new global network of
65,536 off-the-shelf processors
and standard parts.
That new Internet needed
its first programmer
who could harness it

as the world's fastest computer.
That first programmer
must be a triple threat at the frontiers of
in physics, mathematics, and computing.

Supercomputing Across the Philip Emeagwali Internet

The intellectual
and the physical instruments
that were required to make those
mathematical and scientific discoveries,
such as the world's fastest computing,
were the knowledge
of the laws of classical physics,
the mastery
of the partial differential equations
arising beyond the frontier of calculus,
the knowledge of large-scale algebra,
and the expertise
of how to program a processor
to solve the most difficult

mathematical problems
that are compute-intensive.
And the knowledge of how to communicate
via sixty-four binary thousand
email addresses
that each had no @ sign
or dot com suffices.
And how to exchange
the initial and boundary conditions across
one binary million
bidirectional, regular, short,
and equidistant email wires.
And to, finally, compute simultaneously
and do so at 65,536
off-the-shelf and coupled processors
that shared nothing,
but were in dialogue with each other.

Physics is the Thread Across a Million Processors

The laws of physics are the essences
and the common thread
through the partial differential equation
arising beyond the frontier of calculus,
through the partial difference equation
of large-scale algebra that approximates
that partial differential equation,
through the compute-intensive
fluid dynamics code
that was derived from that algebra
and emailed across
that small copy of the Internet
that I invented
as a global network of processors.

4 Contributions of Philip Emeagwali to Science

A question in school essays is this:

"What is the contribution
of Philip Emeagwali
to the development of the computer?"

In 1989, I was in the news
because I discovered how to always
perform the world's fastest computing.
And how to record such speeds
across an Internet
that's a global network
of the slowest processors in the world.
My contribution to the development
the world's fastest computer
wasn't too small as a journal paper.
Or too large as computer science.
In 1989, I was widely recognized
for my contribution
to a new and critical technology.
That contribution
is the world's fastest computing across
the world's slowest processors.
The new knowledge

of the world's fastest computer
that I contributed to computer science
is used to manufacture
the fastest computers of today
which are expected to become
the computers of tomorrow.
My contribution went beyond
discovering an increase in the speed of
the world's fastest computer.
My contribution to developing
the supercomputer included fighting
scientific dogmas.

Finding the Magic Sword for Supercomputing

I faced many obstacles
during my fifteen-year quest to discover
how fastest computing across
a billion processors
could become the magic sword
to be used to solve

the hardest problems.
For instance, on three occasions, in 1977, 1981, and 1989, when the word got out that I was conducting research on the world's fastest computing across the world's slowest processors, the governmental fellowships that partially supported my research were withdrawn.
My fellowships were cut off as retribution and punishment for pursuing the fastest computer speed that was then in the realm of science fiction.

Why is Mathematics Useful for Nigerian Oil Fields?

Two often asked questions are these:

First, how do we use mathematics
in our everyday life?

Second, why is mathematics useful
in pinpointing the locations
of crude oil and natural gas
that were buried one mile deep
in the Niger Delta oil fields
of southern Nigeria.

The young African mathematician
needs to understand
those parallel-processed solutions
used to discover and recover
otherwise undiscoverable
and unrecoverable crude oil
and natural gas
that are buried up to 7.7 miles
(or 12.4 kilometers) deep.
And buried across the 65,000
producing oil fields in the world,
including the 159 oil fields

that dotted the 36,000-square-kilometer
Niger Delta region
of southern Nigeria.
An oil field is about the size of a town.

17 My Billion-Fold Leapfrog to the World's Fastest Computer

Fastest Computing to Solve Compute-Intensive Problems

Solving the most compute-intensive problems
in science and society
requires a leap of the imagination.
Solving a Grand Challenge Problem
of computer science
is in a way akin to slaying
the fire-breathing dragon
of ancient mythologies.
Or the super dragon
that guards the tree of knowledge.

The research supercomputer scientist
needs two swords to slay that dragon.
The first sword is intellectual
and is needed for the
theoretical discovery of fastest computing.
The second sword is physical
and is needed
for the experimental discovery
of the world's fastest computing.

Solving the Nine Philip Emeagwali Equations

An often asked question is this:

"Is the system
of Philip Emeagwali equations
solved?"

The reason my discovery

of the fastest computing
made the news headlines, in 1989,
was that I went beyond harnessing
the total computing power
of the slowest 65,536
processors in the world.
I visualized my processors
as evenly distributed around the surface
of a sixteen-dimensional globe
that was embedded
within a sixteen-dimensional hyperspace.
But it took me sixteen years
and several stages to discover
the first world's fastest computing across
the world's slowest processors.
First, I mathematically invented
the correct equations, namely
a system of nine coupled, nonlinear,
time-dependent, and state-of-the-art
partial differential equations
occurring beyond the frontier of calculus.
That contribution to mathematics

is called the
Philip Emeagwali equations.
Second, I invented algebraic algorithms
that I used to solve my correct
nine partial differential equations
that encoded the Second Law of Motion
described in physics textbooks.
The 65,536 processors of my new Internet
can't be harnessed and used to solve
an incorrect system of equations
of algebra and calculus.
And harnessed to solve them correctly.
Nor can those sixty-four binary thousand
processors
be harnessed to execute
an inaccurate algorithm
and execute them accurately.
Third, I visualized my new Internet
as defined
in the shape of a square
and outlined
in the shape of a circle.

In three-dimensional space, those shapes become a cube and a sphere, respectively.
In sixteen-dimensional hyperspace,
those shapes
become a hypercube and a hypersphere, respectively.

Visualizing the Philip Emeagwali Internet

I visualized the Philip Emeagwali Internet
in the 16^{th} dimension of space.
And visualized my new Internet
as a new global network of
two-raised-to-power sixteen, or 65,536,
identical computers that were defined
at the 65,536 vertices of the cube
in a sixteen-dimensional hyperspace.

Philip Emeagwali Internet Was My Crown Jewel

Harnessing up to a billion processors
to solve
the hardest problem
and solving it for the first time,
on July 4, 1989, and solving it
by executing the world's fastest computing
across my new Internet
is the crown jewel
of my discoveries in physics
and my inventions in computer science.
But the story behind the story
is that the technologies
are concrete and visible
while the techniques
are profound, abstract, and invisible.
The world's fastest computer
is up to one billion times faster than
your computer.
The fastest computer

is the heavyweight champion
of the computer world.
The world's fastest calculation
that I discovered
and invented across my new Internet
was the crown jewel
that sparkled in the limelight
and remains echoic retentive
in the public memory.

Fastest Computing Across Philip Emeagwali Internet

My scientific discovery
of the world's fastest calculation
received spontaneous applause,
in 1989.
The supercomputing community
mirrored back their
appreciative applause
and recognized my contribution

to computer science
by giving me their highest award.
Attempting to find my quote, unquote
"fastest calculations within
a fastest computer"
that was powered by a powerful processor
was like undertaking to find the unicorn
that was a legendary beast
with a single, spiraling horn.
The unicorn can't be found
for the simple reason it does not exist.
My fastest calculations
did not exist within one isolated
super-fast processor
which was not a member
of an ensemble of processors.
My fastest calculations
only exist across a new Internet.
The machinery that I used
to record my world's fastest computing
only exists as a new Internet

that I defined by my 65,536
equidistant processors.
My quest for the world's fastest computer
was for a new Internet
that I could use to compute
at the fastest possible speed.
And compute
two-raised-to-power sixteen times
faster than the computer.
And compute fastest
while solving
the hardest problems,
such as simulating global warming.
My quest was for human progress
that's achieved via an increase
in the speed of the computer.
In my quest
for the world's fastest computer,
I followed sixteen mutually orthogonal,
or perpendicular, directions.
Those directions led me into
an imaginary

sixteen-dimensional hyperspace
where I invented my new Internet.
And invented it
as a new global network of
65,536 equidistant
off-the-shelf processors
that were surrounding a globe
in that sixteen-dimensional hyperspace.

18 Inventing the First Supercomputer as We Know It Today

Solving Compute-Intensive Algebraic Problems

Algebra and calculus are the cornerstones
of extreme-scale computational physics.
In the 1980s,
the most compute-intensive problems

arising in large-scale algebra
are those from discretized
partial differential equations
beyond the frontier of calculus
and not in any textbook.
The grand challenge
in late 20th century calculus
was to discover
how to parallel process,
or how to solve 65,536
compute-intensive problems
in algebra or calculus
and how to solve them
across as many processors.
Many articles, including one
in the June 20, 1990, issue
of The *Wall Street Journal,*
credited Philip Emeagwali
for inventing
how to solve such difficult
mathematical problems.
I discovered

how to solve the most
compute-intensive problems.
And solve them across
a new global network of
65,536 processors.
Those processors were identical,
coupled, and shared nothing.
They defined and outlined a new Internet.
I invented how to harness that new
Internet
and use its processors
to compute together
and harness up to a billion processors
as one coherent, seamless supercomputer
that was the precursor
to the world's fastest computer.

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

Fastest Computing Was Once Impossible Across Processors

The answers to the biggest questions don't come easy.

In a syndicated newspaper article
that was distributed
on September 2, 1985
and distributed to the print media
and distributed by the
United Press International, or UPI,
and in that article,
John Rollwagen,
the president of Cray Research
Incorporated, the company
that manufactured
seven in ten supercomputers,
described his company's use of
64 super-fast processors
as quote, unquote

"more than we bargained for."

My Invention Opened the Door to the World's Fastest Computer

My scientific discovery
of the world's fastest computing
could be described as follows:

A billion processors could be harnessed
to compute a billion times faster
than one computer.

I was in the news because I discovered
the supercomputer solution
of the hardest problems across
an Internet.
My theorized Internet was a global network
of a binary billion processors.
A binary billion
is two-raised-to-power-32,
or 4,294,967,296.

My new mathematical solution
demands serious ideas and hard work.
The reason the twelve-year-old
writes an essay on Philip Emeagwali
is that I discovered
the world's fastest computing.
And discovered
how to solve a billion problems
at once, and across an Internet
that's outlined and defined
by a global network
of one billion processors
that shared nothing with each other.
My discovery made the news headlines
because it opened the door
to the world's fastest computer
that solves a billion problems
at once, or in tandem.

19 How I Discovered the Shift in Computer Thinking

Changing the Way We Look at the World's Fastest Computer

Silent but powerful protests
followed my discovery
of the world's fastest computing.
My supercomputer discovery
which occurred on July 4, 1989, was this:
I discovered a significant shift
in supercomputing thinking.
In the latest thinking,
the world's fastest computer
must harness one billion processors.
And must use those processors
to solve the world's biggest problems
that formerly took one billion days
(or 2.74 million years) to solve
and, instead, solve them faster
and in only one day.

World's Fastest Computer

In the search for new knowledge
about nature and man-made things,
the discovery and invention
are the most coveted contributions
to science and technology, respectively.

For the computer scientist,
the most significant progress is made
when the world's fastest computer
becomes faster.

Each year, the computer gets faster
but it's difficult to articulate
what a specific person contributed
to develop that year's computer.
The quantum increases
in both the speed and speedup
of the world' fastest computer
that I discovered at 8:15 in the morning
of the Fourth of July 1989,

in Los Alamos, New Mexico, USA,
is the quantifiable and objective measure
of my contribution to the development
of the computer.
That quantum increase in speed
was how I corrected
the erroneous belief that was enshrined
into computer science textbooks.
Prior to my discovery
of the world's fastest computing,
it was believed that
the hardest problems
could not be chopped up
into a billion less challenging problems.
And then solved, in tandem
and with one-problem to one-processor
correspondence,
and across a billion processors.
It was believed that
the world's fastest computer,
as we know its technology today,
will forever remain

in the realm of science fiction.
A research and development
on a billion-dollar supercomputer
is a financial contribution
to the world's fastest computer.
Often, the research article
is not a contribution to human knowledge.
The research becomes
a significant contribution
to computer science, if and only, it yielded
a new world's fastest computer
that made the news headlines
and won the most coveted prize
in supercomputing, and has other signifiers
that it's a significant contribution
that made the world a better place
and a more knowledgeable place.

How I Solved the Most Difficult Problem in Supercomputing

During my first fifteen years
of supercomputing
that followed June 20, 1974,
in Corvallis, Oregon, USA,
I identified a lacuna
in computer science that existed across
an ensemble of a billion processors
that's wired together as one coherent unit
that's an Internet.
That missing knowledge
was how to harness a billion processors.
And use them to solve
the most compute-intensive problems
in mathematics, science, engineering, and medicine.
I contributed new knowledge,
or scientific discovery,
to the first world's fastest computing
across the world's slowest processors.
I did so by correcting
the imprecise knowledge

of supercomputing
that was known
in computer science textbooks
as Amdahl's Law.

Correcting Amdahl's Law of Diminishing Supercomputer Speed

In simple terms, Amdahl's Law
stated that fewer than eight processors
could be harnessed and used to solve
the world's biggest problems.
I corrected that error
when I harnessed a new Internet
that's a new global network
of 65,536 processors.
And used that new Internet
to solve
one of the most difficult problems,
called an initial-boundary value problem

of mathematical physics.
Such mathematical problems
couldn't be solved otherwise,
or without using one million processors.

20 Fastest Computing is My Contribution to Technology

Solving Compute-Intensive Problems

The world's fastest computing
can't be invented by luck.
My invention is the product of
a sixteen-year-long quest.
During my first decade and half
of fastest computing,
I analysed the toughest problems in
algebra, calculus, physics,
and computer science.
And I tried different ways of solving

initial-boundary value problems
that were governed by
a system of partial differential equations
at the frontiers of calculus
and computational fluid dynamics.
I theorized my parallel-processed
solutions
both within one processor
and across one billion processors.
I did both before I discovered that
the fastest computing across
the slowest processors
is not a waste of everybody's time,
as was presumed prior to July 4, 1989.

Fastest Computing is My Signature Contribution to Computer Science

It costs about half a million dollars
to train a pre-eminent mathematician.

And train her from the first grade
to the frontier of mathematical knowledge.
But paying half a million dollars
to consume the mathematical knowledge
that was created by
preceding research mathematicians
is not a contribution
to the existing body of
mathematical knowledge.
Inventing new
partial differential equations
that occurs at the frontiers of calculus
and physics
and inventing the fastest computing
across the slowest processors
and using that new knowledge
as the tool for solving
those difficult mathematical equations
were my two signature contributions
to modern mathematical knowledge.
For those reasons, I was the cover story
of the top mathematics publication,

the May 1990 issue
of the *SIAM News*
that was the flagship publication
of the Society for Industrial
and Applied Mathematics.
Mathematics publications
featured me to mathematicians
not because I was good looking.
I created new mathematical knowledge
that no mathematician
had understood before.
The *SIAM News* is where
recent contributions
to mathematical knowledge are published.
The *SIAM News* featured me because
I contributed
the nine Philip Emeagwali equations
that were a system of
partial differential equations
at the frontiers of calculus
and physics.
And I contributed new knowledge

of how to solve them
by supercomputing them across
millions of processors
that shared nothing between each other.
In 1989, I was in the news
because I invented how to solve
initial-boundary value problems
of mathematical physics.
And solve them by supercomputing them
across the slowest processors
in the world.
For that contribution,
I won the highest award
that computer scientist describe
as the Nobel Prize of Supercomputing.

How Are Supercomputers Used in Saudi Arabia?

In an email, a fourteen-year-old
writing an essay
on famous computer scientists

and their contributions
to the development of the computer
asked me:

"How are the contributions
of Philip Emeagwali used
in Saudi Arabia?"

The supercomputer market
is valued at
forty-five billion dollars a year.
The energy and geoscience industries
buy one in ten supercomputers.
And use them to pinpoint oil deposits.

The Ghawar Oil Field of Saudi Arabia
that was discovered in 1948
had up to 104 billion barrels
of recoverable oil reserves.
The Ghawar Oil Field measures
174 miles by 19 miles.
The Ghawar Oil Field is declining

at eight percent each year.
Supercomputing across
a billion processors
is the forty-five billion dollars a year
high-performance computing technology
that must always be used to recover
crude oil and natural gas
from the Ghawar Oil Field.

Saudi Arabia classified
its fastest computer simulations
of its oil fields as a state secret
and proprietary intellectual property.

In 1989, I was in the news for discovering
how the world's slowest processors
could be harnessed and used
to manufacture
the world's fastest computer.
And used to pinpoint the locations
of otherwise elusive crude oil
and natural gas

that were formed
up to 541 million years ago.
And buried up to 7.7 miles
(or 12.4 kilometers) deep.
And buried across an oil producing field
that's the size of a town.

The most important applications
of mathematics, physics,
and computer science occurs within
the world's fastest computers.
The world's most expensive computer
costs one billion,
two hundred and fifty million dollars.
The world's most expensive telescope
costs ten billion dollars.
The world's fastest computer
is to the mathematician
what the world's biggest telescope
is to the astronomer.

I'm Philip Emeagwali. Thank you.

Further Listening and Rankings

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contribution tocomputer development

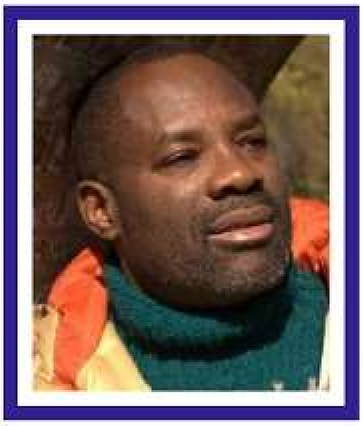
- what is the contribution of philip emeagwali to computer development
- what is lovelace main contribution to the development of the computer
- what are mauchly and eckert main contribution to the development of the computer
- what is the eniac programmers main contribution to the development of the 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).



Inventing the First Supercomputer as We Know It Today | Will a Trillion Processors Power a Planetary Computer?[v]

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."

Transcript of Philip Emeagwali YouTube lecture 211002-4of4 for the video posted above.

Changing the Way We Look at the Supercomputer

Year Million Posthuman Computers

An Internet of Posthuman Gods

Thank you. I'm Philip Emeagwali.

In 1989, I was in the news
for providing the quote, unquote
"final proof"
that supercomputing
across the world's slowest computers
is not science fiction.

Science deals with facts
while fiction deals with truths.

Fast computing across
64,000 human computers
was first theorized as science fiction,
back on February 1, 1922.
But for seven decades,
the idea of fast computing in tandem
and across thousands of computers

was dismissed for the lack of evidence.
In those years, the technology
could not be harnessed and used
to power the world's fastest computers.
My contribution to computer science
that's the subject of schools essays
is this:

I experimentally confirmed
the first world's fastest computing across
the world's slowest processors.
I discovered the quote, unquote
"final proof"
that the slowest processing
across thousands of processors
could yield the fastest computing.
I made that supercomputing discovery
sixty-seven years later, on July 4, 1989,
in Los Alamos, New Mexico, USA.
Solving the world's biggest problem
across a million processors
is to the world's fastest computer

what playing games
with only one processor
is to the regular computer.
Parallel processing
takes computer science
into a new epoch
where millions of processors
work together
to power only one supercomputer.
At 8:15 in the morning, on July 4, 1989,
in Los Alamos, New Mexico, USA,
I became the first person
to stand at the farthest frontier
of the world's fastest computer.
I was the first person
to gaze out towards unknown territories
that were not on the map
of computer science.
I gazed across an ensemble
of the world's slowest processors
to discover the world's fastest computing
which was then unknown

to mathematicians and physicists
who needed that new knowledge
to solve their most difficult problems.
That then unknown field of knowledge
is where unexpected and unimagined
new computer science, new physics,
and new mathematics
are almost guaranteed to be discovered.
The world's fastest computing represents
a remarkable confluence of new ideas
from the frontier of mathematics
to those of physics and computer science.

My contribution to computer science
is this:

I was the first person to synthesize
the new multidisciplinary ideas.
And do so with new ideas of my own.
I synthesized ideas to discover that
the world's fastest computing hid

in the bowels of an ensemble
of the world's slowest processors.

It's not only the supercomputer
that will benefit from my discovery
of the fastest computing across
the slowest processors.
Our understanding of the supercomputer
will increase over the coming years.

I believe that the Internet will evolve
to become one coherent computer,
or a planet-sized supercomputer.

One million years ago,
our prehuman ancestors
looked like apes.
In one million years, or Year Million,
our posthuman Gods
might ridicule our descendants
as looking like humans.

We might have only living Silicon
as our posthuman Gods
that could achieve immortality.
In the distant future,
the aliens on Earth could be us.
And the posthuman Gods
on distant planets
could be our descendants.

I envision posthuman Gods
of Year Million
as thinking across a Cosmic SuperBrain
that is an artificial
intelligence.
That human-made genius
could sprawl across
an epic landscape
to become their eighth
supercontinent.
That powerful brain
could enshroud

our seven land continents
and enshroud the Earth
with their Year Million electronic wires.
I foresee our descendants
being part-humans
and part thinking machines.
The grandchildren of our grandchildren
may not use their Internet
the way we use our Internet.
Their Internet could be within them
while our Internet is around us.
Posthuman Gods
will not need supercomputers
because they could be infinitely fast
computing machineries.

2 Inventing the Philip Emeagwali Internet

In 1989, it made the news headlines
that I—Philip Emeagwali—
had experimentally discovered
how to solve
some of the most compute-intensive
problems
in mathematics and physics.
I was cover stories because
I discovered how to solve
the most difficult problems
in mathematics and physics.
And solve them
with the world's fastest computer
that was powered with
the world's slowest processors.
Furthermore, I invented how to solve
the hardest problems,
called extreme-scale
computational fluid dynamics.
Likewise, I invented how to solve
difficult mathematical problems across
a new Internet that's a new global network

of up to one billion
coupled processors.
Each processor operated
its operating system and shared nothing.
I was in the news because
I invented a new Internet
that's a new global network
of millions, or billions, of processors.
I invented how to parallel process
or how to execute a billion set of
computer instructions.
And how to execute them at once
or how to execute them in parallel
and across a billion processors.
My invention of how
the world's fastest computer
can be built from the slowest processors
enables the supercomputer
to compute a billion times faster
than the regular computer.

My Earliest Years in Computing

I began my quest for that new Internet
in 1974 in Oregon, USA.
I began as a janitor-mathematician
who put away his slide rule,
that was also called an analog computer,
that he bought in 1970
and brought from Onitsha, Nigeria.
In late 1970,
it seemed like I was the only person
with a slide rule in Onitsha (Nigeria).
I also put away my log table,
that was my only computing aid,
of 1967 at our home
that was the Nurses' Quarters
of General Hospital, Agbor, Nigeria.
I put away both my slide rule
and log table
to learn how to compute fastest
and do so when solving

compute-intensive systems of equations
in algebra.

3 Inventing the Nine Philip Emeagwali Equations

In 1974, in Corvallis, Oregon, USA,
I learned how to use the fastest computers
to solve those equations
arising in computational linear algebra.
They were impossible to solve
on the blackboard, or solve
with pencil and paper.
I learned how to solve
a huge system of equations
of modern algebra
and solve them on a supercomputer
that was powered by only one
electronic brain.
As a research mathematical physicist

who came of age in the 1970s and 80s,
I understood how those difficult
mathematical problems
arose from some laws of physics.
I understood how the new calculus
were derived.
And how those laws of physics
were encoded into the system of
partial differential equations
beyond the frontier of calculus.
They are called
the nine Philip Emeagwali equations.

4 My Earliest Years of Computing in the USA

I made my debut
as a computational mathematician
on one of the world's fastest computers.
I began supercomputing because

I needed to solve a huge system
of equations in algebra.
I began my supercomputer quest
on Thursday, June 20, 1974,
in Monmouth, Oregon,
in the Pacific Northwest region
of the United States.
I entered my programs
into a time-shared supercomputer
that was at 1800 SW Campus Way,
Corvallis, Oregon.
I submitted my executable programs
that were written
in high-level programming languages,
such as BASIC and FORTRAN.
And entered them
through my remote job entry terminal.
BASIC is the acronym
for Beginners' All-purpose
Symbolic Instruction Code.
It's a general-purpose,
high-level programming language.

FORTRAN is the acronym
for FORmula TRANslation.
It's the first choice, programming language
of engineers and mathematicians
and other creators of scientific algorithms.
My knowledge of supercomputers
grew over the decade and a half
that followed June 20, 1974.

5 How I Overcame Racial Barriers in Science

My Supercomputer Access Was Denied

In the 1970s and 80s
and as a Black and African-born,
in the USA, conducting
a decade-and-half long
multidisciplinary research
in computational physics,
I was effectively banned

from using supercomputers.
So, I couldn't conduct research
on vector supercomputers
that costs about forty million dollars
each, in the early 1980s.
My accesses to the fastest
vector supercomputers were revoked,
after they discovered that I was Black
and African-born.
It was revoked at various institutions,
such as the U.S. National Weather Service,
Camp Springs, Maryland.
And revoked from [the University of
Michigan], Ann Arbor, Michigan,
for the supercomputer center
in San Diego, California,
that was operated by
the U.S. National Science Foundation.

My Supercomputing Job Offers That Were Rescinded

In July 1985,
I was tentatively offered a job,
as a supercomputer scientist,
at the Great Lakes
Environmental Research Laboratories
of the U.S. National Oceanic
and Atmospheric Administration,
in Ann Arbor, Michigan.
For practical purposes,
I was offered the job
via telephone, when they presumed
that I was white.
Two months later,
on about September 24, 1985,
I was flown into Ann Arbor, Michigan,
to give my supercomputer
hiring research lecture
and do so in the lecture auditorium

of the Great Lakes
Environmental Research Laboratories,
in Ann Arbor, Michigan.
When the decision makers knew
that I was Black and African,
they decided not to hire me
as their supercomputer scientist.

Fast-forward four and a half years,
after that rejection,
newspapers in Ann Arbor, Michigan,
were writing stories
about an African supercomputer genius,
named Philip Emeagwali.
I was in the news because
I had won the highest award
for my contribution to supercomputing.
At the Great Lakes
Environmental Research Laboratories,
the white supremacists were shocked
to learn that the Black
supercomputer scientist

that they interviewed but rejected,
four and a half years earlier,
is in the news for inventing
the first supercomputing
across the world's slowest computers.

Sabotages of My Supercomputing

In 1989, I was in the news
for the discovery of fastest computing.
That was a scientific discovery
that I was supposed to have made
at the Great Lakes
Environmental Research Laboratories.
Because I was Black and African,
I wasn't permitted
to make my supercomputer discovery
in Ann Arbor, Michigan.

As an aside, a search through
the eight billion videos
that were posted on YouTube

will reveal that nobody
in [the University of Michigan], Ann Arbor, Michigan,
or anywhere else in the world,
then and now, had or has
the commanding grasp of mathematics,
physics, and computer science
that was needed to contribute
the new knowledge
that will enable the fastest computing
across the slowest processors
as well as deliver lectures
on their contributions to supercomputing
that is on par
with the one thousand
closed-captioned videos
that I posted on my YouTube channel
named "Emeagwali."
This gap in scientific knowledge
was widely written about
within [the University of Michigan], Ann

Arbor, Michigan, and beyond.

Research scientists in [the University of Michigan], Ann Arbor, Michigan, revered my discovery
of the world's fastest computing.
Their reverence was documented
in a special issue on Philip Emeagwali
in their flagship publication,
called *The Michigan Today*.
That February 1991 issue of
The Michigan Today was titled:

"One of the World's Fastest Humans."

The *Michigan Today*
is a quarterly publication
that's mailed to 610,000 alumni [of the University of Michigan].
The PDF version
of that February 1991 issue,
on Philip Emeagwali,

can be searched for and read online.
As an aside, that *Michigan Today* issue on Philip Emeagwali was used to develop two nation-wide law school admission tests.

In September 2009, the LSAT
(or Law School Admission Test)
of the USA,
had a reading comprehension section
that focused on "Philip Emeagwali"
and that drew from that
Michigan Today issue of February 1991.
And in December 2009, the same American
Law School Admission Test
also focused on my contributions
to computer science
and drew from that
Michigan Today issue of February 1991.
That reading comprehension section
of the American LSAT
as well as millions of school essays

on Philip Emeagwali
put me on the same platform
with Albert Einstein
and William Shakespeare.
Giving that level of recognition
to a young Black sub-Saharan African
will always incur extreme jealousies
from white supremacists
who argue that Albert Einstein
has a higher IQ than Philip Emeagwali.

In [the University of Michigan], Ann Arbor, Michigan, of 1989,
many white supremacists
were sad and jealous
of all the fame and attention
that I was getting.
The jealous ones among them
had the shaky feeling
that they could win that Nobel Prize
of Supercomputing
and do so if they had access

to a supercomputer.
They had access to supercomputers,
since 1946.
But they lacked the scientific knowledge
that I possessed and exhibited
in my one thousand podcasts
and YouTube videos.

So, I was rejected on September 24, 1985,
in Ann Arbor, Michigan,
solely because I was Black
and sub-Saharan African,
not because I lacked the intellect
and knowledge.
I was the first person to discover
the world's fastest computing,
as it's known today.

By the early 1980s, I was ahead
in the supercomputer race
for the fastest calculation in the world
that could be executed across

the slowest processors in the world.
But as a Black supercomputer scientist
who worked alone,
I was perceived as a threat
instead of welcomed
as a contributor to supercomputing.
In the early to mid-1980s,
I was blacklisted and denied access
to vector supercomputers
that were then the fastest in the world.
I was forced to back off
just before I could make
a supercomputer breakthrough.

6 How I Won the Nobel Prize of Supercomputing

In 1989, it made the news headlines
that an African supercomputer genius
who worked alone

had won the highest award
in supercomputing.
And won it for inventing
how to solve a set of
65,536 difficult mathematical problems in large-scale
computational fluid dynamics.
At its compute-intensive core,
each mathematical problem
was a system of 366 equations of
computational linear algebra.
I solved each system
on the slowest processor in the world.
I totaled those problems across
my ensemble of
65,536 processors.
Each processor was coupled
to its sixteen
nearest-neighboring processors.
Each processor shared nothing
with its nearest-neighboring processors.
In the news articles, I was described

as the African supercomputer inventor
who invented how to solve
those world-record algebraic equations.
And solve them
across a new Internet
that's a new global network of
65,536 off-the-shelf processors
that were identical to each other.

Inventing the Philip Emeagwali Internet

I was the Internet scientist
in the news in 1989.

My scientific discovery
of the fastest computing across
a new Internet
that's outlined by up to
one billion processors occurred
on the Fourth of July 1989.
My invention was mentioned
in the June 20, 1990, issue

of *The Wall Street Journal.*
That was my contribution mathematics.
That contribution
has diverse everyday applications
in science and engineering, such as
weather forecasting.
That scientific discovery
was my Eureka invention
as a new Internet scientist.
It was my Eureka moment
because I discovered two new Internets.
I theorized my first Internet
in 1974.
My first Internet
was the supercomputer technology
which I constructively reduced to practice
as my second Internet
that was comprised of
my new global network
of the 65,536 slowest processors
in the world.
I programed them, in 1989,

to execute the fastest computations
in the world.
And execute them while solving
the most difficult problems that arise
in mathematics and physics.
My first Internet was unknown
in the computer textbooks
that were published in 1974.
That was the year I made my debut
in supercomputing
at 1800 SW Campus Way,
Corvallis, Oregon, USA.
My second Internet was unknown,
in 1989, the year I recorded
the fastest computer speed.
And recorded it in Los Alamos,
New Mexico, USA.

7 Inventing the First Supercomputer

Fastest Computing Across a New Internet

My invention
of how to solve up to a billion
difficult mathematical problems
at once
and solve them with
a one-problem to one-processor
correspondence
and solve them across a new Internet
is the reason for writing school essays
titled:

quote, unquote
"The Contributions of Philip Emeagwali to
the Development of the Computer."

Because I wasn't allowed
to conduct my scientific research
and do so in conventional

vector supercomputing,
I was forced to change direction.
And conduct my research
on how to harness
the 65,536 slowest processors
in the world.
And how to use those processors
to invent a new supercomputer
that is beyond super.
The life lesson that I learned
from those rejections was this:

When one door closes,
another door opens.

When the door that led to the room
that was housing the conventional
vector supercomputer closed,
the door that led to the building
housing the most powerful supercomputer
also opened.

How I Leapfrogged to the World's Fastest Computer

Supercomputing Subterranean Fluid Dynamics

I'm a Nigerian-born large-scale
computational fluid dynamics engineer
who came of age in the USA
and in the 1970s and 80s.
My testbed supercomputing problems
for my ensemble of sixty-four [64] binary
thousand processors
ranged from global atmospheric flows
to the fluid dynamics
within an oil producing field
that's up to 7.7 miles (or 12.4 kilometers)
deep
and that covers an area
that's often the size of Mogadishu

(Somalia).
As a computational physicist,
my supreme quest
is to match physics models
and simulations
to the actual geophysical fluid dynamics
being simulated.

Inventing the Shape of the World's Fastest Computer

One of the most difficult
mathematical problems
is global climate modelling.
It has an associated
initial-boundary value problem
that's formulated at the crossroad
where modern calculus,
computational physics,
and fastest computing intersect.
That compute-intensive problem

is mathematically defined
over a physical domain.
For my global climate models,
I visualized the geometrical shape
of the global warming problem
as a globe
that has a diameter of
7,900 miles.
That globe was enshrouded
by a concentric sphere
that has an inner diameter of
7,900 miles
and an outer diameter of
7,962 miles.
The inner diameter of that globe
was my geometrical metaphor
for the surface of the Earth.
The outer diameter of that globe
represents the limits of the atmosphere of
the Earth.

Inventing the World's Fastest Computer

My contributions to the invention
of the first world's fastest computer,
as it's known today, were these:

At 8:15 in the morning
of the Fourth of July 1989
in Los Alamos, New Mexico,
USA, I jumped in joy because I discovered
the fastest computing across
the slowest processors.
I invented the technology
as the new world's fastest computer
that's defined across
the slowest processors in the world.
That new supercomputer
that made the news headlines
wasn't a computer, by or in itself.
I visualized my new supercomputer
as my new Internet, in reality.

That new Internet
was a new global network of
off-the-shelf processors
that were parallel processing
as one seamless, coherent, and gigantic
supercomputer.
And computing together
to solve the world's most important
and complex challenges.

8 Inventing the Philip Emeagwali Internet

I first discovered
the first world's fastest computing across
my theorized Internet
that's a new global network of
sixty-four binary thousand,
or two-raised-to-power sixteen,
processors.

My processors were identical
and shared nothing.
I visualized and theorized my
65,536 processors
as identical computers
that were evenly distributed
around the Earth.
I visualized those two-raised-to-power
sixteen identical computers
as being equal distances apart.
And with much uniformity in processors
and regularity in email wires.
Over the fifteen years
that followed June 20, 1974,
in Corvallis, Oregon, USA,
my theorized Internet evolved
towards a new global network of
sixty-four binary thousand processors
that I visualized as encircling a ball
in my sixteen-dimensional hyperspace.

I called that ball a HyperBall.
Years later, that name, HyperBall,
was replaced by the current name

quote, unquote
"Emeagwali Computer."

I visualized the Emeagwali Computer
as shaped like a hypercube
that's tightly circumscribed
by a HyperBall.

Fastest Computing at a Crossroad

The world's fastest computing
resides at the crossroad
where new calculus,
the most large-scaled
computational physics,
and the fastest computing intersect.
Because fastest computing across
a billion processors

is a highly multidisciplinary
field of study, it's problematic
to explain where the mathematics ended
and where the physics began
and where the computer science
continued.
As a supercomputer scientist
who came of age in the 1980s,
I've been identified
as a mathematician or a physicist
or a computer scientist.
In the 1970s and 80s,
fastest computing across
the slowest processors
was very complicated
and was mocked and ridiculed
as science-fiction
and as a tremendous waste of
everybody's time. In the 1980s,
I was the only full-time programmer
of the most massively parallel
supercomputer ever built.

That supercomputer was powered by
65,536 processors.
Today, the world's fastest computer
is programmed by up to ten thousand
mathematicians and scientists.
The reason I programmed
such machinery alone, back in the 1980s,
was that nobody else understood
how to execute the fastest computing.
And do so across the slowest processors.
And record supercomputing speeds
that's a million times faster than
a computer that's powered by
only one processor.

9 Changing the Way We Look at the Computer

My contributions to computer science
were these:

I discovered how to harness

millions of processors
and use them to reduce
the wall-clock time-to-solution.
And reduce that time
from thirty thousand [30,000] years
within one processor
to one day across a new Internet
that's a new global network
of 10.65 million off-the-shelf processors.
My supercomputer invention
occurred on July 4, 1989,
in Los Alamos, New Mexico, USA.
My invention of the first supercomputing
across the world's slowest computers
that outline an Internet
made the news headlines because
it indicated progress in computer science.
And resulted in a fundamental change
that changed the way
we will look at the regular computers
of tomorrow that could evolve
from the fastest computers of today.

The world's fastest computer speed
that I discovered
and that made the news headlines
was this:

The processing power
of the world's fastest computer
which now occupies the space
of a soccer field
can be increased to the power
of a theorized supercomputer
that could enshroud the Earth
in forthcoming centuries.
The world's fastest computer
can weigh more than a million pounds,
or eight thousand Africans.

The supercomputer of the future
could be powered by trillions of processors
that will be communicating as an Internet
that enshrouds the Earth.

That planet-sized computer
could enable discoveries across
science and industry.

Fastest Computing a Billion Times Faster than a Computer

Simulating Nuclear Explosions

In the 1980s,
I couldn't conduct my research
on how to harness
one million processors.
And use them to solve
the hardest problems
in science, engineering,
and medicine.
As a supercomputer scientist,
I came of age in the 1970s and 80s
and in the USA.
In those two decades,

it was impossible
for a Black African-born
but naturalized U.S. citizen,
such as myself,
to gain the top-secret clearance
that was needed to work with
the world's most powerful
supercomputers.
The fastest computers are used
to simulate the explosions
from detonating nuclear bombs.

Black Inventors Were Not Hired

The U.S. national laboratories
—not universities and corporations—
were the primary places
that I could conduct my research
in fastest computing across
the slowest processors.
In the 1980s, I had the visceral feelings

that I was on a hot track
to discover and invent
how and why
a million processors that computed
in tandem
could be harnessed
to make future computers faster
and supercomputers fastest.
In retrospect, I was pursuing
a supercomputer invention—namely
parallel computing—
that couldn't be invented
under the vision
of any U.S. national laboratory.
Or be invented
as part of a supercomputing
research team anywhere in academia.
That, plus the fact that
I was Black and African, was the reason
I wasn't hired
as a research supercomputer scientist
in the 1970s and 80s.

10 Father of the Internet | A Beautiful Theory that is an Internet

In my unsuccessful hiring talks
that I delivered
in U.S. government laboratories,
I provided broad brushstrokes
to research computational physicists.
And to research
computational mathematicians.
Back then, my theories on how to solve
the hardest problems
and solve them across a million
processors
were dismissed as science fiction.
My idea was ridiculed
as a beautiful theory
that lacked an experimental confirmation.
That beautiful theory
was my new Internet

that I visualized as a new
global network of
65,536 off-the-shelf processors
that shared nothing,
but were in dialogue with each other.
My broad brushstroke was to solve
the most difficult problems
in mathematics, science,
and engineering.
My supercomputing quest
was to discover how to solve them across
my ensemble of
two-raised-to-power sixteen
processors
that were coupled to each other.
In the 1970s and 80s,
the world's fastest computer speed
that I recorded on July 4, 1989, was mocked
as a huge embarrassing mistake.
And dismissed as science fiction.

Achieving the fastest computing across
the slowest processors
was ridiculed as an empty pipe dream.

My Leapfrog from Computer to Internet

In 1974, and in Corvallis, Oregon,
I made a leap of my imagination.
I leapt from a theorized global network
of sixty-four thousand human computers
that were equal distances apart,
and around the Earth,
to my theorized global network
of sixty-four binary thousand computers
that were also uniformly distributed
around the Earth.
I made that leap of my imagination
because that's what humans do.
Humans extrapolate from the known
to the unknown.

The genius is the ordinary person

that found the extraordinary
in the ordinary.

Why is Supercomputing a State Secret?

The need for faster computers
isn't going anywhere.
The supercomputer will help define
the political and economic powers
of the 21st century.
The nation that controls the technology
that powers the world's fastest computer
controls high-stake seismic imaging
and petroleum reservoir simulation.
Both technologies must be used
to nail down the exact locations
of crude oil and natural gas
that were formed
up to 541 million years ago.
The nations that control
petroleum technologies
control the 65,000 oil fields in the world.

This is the reason China wants to control
the technology that powers
the world's fastest computers.
Doing so will enable China
to take the first step
in controlling some of the
159 producing oil fields in Nigeria.
Therefore, it will not come as a surprise
that the Saudi Arabian government
placed armed guards
around its most powerful supercomputer.
One of the world's fastest computers
is used to simulate the recovery of crude
oil
and natural gas
from the vast oil fields of Saudi Arabia.
Saudi Arabia classified
the supercomputer simulations
of their oil fields as state secrets.
They're state secrets because
the supercomputer is the key
to the petroleum dependent economy

of Saudi Arabia.
The supercomputer is the magical lock
that, so to speak, opens the oil field
that's buried up to 7.7 miles
(or 12.4 kilometers) deep
in the Sakhalin Island
in Russia's Far East.
And up to twice the size
of the state of Anambra, Nigeria.

The Size of the Supercomputer Market

The world's fastest computer
is not only the pinnacle
of the computer industry,
but it's also big business.
In recent years, the industry grossed
forty-five billion dollars a year.

An Internet That's Also a Supercomputer

Inventing the Supercomputer as an Internet

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

The first Internet that I invented
was a new global network of processors.
I designed that Internet
to be congruent with the atmosphere
of the Earth.
I reasoned that the surface of the Earth
is enshrouded by a 62-mile-deep
ocean of air, moisture, and water, such as
the rivers, lakes, oceans, and even fluids
like crude oil and natural gas.
Furthermore, I visualized that 62-mile deep
body of fluid
as a concentric sphere

with an inner diameter of
7,917.5 miles (or 12,742 kilometers).
Not only that,
I visualized that concentric sphere
as tessellated into 65,536 equal-sized
ocean of fluids
that extended from the bottom of
the oceans
to the uppermost boundary
of the Earth's atmosphere.

I had to visualize the shape
of my new Internet as follows:

My new Internet
must circumscribe a globe
has a diameter of 7,917.5 miles
(or 12,742 kilometers).

I defined my new Internet
as outlined
as a new global network of

65,536 processors
that has a one-to-one correspondence
with 65,536 equal-sized
physical domains.
Each processor within my new Internet
will run one climate model.
The world's fastest computer
occupies the footprint of a football field.
And internally communicates across
a total of 200 miles,
or about 322 kilometers, of cables.
And it costs one billion,
two hundred and fifty million dollars each.
That world's fastest computer
is the top dog in mathematics.

Where is the measurable paradigm shift,
or the step-changing discovery,
that's the greatest milestone
in the history of the computer?

Where is the continental drift

of supercomputing?

The increase in the speed of
the supercomputer is the central essence
of what defines progress in computing.
The world's fastest computer
could become the laptop computer
of tomorrow.
Speed is the essence of the computer.
Therefore, a paradigm shift, or a change
in the way we think about the computer,
occurs when there's a quantum leap
in supercomputer speeds.
According to Moore's Law,
the speed of the computer
is expected to double
every eighteen months.
However, that factor-of-two increase
in computer speed
is merely evolutionary and conventional.
That factor-of-two increase
wasn't a paradigm shifting discovery.

Visualization was the key instrument
which I used to invent my new Internet
that's a new global network of
off-the-shelf processors
which defined and outlined
my new supercomputer.
I used the cube as my metaphor
for my new Internet.
And I visualized a processor
as corresponding to a vertex of the cube.
And a bidirectional email wire
as corresponding to each edge of the cube.
Furthermore, I visualized my new Internet
as a cube
that was tightly circumscribed
by a sphere.
For my world's fastest computing emails
that made the news headlines, in 1989,
I visualized my cube as a hypercube
in the 16th dimension
that was circumscribed by a hypersphere
in the 16th dimension.

I visualized my new Internet
as defined and outlined
by a new global network of sixteen times
two-raised-to-power sixteen, email wires.
Or a network of one binary million,
or 1,048,576,
bidirectional edges of that hypercube.
I visualized my email wires
as projected and as etched onto
the fifteen-dimensional hypersurface
of that sixteen-dimensional hypersphere
that quote, unquote "circumscribed" it.
Finally, I visualized those edges
as my metaphors
for my 1,048,576 bidirectional
email pathways
that emanated to and from
my new global network of
65,536 off-the-shelf processors
that was my new Internet.
I visualized my processors
as equal distances apart

and as corresponding to the as many
vertices of the hypercube
on that hypersurface.
For these contributions,
I'm the only father of the Internet
that invented an Internet.

11 How I Discovered a Quantum Leap in Supercomputer Speed

At 8:15 in the morning, on July 4, 1989,
in Los Alamos, New Mexico, USA,
I discovered how to increase
the speed of the fastest computer
and do so by a factor of 65,536.
I recorded my computer speedup across
as many processors.
On that day, I also discovered how to,
in theory, increase that speed
by a factor of one billion across
one billion processors.
I visualized those one billion processors

as uniformly encircling a globe
and doing so as a new Internet.
That new Internet was where I executed
the world's fastest computing.
For six months after my discovery
of fastest computing, leading
supercomputer scientists
were shocked at the speed
of my calculations.
But some supercomputer scientists
mocked my discovery
of the alternative way of executing
the world's fastest computing.
And using that new knowledge
to solve the most difficult problems
arising in mathematics.
The naysayers wrote that
Philip Emeagwali
has made a quote, unquote
"terrible mistake."
Those naysayers stopped laughing at me
after it was announced that my discovery

of the world's fastest computing
has been validated.
I won the highest award in supercomputing
and for the year 1989.
My discovery of fastest computing
made the news headlines around the world
and became my signature invention.
It's the reason Philip Emeagwali
is the subject of school essays.
Achieving that 65,536-fold increase
in supercomputer speed
was a fundamental change
of tectonic proportions
that changed the way
we look at the world's fastest computer.
Computing across up to a billion
processors
was a magical change because
it was both unexpected and extraordinary.
The reason my scientific discovery
of the world's fastest computing
made the news headlines

was that the new technology
was both unorthodox and revolutionary.

Using the Supercomputer to Foresee the Otherwise Unforeseeable

In the conventional paradigm
of supercomputing,
called serial computing,
the computer scientist visualized
one processor
as computing automatically to solve
one of the most difficult problems
in mathematics.
One such problem was the
initial-boundary value problem
arising at the frontier of calculus
and large-scale computational physics.
The system of
partial differential equations that governs

such initial-boundary value problems
is at the mathematical
and computational core
of the highest-resolution
global climate model
that must be used to foresee otherwise
unforeseeable long-term global warming.

My Leapfrog from Slowest Computing to Fastest Computing

What separates the old
and new ways of fastest computing
is not the problem they solve
but how they solved it.
In their old way, mathematical problems
are solved
within one processor.
In my new way, they're solved
across up to one billion

coupled processors.
Those processors emulate one seamless, coherent, and gigantic supercomputer.

The Internet is the precursor
to a planet-sized computer
that will shine like a beautiful star
in a dark galaxy.

Thank you. I'm Philip Emeagwali.

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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).