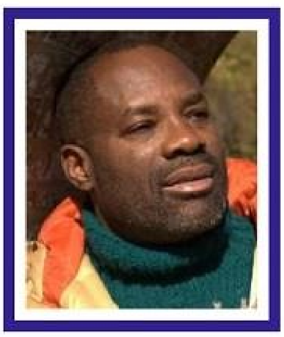
53 Father of Large-Scale Algebra—Famous Black Mathematicians and Their Contributions—Part 4 of 10



Philip Emeagwali Lecture 180912-1 and 170922
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53.1.1 Contributions to Mathematics (Algebra)

53.2 Inducted into the Mathematics Hall of Fame

53.2.1 Lecture of Philip Emeagwali at the International Congress of Mathematicians

I'm Philip Emeagwali.

A contribution to mathematics
that is groundbreaking
is always front-page story
in mathematics publications.
In the world of mathematics,
it is a tradition
to invite a research mathematician
that contributed
to mathematical knowledge
and to invite him (or her)
to deliver a research lecture
on his (or her) contributions
to mathematical knowledge

and to deliver that research lecture 2584
to the forthcoming
international congress
of research mathematicians.
That international congress
of research mathematicians
is held once every four years.
My mathematical invention
of how to solve
the toughest mathematical problems
that arose in physics, calculus,
and algebra
and how to solve
those mathematical problems
across my ensemble
of 64 binary thousand
tightly-coupled processors
occurred on the Fourth of July 1989
and occurred in Los Alamos,
New Mexico, United States.
Two years later,

and on July 8, 1991, in Washington,
in the District of Columbia,
United States,
I gave an esoteric research lecture
that was for research mathematicians
only.
Nine years earlier, the same lecture
in Washington, District of Columbia,
attracted only one attendee.
But on July 8, 1991,
I was still getting cover stories
including a cover story
of that day's issue
of the *Detroit Free Press*
and a PBS—Public Broadcasting Service—
television interview, the following day,
in **Cambridge**, Massachusetts.
For the media attention
my contributions
to algebra and calculus
were getting,

I was not surprised
that my 11 a.m. lecture
in the Dover Room
of the Washington Sheraton Hotel
in Woodley Park
was so well-attended
that all the seats were taken.
In fact, research mathematicians
were violating the fire code
by standing on restricted spaces.
That research mathematics lecture
on my contributions to algebra
and to calculus
was preceded by a cover story
in the May 1990 issue
of *SIAM News*.
The *SIAM News*
is the top publications in mathematics.
The *SIAM News*
is written by research mathematicians
and written

for research mathematicians.
SIAM is the acronym
for the Society for Industrial
and Applied Mathematics.
At that mathematical congress
of July 8, 1991,
I was the research mathematician
that was in the news
the most.
I lectured to a standing-room only
audience of research mathematicians.
I lectured
on how I mathematically invented
how to solve
the **toughest problems**
arising in algebra, calculus, and physics.
I lectured on my new
massively parallel processing way
of solving the toughest
mathematical problems
arising in extreme-scale

computational physics
and solving those problems
by massively parallel processing
64 binary thousand
algebra, calculus, and physics problems
and parallel processing them **at once,**
instead of the old way of
sequentially processing
only one
mathematical problem
at a time.
My mathematical processes
were called executing
a set of floating-point
arithmetical operations
that solves a linear system of equations
of algebra
that, in turn, approximates
a system of equations
of calculus.
I invented new algebra and new calculus.

As a research computational
mathematician
that came of age
in the 1970s and '80s,
I was searching
for new algebra and new calculus
and searching
for new mathematical knowledge
and searching
for that knowledge alone.
I was searching alone, not by choice.
I did my research alone,
because I was scorned, ridiculed,
and rejected
by the research mathematics community.
I was dismissed
from my research teams.
According to an Igbo proverb:

[quote]
"A new fowl, in a new land,

2590

looks at the old fowls
to learn how to crow
in their new language."
[unquote]

I was dismissed because
I was the new fowl
in the new land
of the massively parallel processing
supercomputer.
Back on June 20, 1974,
I was the new fowl,
in the new land
of the sequential processing
supercomputer
that solved only one problem
at a time.
For the sixteen years
onward of June 20, 1974,
and according to an article
in the June 20, 1990 issue

of the *Wall Street Journal*,
I—**Philip Emeagwali**—was the new fowl
who did not look at the old fowls,
or my metaphor
for the community of 25,000
supercomputer scientists
that were led by **Seymour Cray.**
I did not learn from the old fowls
how to crow, or program,
an isolated processor
that defined the sequential processing
supercomputer
and defined the vector processing
supercomputer.
In my lecture of July 8, 1991
at the international congress
of mathematicians,
the process
of massively parallel processing
initial-boundary value problems
arising in calculus and physics

and the process of solving those 2592
problems at once
was a strange idea.
That international congress
of mathematics
only holds once every four years
and was to the mathematician
what the Olympic Games
is to the athlete.
As a research extreme-scale
computational mathematician,
my discovery lecture
to the research mathematicians
at that international congress
was on the nine new
partial differential equations
of calculus
that I invented.
Those partial differential equations
were in the news
and were the cover story

of the May 1990 issue
of the *SIAM News*
that was the most widely read
bi-monthly news journal
within the global
mathematics community.
Presenting my mathematical inventions
at that international congress
gave me the sense of accomplishment
that an athlete will have
after winning a gold medal
at the Olympic Games.
I felt like I won gold medals
for my contributions
to the modern calculus
and to the extreme-scale algebra
that must be formulated
to solve the new calculus.
I felt like I won gold medals
at the Olympic Games
of mathematics

that holds once every four years.
I felt like I was inducted
into the mathematics Hall of Fame.
Delivering that lecture
was more meaningful to me because
that international congress
of mathematicians
of July 8, 1991
took place in my adopted hometown
of Washington, D.C.
where I spent nearly a decade,
onward of June 8, 1977,
doing most of my mathematical research
and inventing my nine new
system of coupled, non-linear,
time-dependent, and state-of-the-art
partial differential equations
of modern calculus
that encoded
the Second Law of Motion
of physics.

53.3 A Black Mathematician in Urban America

53.3.1 Black Mathematicians in Washington, DC

Since June 10, 1977, I was a familiar face
at the front desk
of the U.S. Library of Congress
in Washington, D.C.
The U.S. Library of Congress
is the largest library in the world.
Some of my contributions
to calculus and algebra
occurred while I was reading,
researching, and writing
inside the U.S. Library of Congress.
In the early 1980s,
I took the fifteen minute walk
from my residence

at 1915 East-West Highway,
Apartment 303,
Silver Spring, Maryland,
to the Metro Station
of Silver Spring, Maryland.
From Metro Station,
I took the Red Line
for the 30 minute ride to Union Station
that is near the U.S. Capitol Building,
Washington, District of Columbia.
From Union Station, I took a short walk
to the U.S. Library of Congress.
I went to the U.S. Library of Congress
because in those days
it took three weeks
to complete an inter library loan request.
Rather than wait for three weeks,
I went to the U.S. Library of Congress
to get instant access
to the rarest mathematical materials.
In the early 1980s, 2596

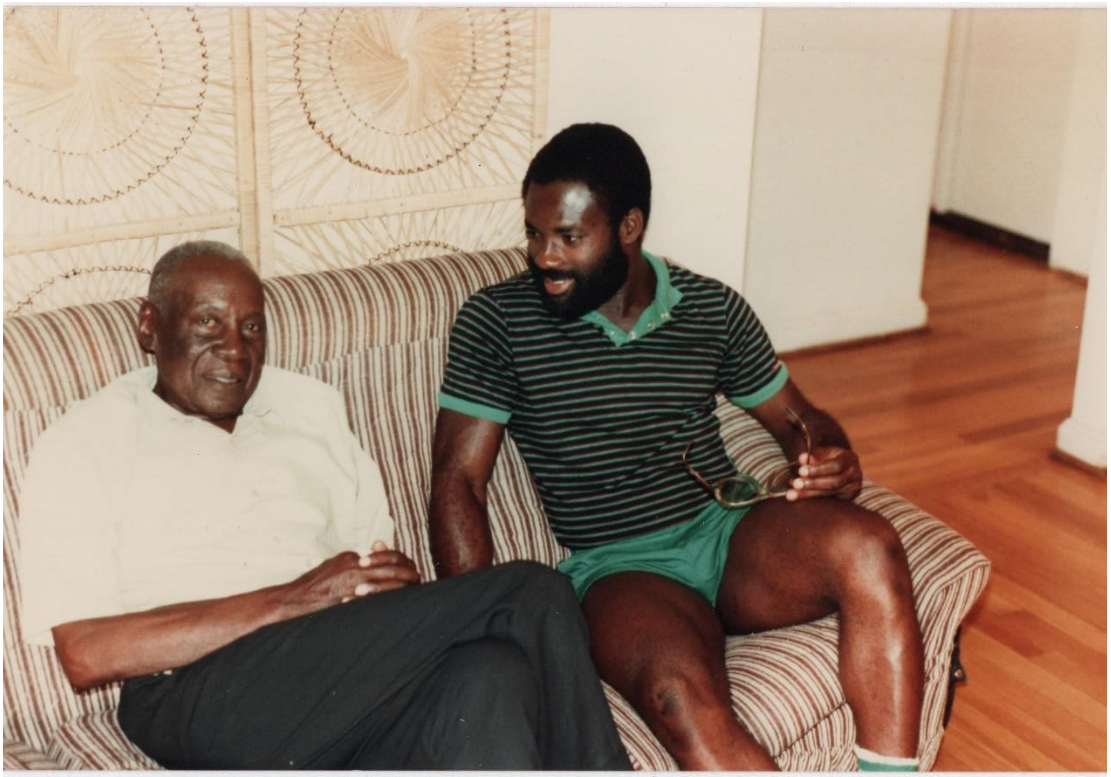
I was also a familiar face 2597
in the one-room library
of the Embassy of Nigeria
in Washington, D.C.
I went to the Embassy of Nigeria
to read Nigerian newspapers.
I discovered that
the Embassy of Nigeria
is the place to meet the Who's Whos
in the Nigerian society.
That's where I ran into
the business man **Moshood Abiola**,
who strode into the one-room library
dressed in an off-white suit
and carrying
a big dark brown leather bag.
So I spoke to **Moshood Abiola**
about a decade and half
before he became
the presumed president of Nigeria.
Solving an **initial-boundary value**

problem
of modern calculus
that’s governed by a system of
coupled, non-linear, time-dependent, and
state-of-the-art
partial differential equations
and solving that problem
across a new internet
that is a new global network
of 64 binary thousand
tightly-coupled processors
that were already available
in the market
is so intellectually demanding
that it was dubbed
a grand challenge problem.
For that reason,
I was mentally exhausted
by the late afternoons
of the late 1970s
and early ‘80s.

I rested my brain 2599
from doing calculus and calculating
across
my new internet
that is a new global network of
one binary million
bi-directional, regular, short,
and equidistant email wires.
I rested my brain
by playing three to five sets
of tennis games.
After ten years of playing tennis
almost daily, standing out in the sun,
and a tough work-out regimen,
I was ranked
by the United States Tennis Association,
or the USTA for short,
as a Level Five tennis player.
I defeated the number one
seeded tennis player
of the Howard University tennis team

that I met practicing
at the **Banneker** Recreation Center
Tennis Courts.
And I defeated the number one
seeded tennis player
of the University of Wyoming
that I met in Casper, Wyoming,
and I defeated him
with the consistent ground strokes,
great agility, marathon level fitness,
and speed of a tennis baseliner.
I gave up playing tennis
in part because
I was programming supercomputers
twelve hours a day.
I also gave up tennis
in part because
I had few Level Five
tennis partners
that I could play with.
Playing against weaker tennis players

is good for my confidence and ego. 2601
But it does not improve my game.
For the same reason,
a Level Six tennis player
would not want to play with me.
On three occasions, I played against
retired Level Seven tennis players,
the tennis players
you watch on television.
These world-class players
are overpowering
with their 100 miles per hour
serve-and-volleys.



53.3.2 Supercomputing the Motions of a Tennis Ball

I discovered that I **recuperated** faster
when I played tennis
in the late afternoon.
And that I **recuperated** slower
when I did not play tennis
but instead
watched television in the evening.
In the late 1970s,

I **recuperated** with three to five sets 2603
of tennis games
at the **Banneker** Recreation Center
Tennis Courts
that was named after
Benjamin Banneker
and that was **across** the street
from and between
the School of Engineering
of **Howard University**
and **Benjamin Banneker** High School,
Washington, DC.
Benjamin Banneker
was the prominent
black American mathematician
of **Senegalese ancestry**.
Benjamin Banneker
was extolled as a “scientific genius”
by both **Thomas Jefferson**
and the French Academy of Sciences.
Benjamin Banneker

was on a US postage stamp 2604
and is the subject of school reports.
Benjamin Banneker
famously and politely challenged
Thomas Jefferson
by famously writing that:

[quote]
“The colour of the skin
is in no way connected
with strength of the mind
or intellectual powers.”
[unquote]

In the summer of 1977,
I was twenty-two years old
and hanging around
Charles Drew dormitory
of Howard University,
Washington, D.C., and doing so
without realizing that

I would cross paths with **Charles Drew**
in school curricula and reports.
Charles Drew is best known
for his contributions to the blood bank.
I played tennis at **Banneker**
Recreation Center Tennis Courts
that was at **Euclid** and **9th Street**
Northwest.
I played tennis at **Banneker** Courts
during the two and half years
onward of October 1978
that I lived at the corner of
Euclid and **16th Street** Northwest
in the **Adams-Morgan** neighborhood
of Washington, DC.
I also went to
16th & Kennedy Streets Northwest
to play tennis
at the **Rock Creek Park**
Tennis Center.
That tennis center

2606

is to Washington, DC
what Wimbledon Lawn Tennis
is to London, England.
As a computational fluid **dy**na**mi**cist,
I understand the motions of tennis balls
in a deeper way
that my tennis partner
cannot understand.
I understand that
the **top spin** of first serves
are **spinning** at
one thousand revolutions
per minute.
Wilfred St. John
who was born in the **Caribbean**
and **Ron**
who was born in **Trinidad**
were my two favorite tennis partners
of the early 1980s.
We played at the four tennis courts
of Rosemary Hills neighborhood

of Silver Spring, Maryland.
The tennis courts were at
2450 Lyttonsville Road,
Silver Spring, Maryland.
Those tennis courts are adjacent
to the newer **Gwendolyn Coffield**
Community Recreation Center
and to the Rosemary Hills-**Lyttonsville**
Local Park, in Silver Spring, Maryland.
Those four tennis courts
were a short walk
from my residence
at 1915 East-West Highway,
Silver Spring, Maryland.
Ron who was in his mid-20s,
was very strong, very tall, and very fast.
But Ron gives away his hard won points
by making too many mistakes.
Ron had a first serve
that terrified other tennis players.
Ron serves his tennis balls flat,

and serves them with zero top spin, 2608
and serves balls at 120 miles per hour.
Ron's first serves leave their imprints
on the hard court.
Ron serves at the same first serve speed
that **Arthur Ashe** served
in **Wimbledon**, England.
The only way I could return
Ron's first serves
was to stand several feet
outside the tennis court
to receive them.
I use the number of
revolutions per minute
and the speed of the tennis ball
to model the motion
of the tennis ball
and do so from a system of
coupled, non-linear, time-dependent,
and state-of-the-art
partial differential equations

of modern calculus
that originates from my blackboard
and that I must solve
as 64 binary thousand
computer codes
that were running simultaneously
and executing **across** a new internet
that is a new global network of
as many tightly-coupled processors
that shared nothing with each other.
I had to be physically fit
to be intellectually fit.
In the early 1980s,
my three-hour jogging trail
was through the **Rock Creek Park**
of Washington, DC.
I began jogging
through the Rock Creek forest
at 7 a.m.
and I jogged for about three hours.
Sometimes, I jogged through the city.

2609

For my city runs, 2610
I started from Metro Station
of Silver Spring, Maryland
and jogged along **Georgia Avenue**
towards downtown Washington, DC,
making a right turn
at Howard University
and heading towards
George Washington University
and back to Silver Spring, Maryland.
It is impossible for me to get lost
in Washington, DC,
just as it is impossible
for a cat
to get lost in its neighborhood alleys.
For this reason,
I was at home—both physically
and intellectually—whenever
I am in Washington, D.C.
I was at home during the 1991
international congress of mathematics

that took place in my backyard
of Washington, DC
and took place a jogging distance
from my former residence
in Silver Spring, Maryland.

53.3.3 Crossing Paths With Benjamin Banneker

It seems surreal
and a strange coincidence
that I followed the footsteps
of **Benjamin Banneker**
even though he was born
two centuries,
two decades, and three years
before I was born.
Benjamin Banneker
was born in Colonial America
and I was born in Colonial Africa.
I was born on August 23, 1954
in Akure,

2612

in the British West African
colony of Nigeria.
The father of **Benjamin Banneker**
has his ancestral roots
in present day Senegal, West Africa,
and we both were first-generation
Americans.
I was a regular visitor
to the **Benjamin Banneker** Museum
in Ellicott City, Maryland
and a regular hiker
along nearby trails.
Like **Benjamin Banneker**,
I was publicly extolled
by a U.S. president
who acknowledged my contributions
to scientific knowledge.
Like **Benjamin Banneker**,
I am on postage stamps.
Like **Benjamin Banneker**,
I am the subject of school reports

for my contributions
to the development of the computer.

2613

53.4 Oil Recovery Algorithms

53.4.1 Contributions to Mathematicians

I am the research
computational mathematician
who searched for new calculus
and new algebra
that are most suitable
for the most massively
parallel processing supercomputer
in the world.
I searched for new mathematics
and I searched
for the twenty years
onward of June 1970.
After twenty years,

I was at the frontier of knowledge 2614
of new calculus and new algebra.
Only a few hundred
of the 10,000 research mathematicians
that read the cover story
of the May 1990 issue
of the *SIAM News*
could understand my contributions
to calculus and to algebra.
But those research mathematicians
that were at the frontiers of knowledge
of modern calculus,
extreme-scale algebra,
and computational physics
and that attended my lecture
on July 8, 1991
at the **international congress**
of mathematicians
understood my contributions
to the partial differential equations
of modern calculus.

Those research mathematicians
also understood my contributions
to large-scale algebra
that arose from solving those
partial differential equations.
Briefly, I explained to the
international congress
of mathematicians
the new calculus and the new algebra
that I contributed as never-before-seen
mathematical knowledge.
I explained
at the **international congress**
how I mathematically invented
the 36 partial derivative terms
that I contributed
to the calculus of extreme-scale
computational physics
that is used to **recover**
otherwise **unrecoverable**
crude oil and natural gas

that were buried a mile-deep
in the Niger-Delta oilfields
of southeastern Nigeria.

53.4.2 Contributions of Philip Emeagwali to Calculus

In the early 1980s
and while I was living
in the Washington, DC,
metropolitan area,
I made two contributions
to modern calculus.
My contributions
were new and for that reason
were not in any calculus textbook
of the 1980s and earlier.
My first contribution to mathematics
was in the early 1980s.
That mathematical contribution
was my theoretical discovery

of 36 formulas,
each called a partial derivative term
of calculus.
I mathematically discovered
that my 36 formulas
made my nine
partial differential equations
of modern calculus
that I invented
to more accurately represent
the motions of the crude oil,
injected water,
and natural gas
that were encoded
in the petroleum reservoir simulator.
My new partial differential equations
are more accurate when used to **recover**
otherwise **unrecoverable**
crude oil and natural gas.
My second contribution
to modern calculus

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occurred from the
mathematical studies
and laboratory experiments
that I conducted in the mid-1980s.
That contribution to extreme-scale
computational mathematics
was my invention
—that the technology
of massively parallel processing
makes the computer **faster**
and makes the supercomputer
fastest,
and my invention
of how those unheard-off
supercomputer speeds
and how to harness
millions upon millions of processors
and harness them
to solve the toughest problems
arising in modern calculus,
large-scale algebra,

and extreme-scale
computational physics.
Such grand challenge problems
of supercomputing
include the general circulation model
that must be used
to foresee otherwise unforeseeable
climate changes.
I invented
how to harness the processors
within the modern supercomputer
and I invented
how to use the fastest computation
of a supercomputer
to more accurately solve
what mathematicians describe as
initial-boundary value problems
of modern calculus.
My most important contribution
to calculus
was my invention

of how to solve
the toughest problems
arising in calculus
and how to solve them
across motherboards,
or **across** an ensemble of
65,536 cooperating processors
that shared nothing with each other.
In 1989, it made the news headlines
that I invented
how to solve
the toughest problems
arising in modern calculus, large-scale
algebraic computations,
and extreme-scale computational physics
and that I invented
how to solve
those initial-boundary value problems
and how to solve them **across**
a new internet
that is a new global network of

2620

64 binary thousand 2621
tightly-coupled processors
that were already available
in the market.
I invented
how to solve those tough problems
and solve them **across**
an analogous global network of
as 64 binary thousand computers.
My invention
of how to parallel process
across a new internet
was a paradigm shift
that changed the way
we solved the toughest problems
arising in modern calculus
and extreme-scale algebra.
In the old way,
the toughest problems
in modern calculus,
extreme-scale algebra,

and extreme-scale computational physics 2622
were unsolveable
(or **impossible** to compute)
on the blackboard
or were **inaccurately** solved
(or computed)
on one motherboard
or on one computer
that is powered by only one **isolated**
processor
that was not a member
of an ensemble of processors
that communicates and computes
together
and as one seamless, cohesive
supercomputer.
That invention
was the reason
my mathematical contribution
to modern calculus,
extreme-scale algebra,

and extreme-scale computational physics 2623
was front-page news
in the world of mathematics.
I provided the lockdown evidence
when I invented
how the toughest problems
arising in modern calculus,
extreme-scale algebra,
and computational physics
can be solved on the blackboard,
can be solved beyond the motherboard,
and can be solved **across** a new internet
that is a new supercomputer
and that is a new computer.
I invented that new internet
as a new global network of
two-raised-to-power sixteen
processors
that were already available
in the market
and that were married together

as one seamless, cohesive whole unit
and married together
by another global network of
sixteen times
two-raised-to-power sixteen
regular and short email wires
that were equal distances **apart**.
I mathematically visualized
that new internet
as uniformly encircling a globe
that is mathematically embedded
within a sixteen-dimensional
hyperspace.
I invented
how to push the frontier of
modern calculus
and extreme-scale algebra
and how to do so
to solve
one of the most computation-intensive
problems

arising in extreme-scale 2625
computational physics
and that is called
petroleum reservoir simulation.
The Niger-Delta oilfield
doesn't fit into a lab,
or into one computer.
For that reason, I invented
how to fit
the Niger-Delta oilfield
into a new supercomputer
that is not a computer *per se*
but that is a new internet *de facto*.
My new internet
is powered by an ensemble of
65,536 commonly-available processors
with each processor
operating its own operating system
and with each processor
having its own dedicated memory
that shared nothing with each other.

53.5 The Infinite Reduced to Finite

2626

53.5.1 From Infinite to Finite Time-to-Solution

I invented
how to solve one of the most
computation-intensive problems
arising in supercomputing
and how to do so
by mathematically inventing
how to compress
the infinite **times-to-solution**
to finite **times-to-solution**
and, finally,
by inventing
how to compress
65,536 days, or 180 years,
of **time-to-solution**
to just one day of **time-to-solution**.
It takes infinite calculations
and infinite **time-to-solution**

for even the fastest supercomputer
to solve the toughest problems
arising in modern calculus,
extreme-scale algebra,
and computational physics.
It takes infinite calculations
and infinite **time-to-solution**
to solve those problems **directly**
and **exactly**.
As a matter of fact, or by definition,
the fastest supercomputer only solves
calculus problems **indirectly** and
approximately
and only solves
the algebraic restatement
of that calculus problem.
That error, in part, explains
why tomorrow's weather forecast
is not an exact science.
I can say more
if I have your permission

to use a few esoteric 2628
mathematical short hands
that are only understood by the few
grand wizards of calculus
that were initiated
into the priesthood of mathematics.
Please allow me to quote myself
and to quote
from my July 8, 1991 lecture
that I delivered
to research mathematicians
that were attending
the **international congress**
of mathematics.
This was what I told those research
computational mathematicians
that were at the frontier
of mathematical knowledge.

[quote]
"To parallel process,

or to process many problems
(or many processes)
at once,
instead of processing only one problem
at a time
is the necessary condition
for solving the **diagonalized**
system of equations of algebra
that I invented
from my explicit finite difference
discretizations
of my governing system of
coupled, non-linear, time-dependent,
and state-of-the-art
partial differential equations
that defined
my initial-boundary value problems
of calculus
that was at the mathematical foundation
of extreme-scale

petroleum reservoir simulation.” 2630
[unquote]

“In particular,” I continued

“a sufficient condition
for accurately solving the
initial-boundary value problem
is to attain infinite speed-up.
I invented
how to use a new internet
that I invented
and how to use that new internet
to compute 65,536 times faster
than one computer
that is powered by only one
isolated processor
and with that one computer
computing alone

to solve one extreme-scale problem
arising in computational physics
in which the laws of physics
were central to the definition
of that computation-intensive problem."
[unquote]

53.5.2 The Invisible Became Visible

I was the inventor
that saw nine unseen
partial differential equation
of modern calculus.
I saw a 65,536-fold increase
in high-performance
supercomputing speed
for executing the fastest
floating-point arithmetical operations.
The potential to achieve that speedup
preexisted

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within my new internet
that I visualized and programmed
as a new global network of
65,536 tightly-coupled processors
with each processor
operating its own operating system
and with each processor
having its own dedicated memory
that shared nothing with each other
that were already available
in the market,
or a new global network of
as many computers.
That new internet was a new frontier
in extreme-scale
computational mathematics
that I had to cross
to see a previously unseen
massively parallel processing
supercomputer
that is the modern supercomputer
that is used to conquer tomorrow's

challenges, 2633
such as solving the toughest problems
arising in modern calculus
and in extreme-scale algebra.

I’m **Philip Emeagwali**.

In 1989, I was in major U.S. newspapers,
such as the June 20, 1990 issue
of the *Wall Street Journal*.
I was in the news because
I invented
the lockdown evidence
of how to compress 65,536 days,
or 180 years, of **time-to-solution**
on one computer
to only one day of **time-to-solution**
across a new internet
that is a new global network of
65,536 computers.

I invented how to execute
the excruciatingly-detailed
petroleum reservoir simulation
and I invented
how to solve
that initial-boundary value problem
of modern calculus
and computational physics
and I invented
how to solve that problem
as soon as possible.
For that massively parallel processing
supercomputer accomplishment,
I won the top accolades
from the top technical societies
in the United States.
As a technological inventor,
I created something
—namely, a new internet
that is a new supercomputer—
that could have been created

but was not created. 2635
By seeing something
where nothing existed,
the discoverers and inventors
made darkness visible.
My invention
was how to make a new internet
that is a new global network of
65,536 tightly-coupled, commodity
processors
and how to make
those cooperating processors **invisible**
individually
and yet **visible**
as one seamless, cohesive supercomputer
that solves extreme-scale problems
in algebra.
That was how I crossed
the frontiers of knowledge
to see a new Internet
that was previously unseen.

Throughout history, every inventor
entered the unknown world,
or the *terra incognita* of technology,
before the invention
became the news headlines.
Their biographers,
or authorized story tellers,
came on the scene,
often decades after the discoverer
is no longer with us.

53.5.3 Contributions of Philip Emeagwali to Algebra

The fastest supercomputer
in the world
occupies the space of a soccer field
and requires building
a new multi-storey facility
to house the millions upon millions
of commodity processors

that will enable it to execute
the fastest computations.
Extreme-scale algebra
is the recurring decimal
in extreme-scale computational physics
that, in turn, is the recurring decimal
within the millions upon millions
of commodity processors
that make the new supercomputer **super**.
Executing extreme-scale
computational physics codes
demands unreasonably large
execution times.
I made headlines
in major U.S. newspapers
because I invented
how to reduce 180 years
of **time-to-solution** across
one computer
powered by only one processor
that was not a member

of an ensemble of processors 2638
to just one day of **time-to-solution**
on the massively parallel processing
supercomputer
that is a new internet
that is a new global network of
65,536 processors.
That invention was recorded
in the June 20, 1990 issue
of the *Wall Street Journal*.
That invention
of a new internet
that is a new computer
is my signature invention.
That invention
is my contribution to calculus, algebra,
and computer science.
That invention
is the reason the 12-year-old American
is writing a school report
on the contributions

of **Philip Emeagwali**
to the development
of the modern computer.

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