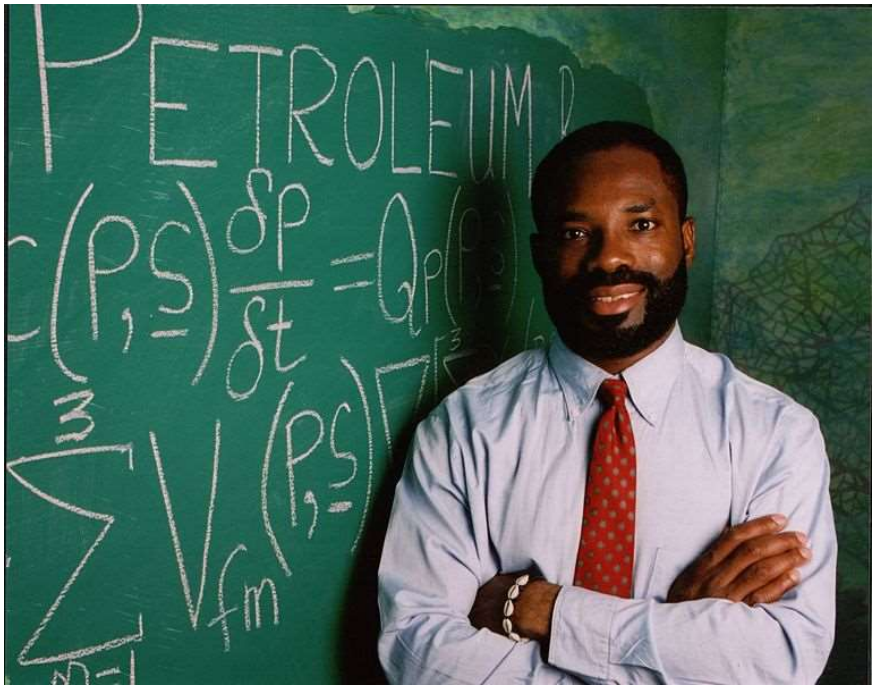
I discovered how to reduce computations that took one hundred and eighty [180] years, or 65,536 days, within one computer to only one day across 65,536 computers. I discovered one hundred and eighty [180] years in one day. I discovered a supercomputer that is a global network of 65,536 computers, or an internet.

Philip Emeagwali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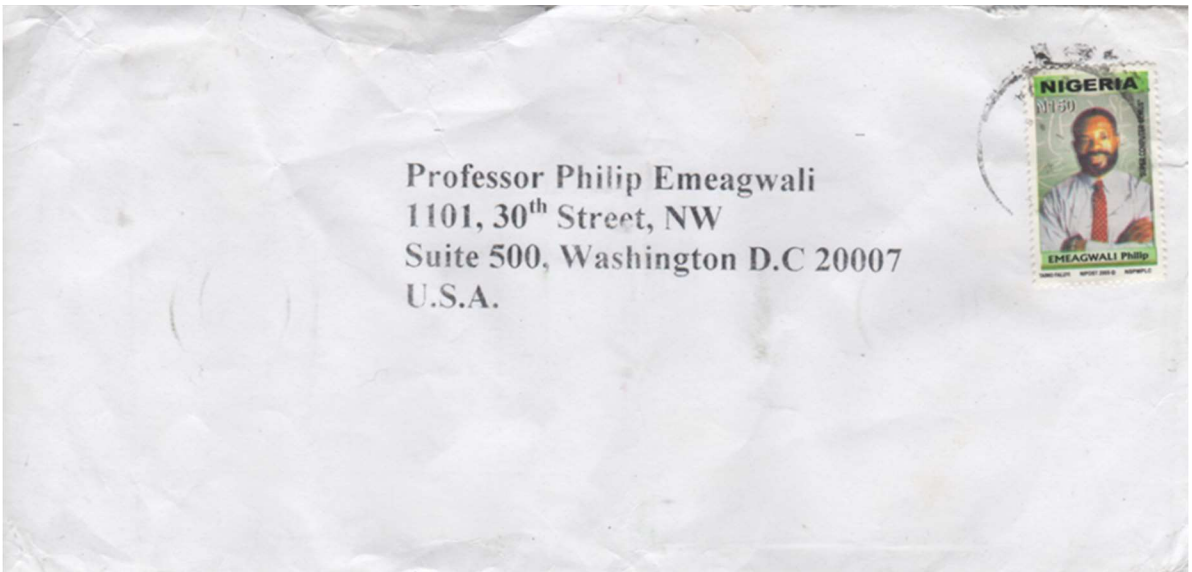
Professor Philip Emeagwali
1101, 30th Street, NW
Suite 500, Washington D.C 20007
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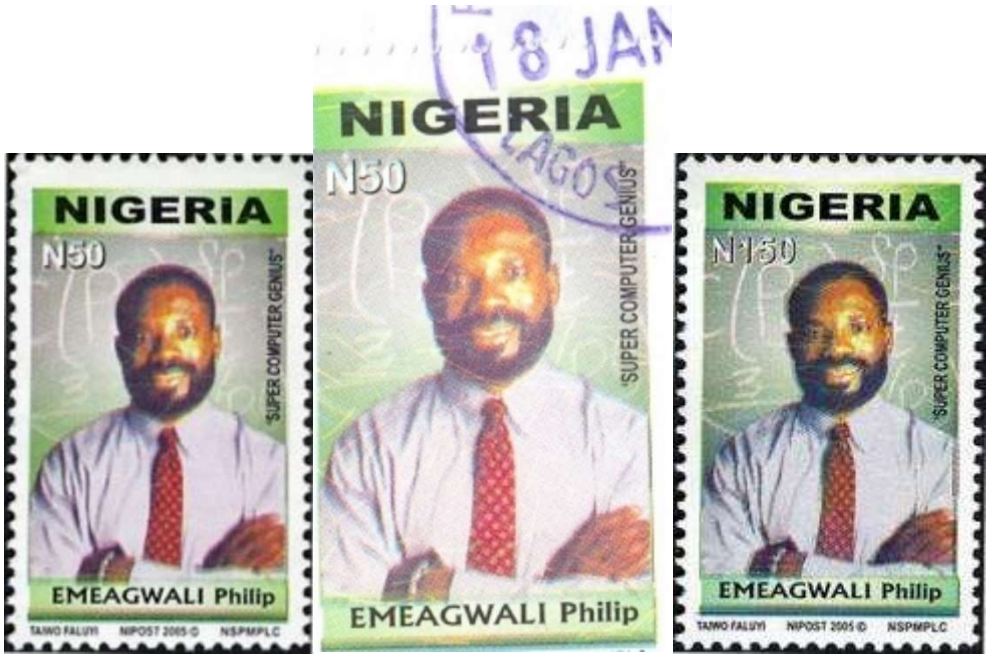
EMEAGWALI Philip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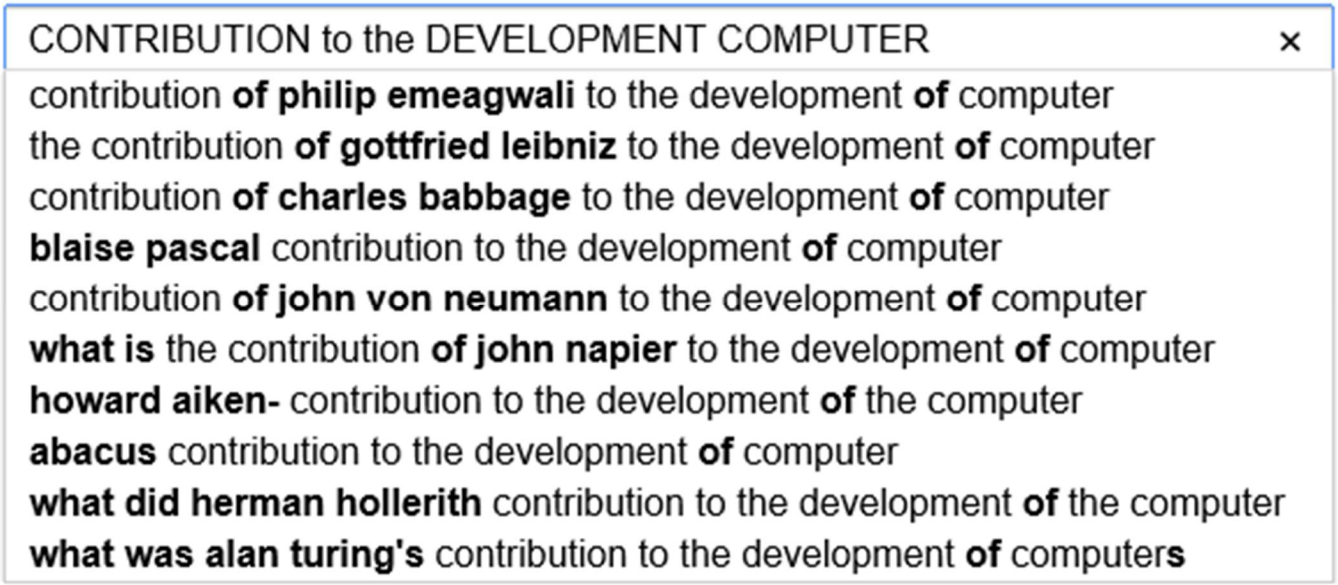


Screenshot on February 15, 2013

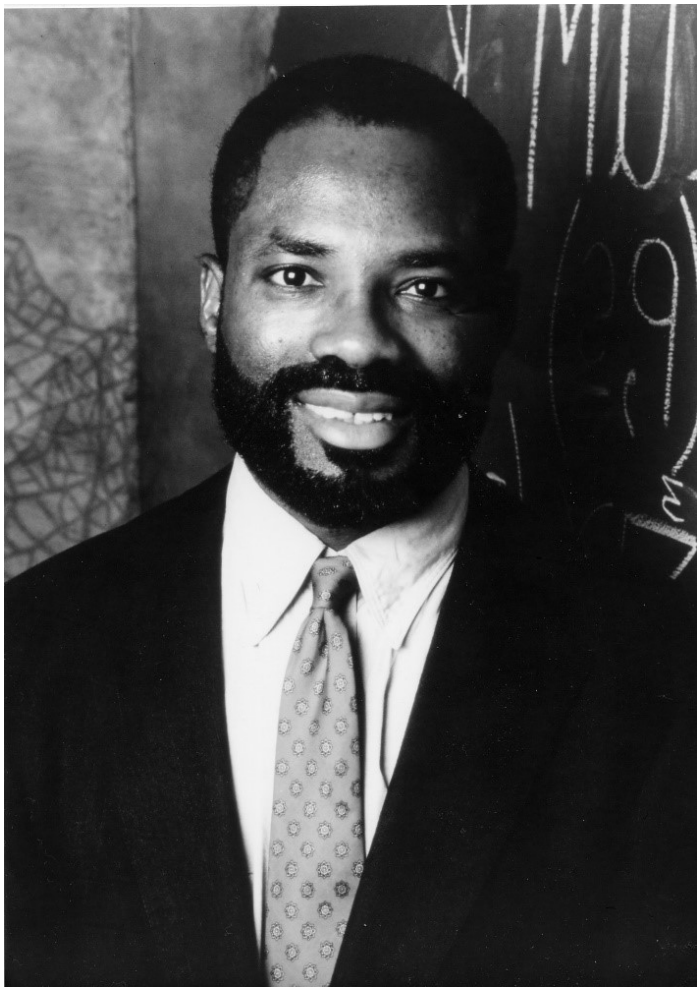
It is extracted from one billion daily Google searches. It measures global footprints across all seven continents, across history of computing, going all the way to the abacus that was invented five thousand years ago. It is an objective and literal way of measuring the influence of inventors studied in schools for their "contributions to the development of the computer."

Google

"For contributions to the development of the computer"

TOP 10

FATHERS OF THE COMPUTER



1. Philip Emeagwali
2. Gottfried Leibniz
3. Charles Babbage
4. Blaise Pascal
5. John von Neumann
6. John Napier
7. Howard Aiken
8. Abacus
9. Herman Hollerith
10. Alan Turing

PHILIP EMEAGWALI: FAST FACTS

Birth date: August 23, 1954

Birth place: Akure, Nigeria.

Birth name: Chukwurah Emeagwali (pronounced eh-may-ah-gwah-lee)

Father: Nnaemeka James Emeagwali, a 33-year-old hospital nurse in Akure

Mother: Iyanma Agatha Emeagwali, had Philip six days after her 15th birthdate

Marriage: Dale (Brown) Emeagwali (August 15, 1981- present)

Child: with Dale Emeagwali: Ijeoma, June 15, 1990

Research: Attended 500 weekly scientific seminars by the Who's Whos in Science during the decade of the 1980s.

Lectures: Posted at SoundCloud.com/emeagwali and/or YouTube.com/emeagwali

Supercomputer: A global network of 65,536, or two-to-power sixteen, computers visualized on the surface of a globe in the sixteenth dimension.

Primordial Internet: A global network of two-to-power sixteen, or 65,536, computers receiving emails to and from sixteen-bit addresses and along sixteen times two-to-power sixteen, or 1,048,576, bi-directional communication wires, each akin to short telegraph wires.

Most Voted: Number One in school projects on biographies of great computer scientists

Most Searched-For: Contributions to the development of the computer

Discovery: How to speed up 180 years of computing to one day of supercomputing.

Invention: Constructively reduced a global network of 65,536 computers—*a.k.a.* an internet—to a supercomputer.

Listed: Top ten's in computing, scientific role models, and sixth Nigerian on Nigerian postage stamps.

Paradigm Shift: From computing within one computer to communicating across 65,536 computers.

Invention Moment!: News headlines in 1989 was "African Computer Wizard Wins Top Computing Prize."

Benefit: To foresee unforeseen global warming. To discover oil and gas.

Instrument: Nine in ten supercomputers used for computational physics.

Little Known Fact #1: Philip Emeagwali's lectures are highly reprinted in newspapers.

Little Known Fact #2: Philip Emeagwali controlled more (sixteen) supercomputers than any person that ever lived.

Little Known Fact #3: Philip Emeagwali's discovery amplifies the benefits of the invention of the integrated circuit by a factor of 64 binary thousand.

Little Known Fact #4: In 1989, 25,000 people had supercomputer accounts. And nine in ten supercomputer cycles pertained to physics.

Little Known Fact #5: A supercomputer powered by 65,536 processors only allows one programmer at a time to lock-and-use all 65,536 processors on a 24/7.

Little Known Fact #6: In 1989, only one supercomputer was powered by 65,536 processors. That supercomputer was located at the Los Alamos National Laboratory. It was programmed round-the-clock by Philip Emeagwali.

Little Known Fact #7: The supercomputer powered by 65,536 processors was abandoned, for Philip Emeagwali, because Amdahl's Law described in supercomputer textbooks of the 1980s decreed that it will be impossible to achieve a speedup of up to eight with eight or more processors.

Little Known Fact #8: That abandoned supercomputer that was a global network of 65,536 processors was programmed twenty-four seven (24/7) by only one programmer.

Little Known Fact #9: In 1989, The Computer Society of IEEE issue a press release about the discovery of Philip Emeagwali.

Little Known Fact #10: For his discovery of a speed increase of 65,536 fold, Philip Emeagwali became the first computer giant to be extolled in a U.S. presidential speech.

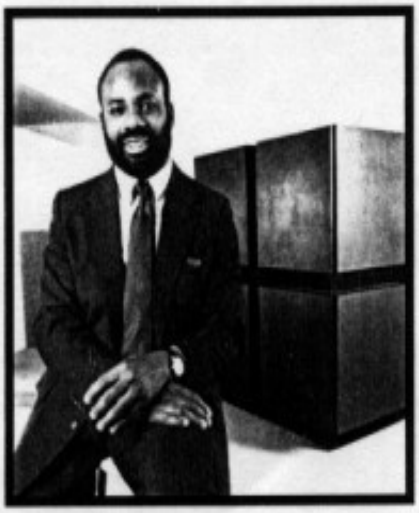
Philip Emeagwali conducted his experiments on the machine shown in the background. He visualized it as a global network of 65,536 computers.

On the 50th anniversary of the computer, we salute the brilliant pioneers behind this modern miracle

Just fifty years ago, the world's first electronic computer was unveiled. This remarkable invention has changed our lives faster than any other invention in history. Moreover, the rate of change is accelerating.

The women and men of EDS salute those whose insights, vision and persistence have contributed to developing this remarkable tool.

A leader among them is Dr. Philip Emeagwali. Emeagwali is an interdisciplinary computer scientist and inventor who developed software that allowed multiple processors to tackle complex problems simultaneously, paving the way to solving problems once thought unsolvable.



Dr. Philip Emeagwali

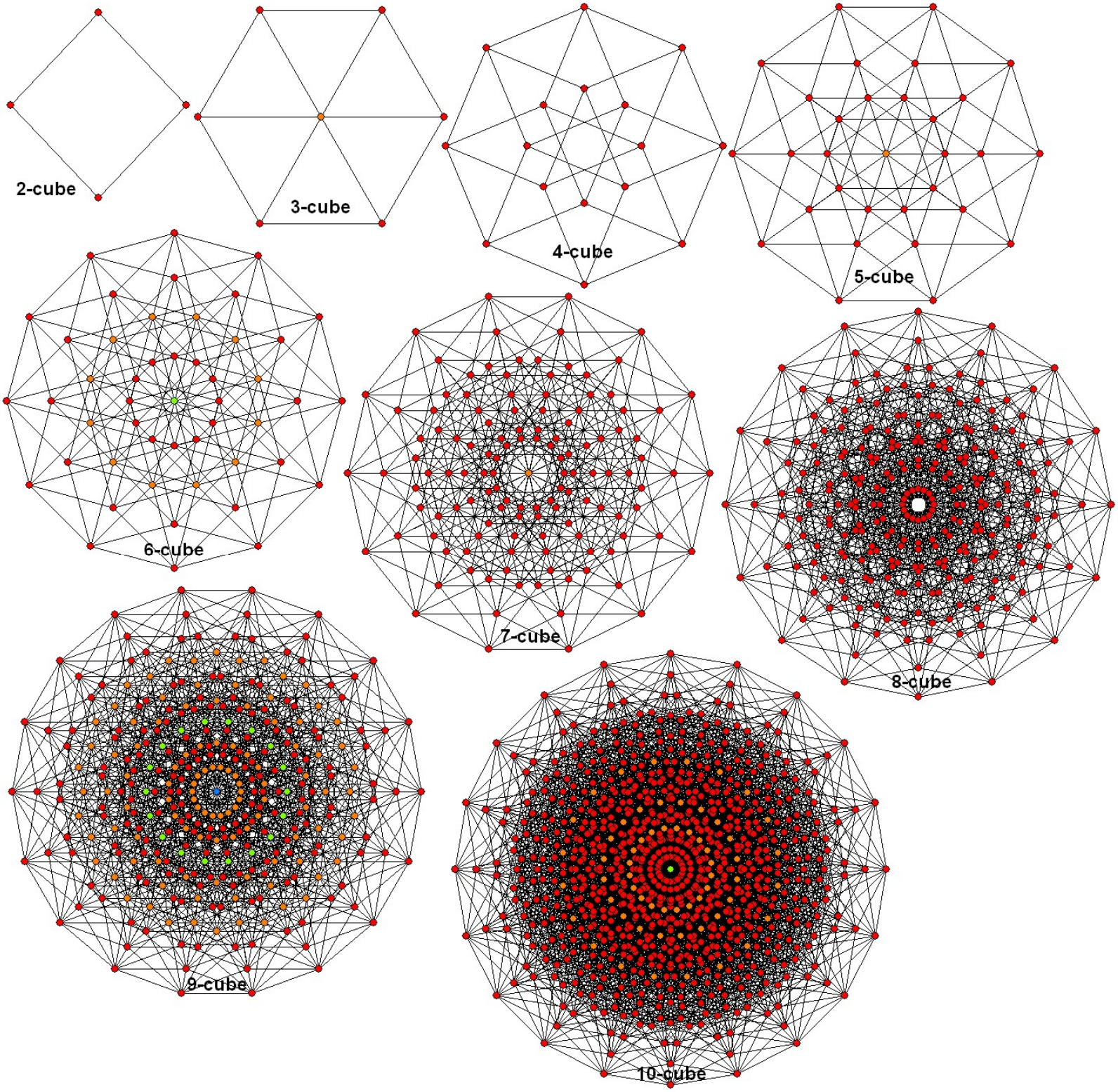
Inspired by the complex designs of nature, Emeagwali used geometry to prove that bees use the most efficient method possible to construct their honeycombs. He reasoned that a computer based on the honeycomb design could improve efficiency. It did. His design breakthrough allowed 65,000 processors working together to perform the world's fastest computation at 3.1 billion calculations per second.

That was three times the speed of the fastest supercomputers of the day – at one-fifth the cost.

Today, he is pushing the limits of computing and networking even further. Dr. Emeagwali's inventions have helped improve yields from oil reservoirs as well as the accuracy of weather forecasting.

He is also working on developing supercomputers powerful enough to simulate weather trends over a century to investigate atmospheric warming.

EDS applauds Dr. Emeagwali and all those who are harnessing the power of information to improve life for millions. Without their work, we couldn't do ours.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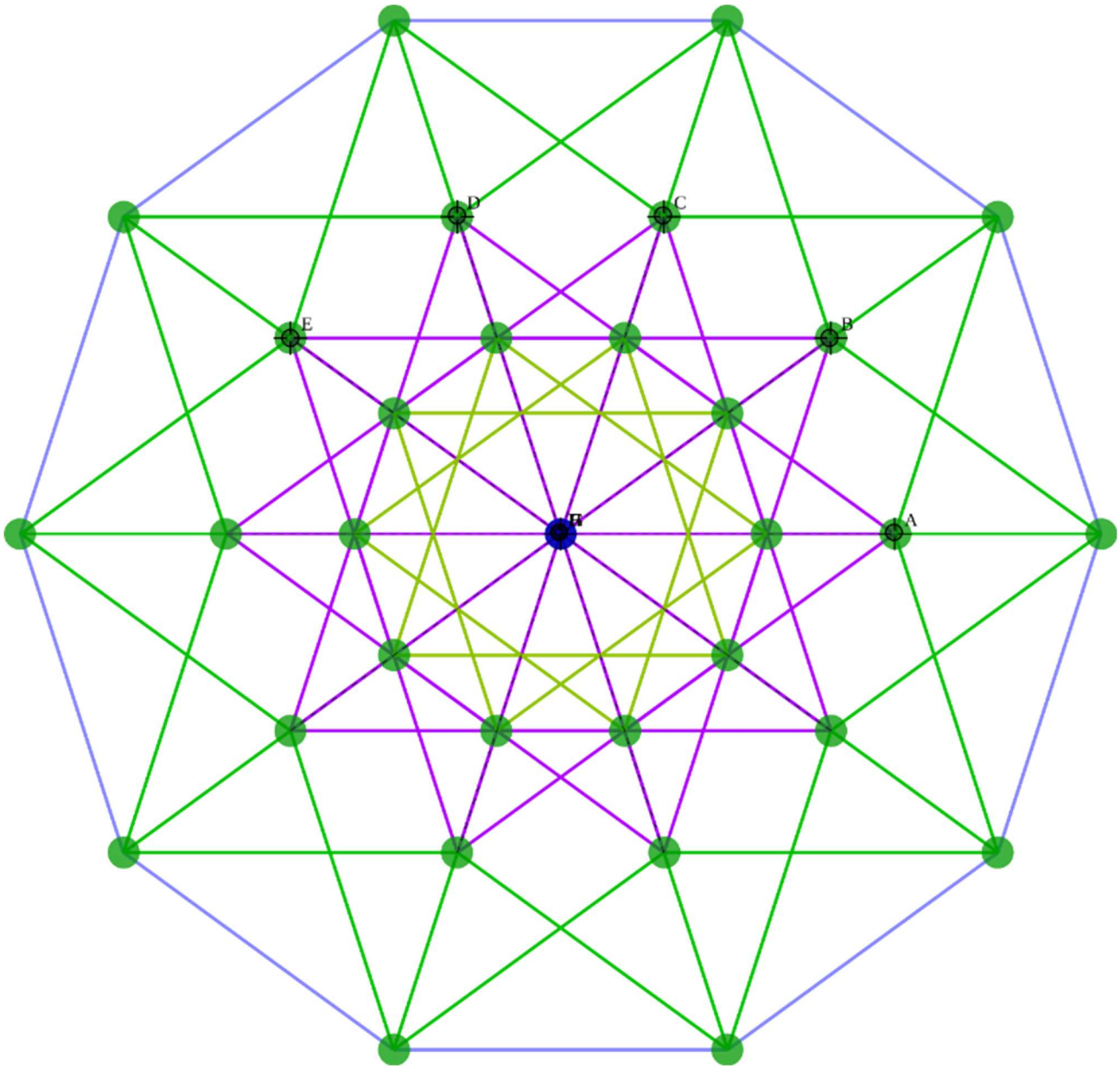
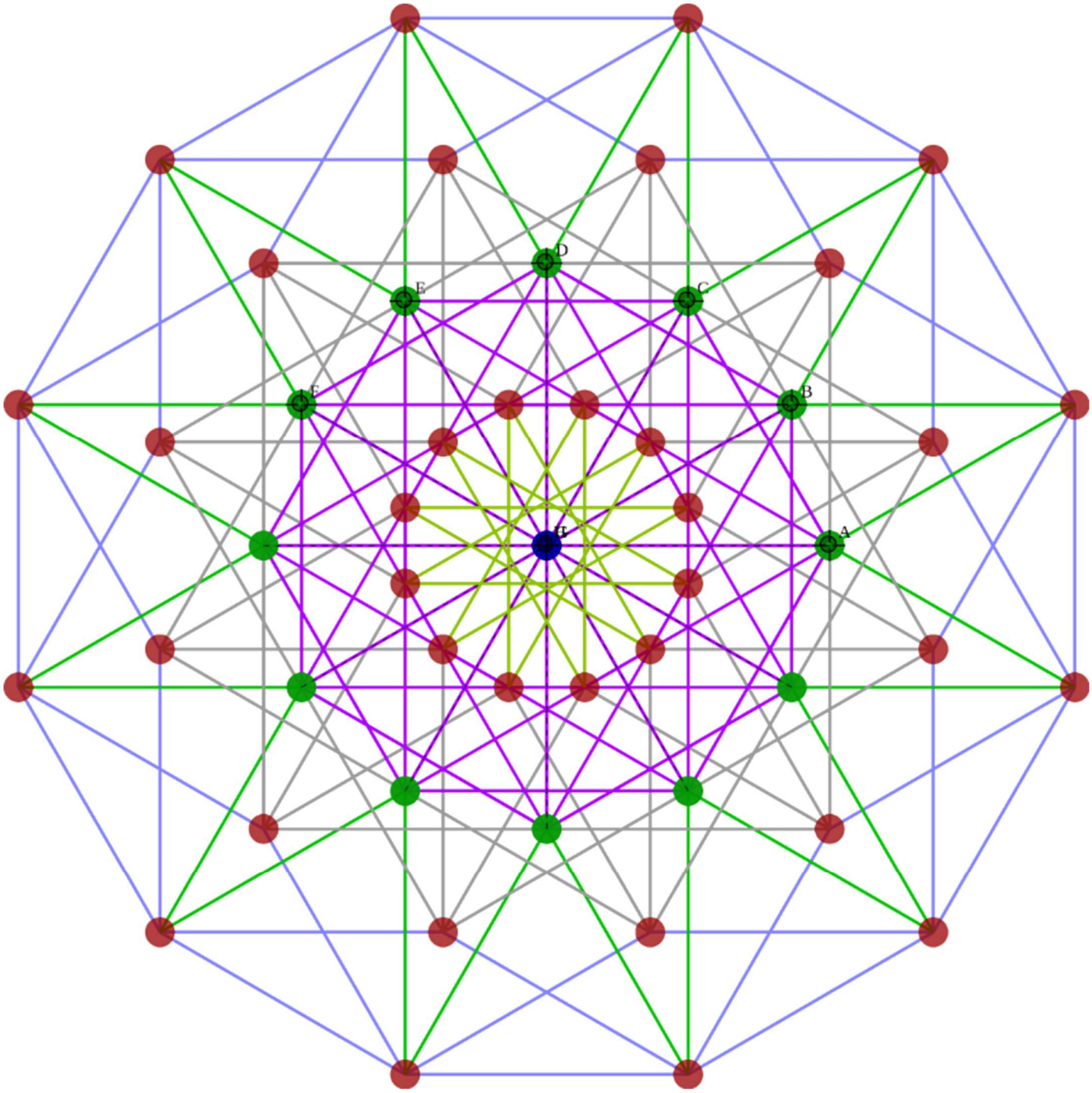
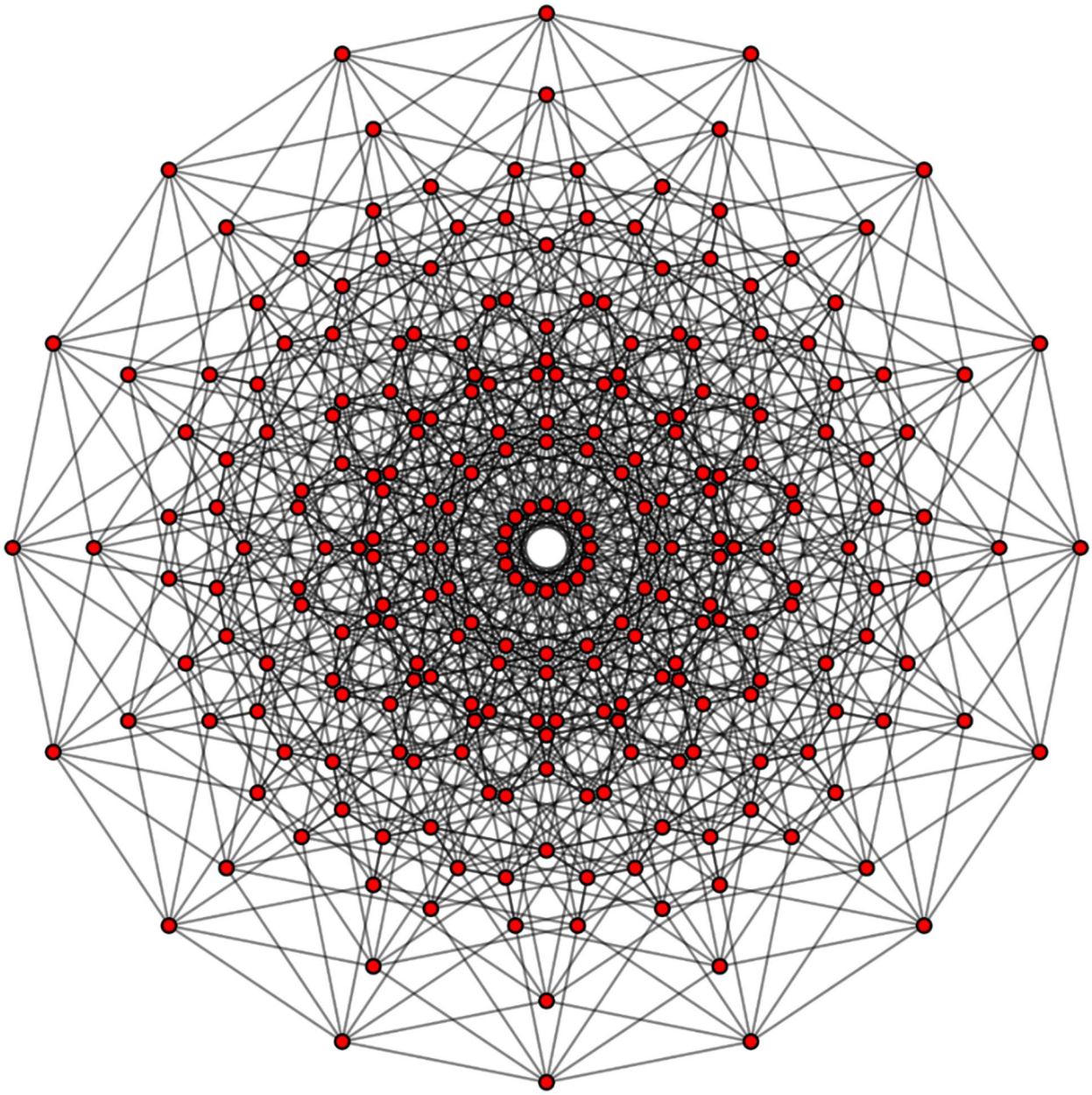


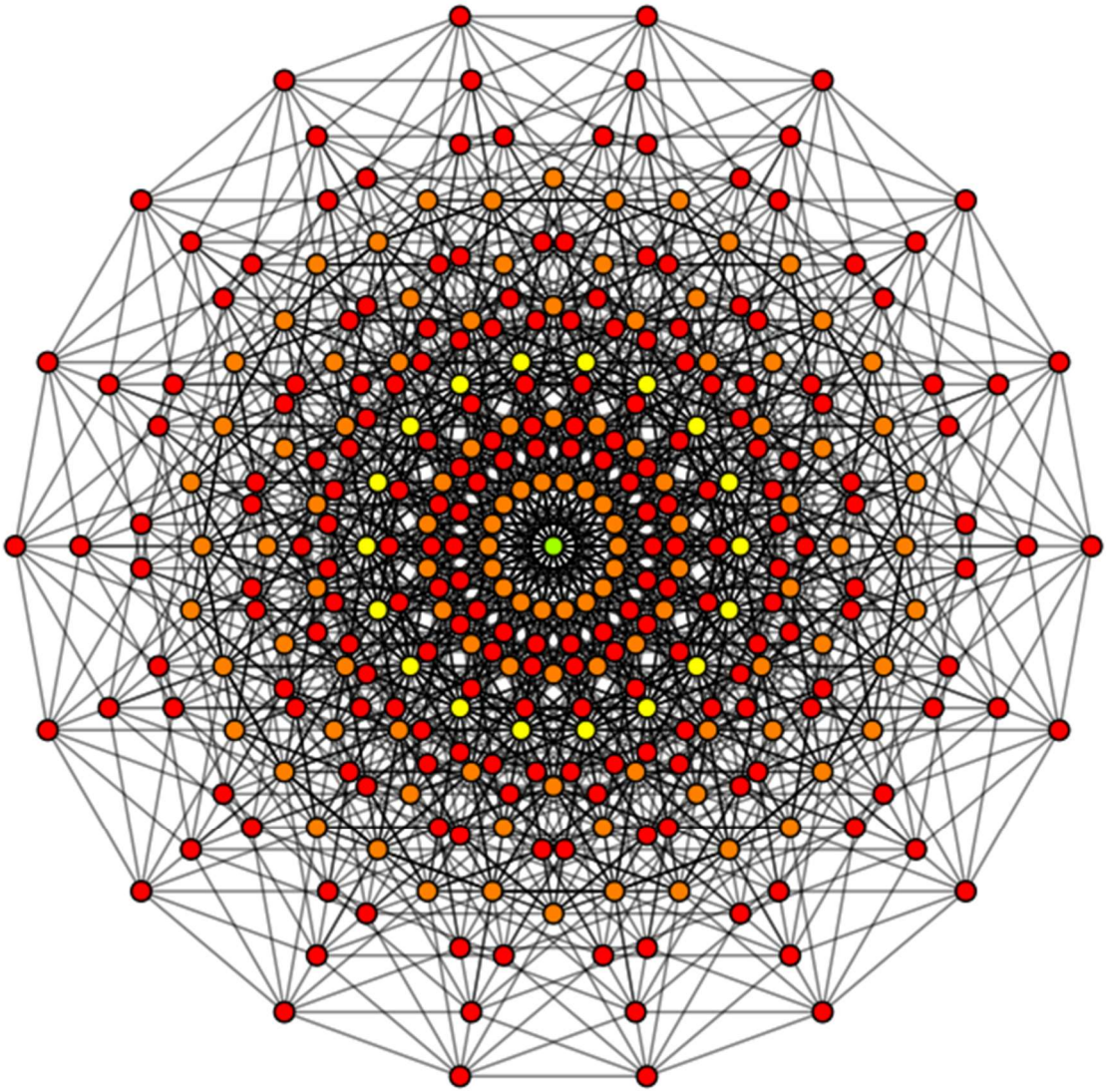
The lines and red dots represent the email paths and 32 computers within a global network of two-to-power five computers, as visualized, theorized, and experimentally programmed by Philip Emeagwali.



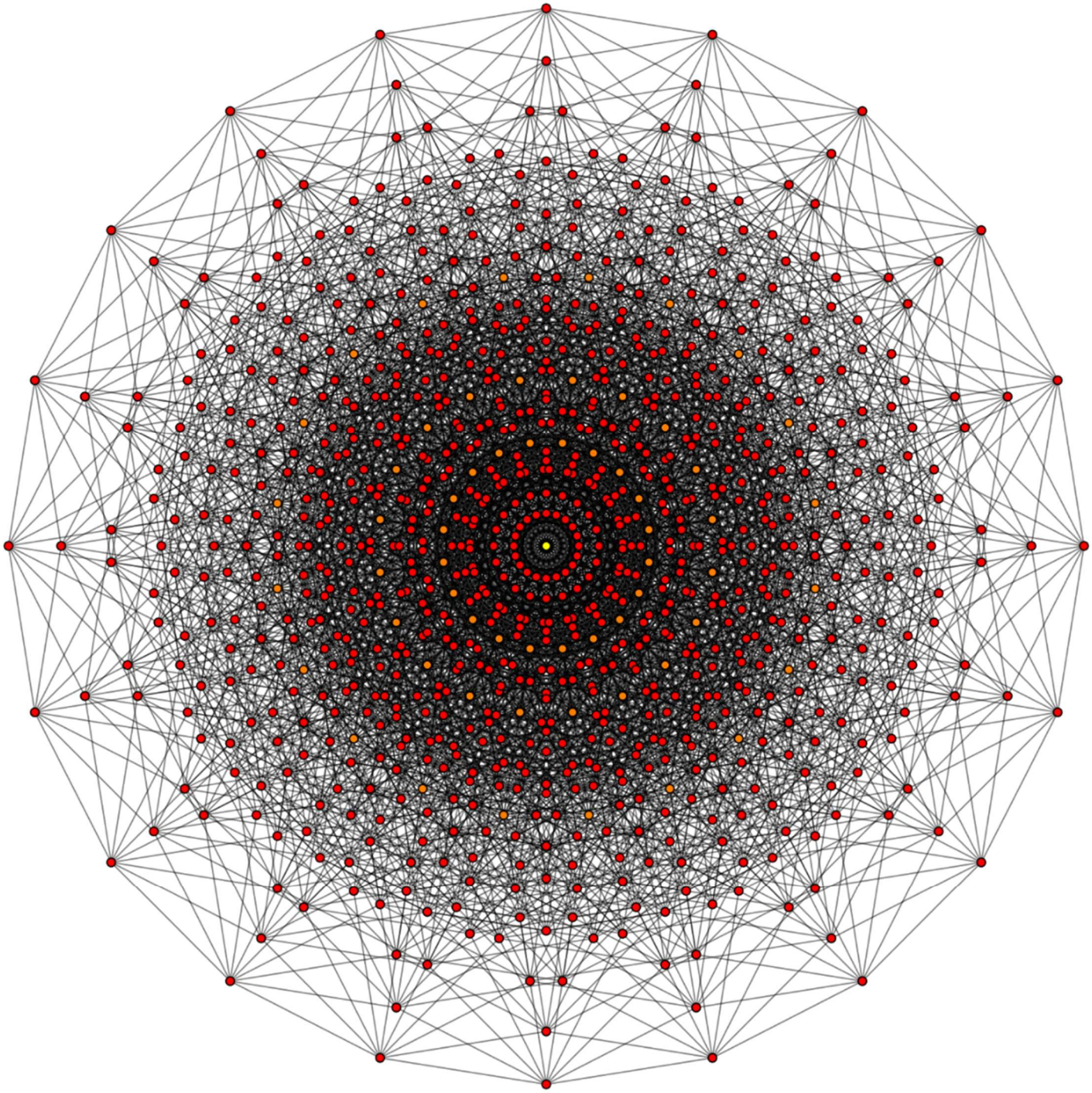
The lines and red dots represent the email paths and 64 computers within a global network of two-to-power six computers, as visualized, theorized, and experimentally programmed by Philip Emeagwali.



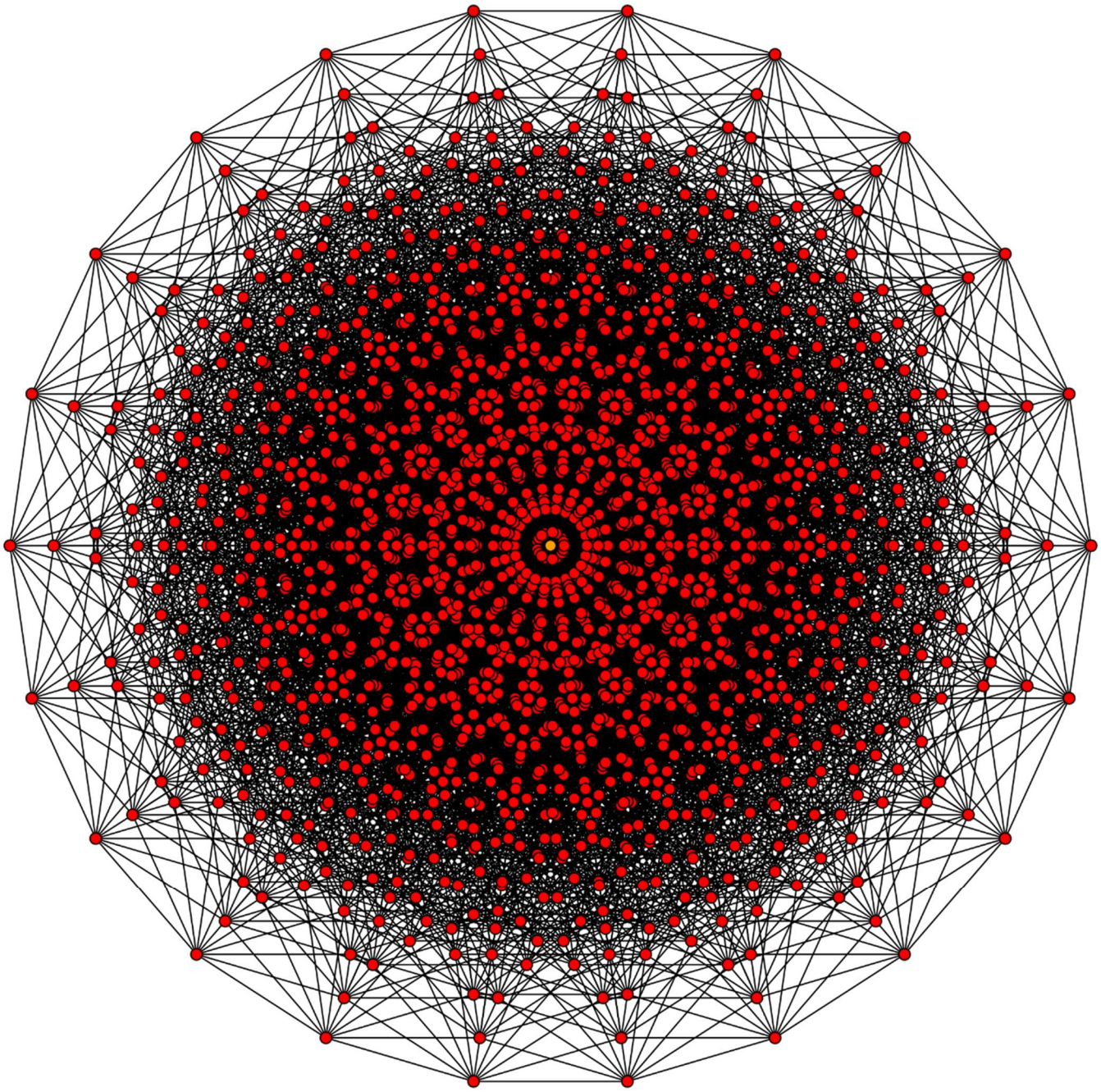
The lines and red dots represent the email paths and 256 computers within a global network of two-to-power eight computers, as visualized, theorized, and experimentally programmed by Philip Emeagwali.



The lines and red dots represent the email paths and 512 computers within a global network of two-to-power nine computers, as visualized, theorized, and experimentally programmed by Philip Emeagwali.

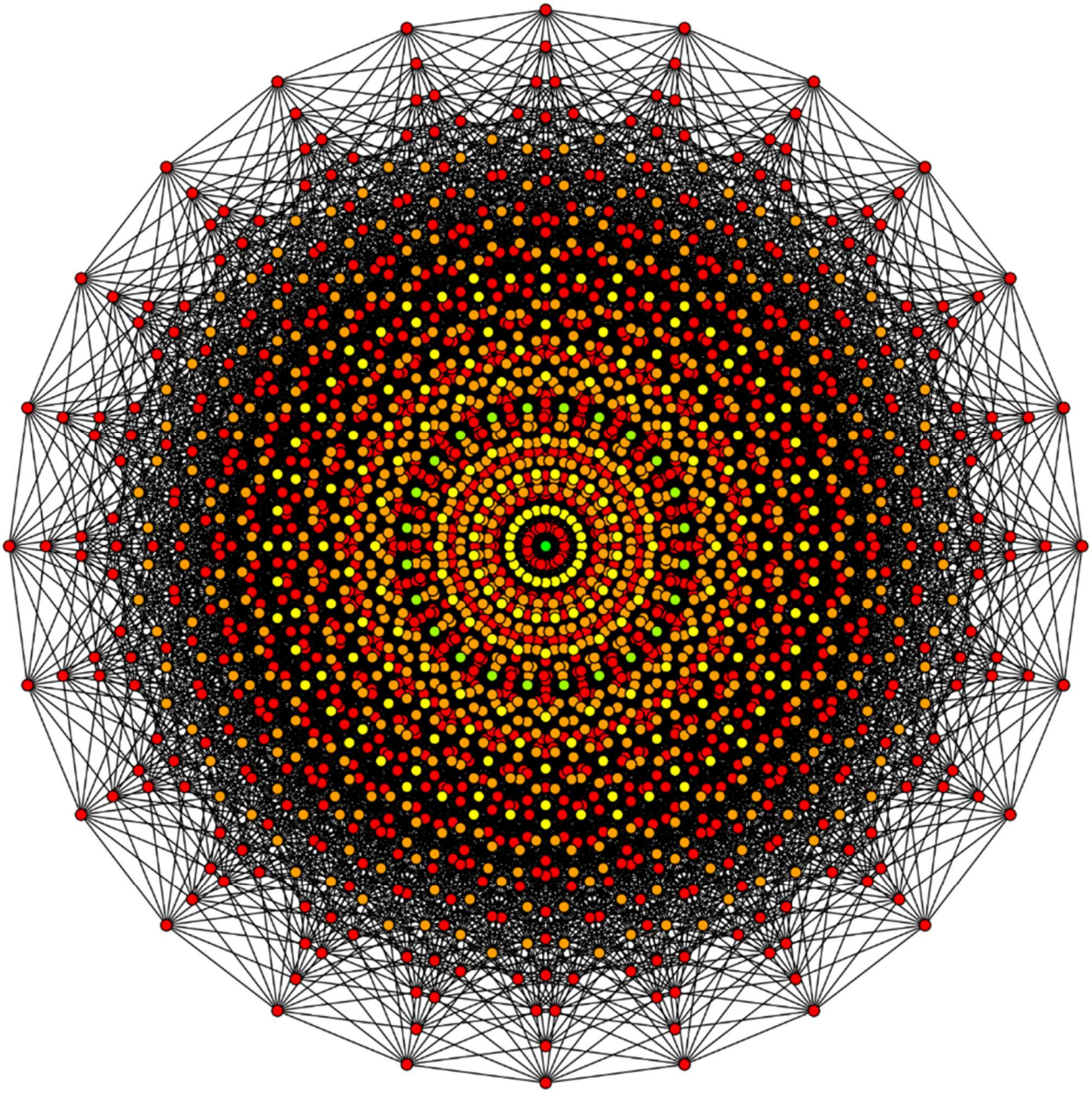


The lines and red dots represent the email paths and 1,024 computers within a global network of two-to-power ten computers, as visualized, theorized, and experimentally programmed by Philip Emeagwali.



The lines and red dots represent the email paths and 2,048 computers within a global network of two-to-power eleven computers, as visualized, theorized, and experimentally programmed by Philip Emeagwali.

The geometric positions of the computers did not affect the total speed of the computational physics. The topological positions affect the speed of the computational physics. For global circulation modeling for global warming, the grand challenge initial-boundary value problem can be visualized as a planet-sized global network of 65,536 computers positioned on the two-dimensional ground of a soccer stadium.

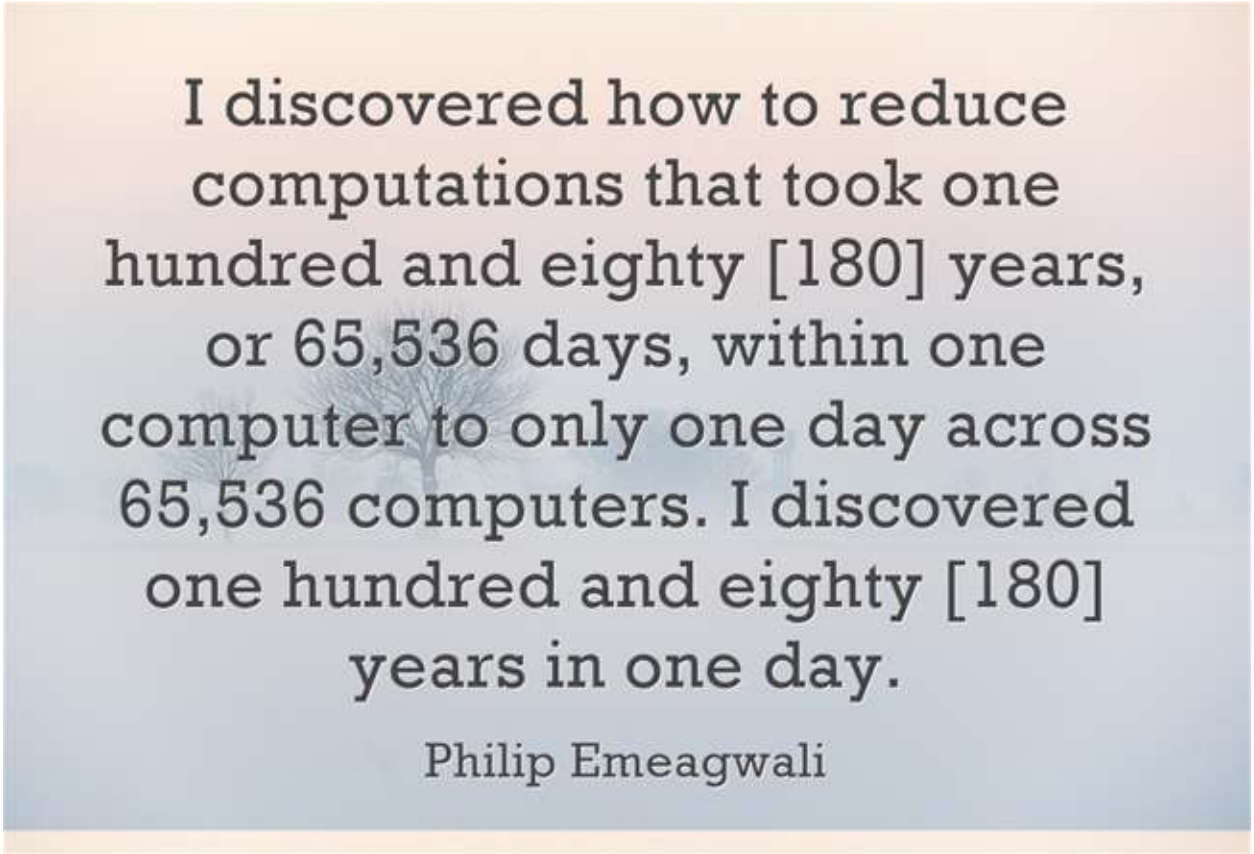


The lines and red dots represent the email paths and 4,096 computers within a global network of two-to-power twelve computers, as visualized, theorized, and experimentally programmed by Philip Emeagwali.

Twelve dimensional email pathways with 4096, or two-to-power twelve, computers that were visualized as equal distances apart on the eleven-dimensional hypersurface of a hyper-globe in twelve-dimensional hyperspace.

I discovered how to reduce computations that took one hundred and eighty [180] years, or 65,536 days, within one computer
to only one day across 65,536 computers. I discovered
one hundred and eighty [180] years in one day. I discovered a supercomputer that is a global network of 65,536 computers, or an internet.

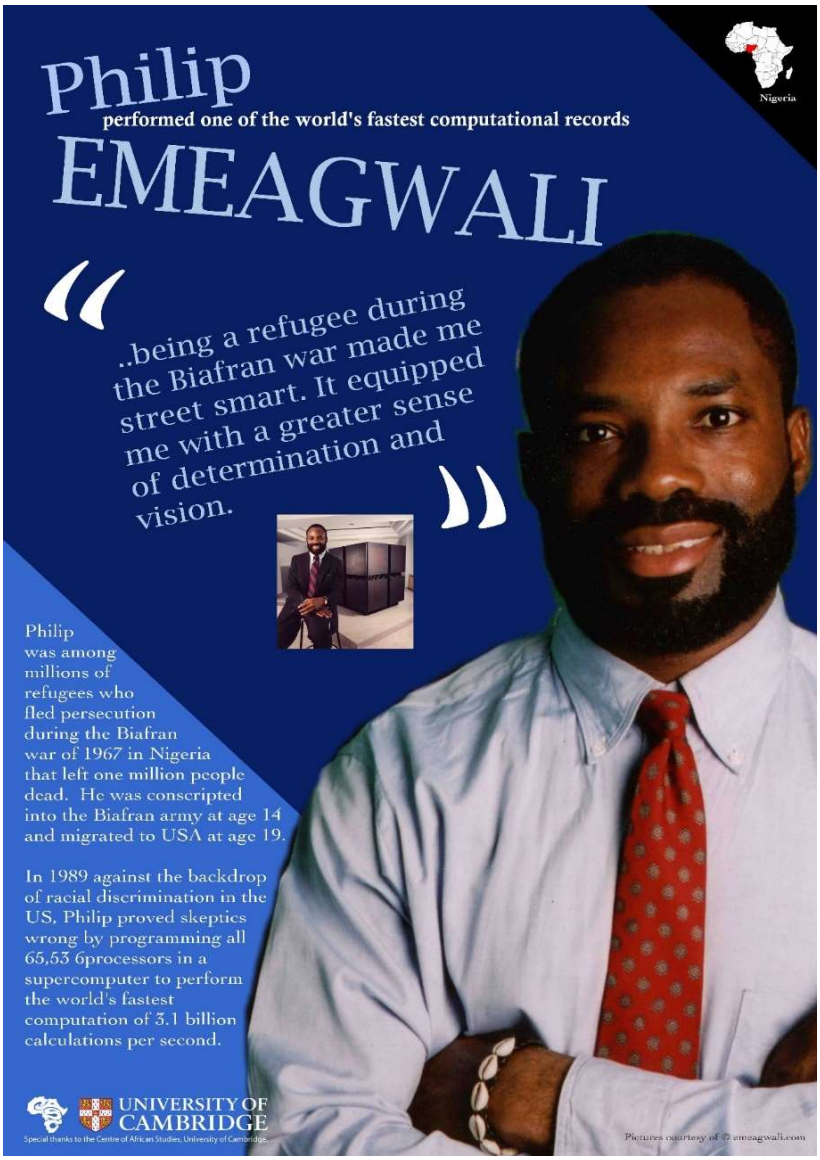
- Philip Emeagwali



Philip Emeagwali discovered how to reduce heavy-duty computations that took one hundred and eighty [180] years, or 65,536 days, within one computer to only one day across 65,536 computers.

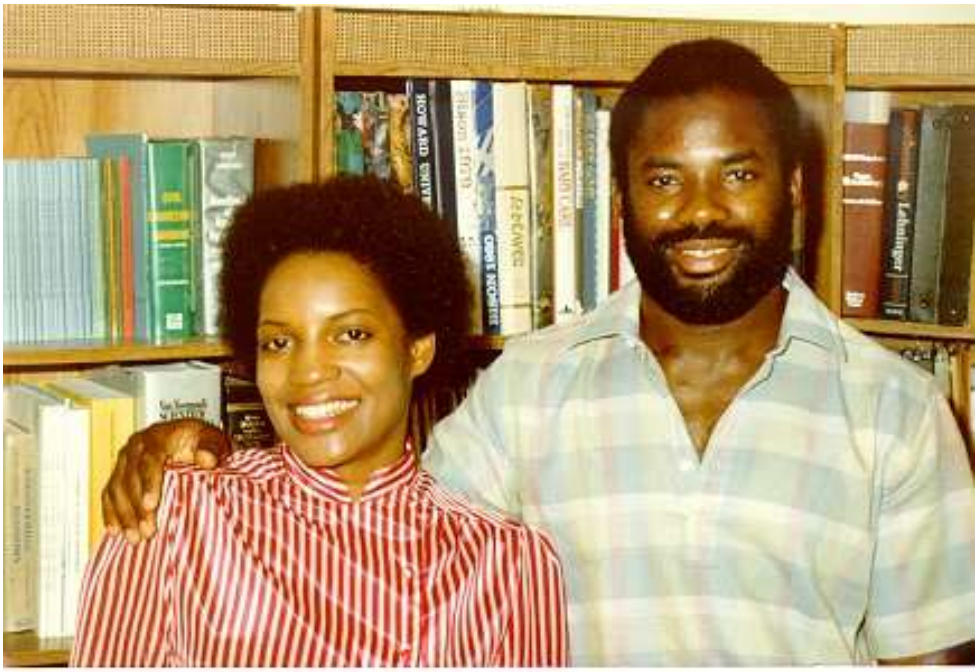
Philip Emeagwali discovered

one hundred and eighty (180) years in one day....



The BBC television hailed Philip Emeagwali as a “digital giant.”

http://news.bbc.co.uk/2/hi/in_depth/sci_tech/digital_giants/8561413.stm



Dale and Philip Emeagwali
(Silver Spring, Maryland. Circa December 1983)

The Philadelphia Inquirer

Friday, February 26, 1999

He's an intellectual inspiration

Philip Emeagwali spurns the title of genius. Nurturing is the key, he told Willingboro parents.

By David Cho
INQUIRER SUBURBAN STAFF

WILLINGBORO — Philip Emeagwali, a man of immeasurably high intelligence, spurns the description people most often attach to him: genius.

"I don't like that term. People think it only means genius in the mathematical sense or that it refers to a select group of people," Emeagwali, 44, told about 50 parents last night at a public forum on schools. "But I think every one of us has the power to be a genuis. I was not born a genius; it was nurtured in me by my father."

When he was 10, growing up in western Nigeria, Emeagwali was drilled daily by his father to solve 100 math problems in one hour. There was no time to write solutions on paper — he had 36 seconds per problem. So Emeagwali did them in his head.

"People later called me a mathematical genuis, but you would be a genuis, too, if you had to do 100 math problems in an hour," he said.

In the last two days, the man who has been called "one of the greatest intellectual giants Africa has produced" has been taking his message — the importance of homework, cultivating encouragement at home, and surmounting obstacles — to a school district that has been mired in problems.

Standardized test scores here sank to such lows in recent years that the state placed the district in a special monitoring program. And even as the roofs of the town's school buildings crumbled, taxes soared.

Not that Emeagwali didn't have his own trials to overcome.

When he was 12, Emeagwali lived underneath ceilings that crumbled from rocket shells. From 1967 to 1970, Nigeria fell into civil war, forcing schools to close. Emeagwali had finished only seventh grade.

"We ate only once a day. Some days we had nothing to eat. We were among the poorest families in the world," Emeagwali told students at a high school assembly earlier in the day. "Growing up poor and overcoming several obstacles made me a stronger person. I became more determined to succeed in life."

Studying on his own from 6 a.m. to midnight, Emeagwali passed entrance examinations to the University of London with top grades. In 1974, he immigrated to the United States, obtaining degrees in several subjects. His parents and eight younger brothers and sisters followed him to America.

Since then, Emeagwali, whose IQ is too high to be measured on conventional tests, has put together a resume that extends like the decimals of pi. He is listed in Who's Who in the World and Who's Who in America. He has won numerous awards, including the Gordon Bell Prize — computer science's Nobel Prize. He devised ways of making oil fields more productive, saving the United States hundreds of millions of dollars a year. His inventions include the world's fastest computer, which in 1989 computed 3.1 billion calculations in one second.

He is now setting up a consulting firm in Baltimore, whose services are wanted by everybody from the United Nations to telecommunications firms.

While this was only his third speaking engagement in schools, students in Willingboro gave an enthusiastic response to his message, mobbing him with questions and requests for autographs after his speech. He is scheduled to speak at Willingboro's Bookbinder and Pennypacker Park Elementary Schools today.

Emeagwali came to Willingboro after Robert Matthews Jr., a sixth grader at Garfield East Elementary School, asked him, via e-mail, to speak at his school. Matthews had been assigned to do a report on an African American scientist for Black History Month.

School administrators then asked Emeagwali to speak to parents at a public forum, which was scheduled for last night. Draped in a sky-blue North African robe and cap, Emeagwali stood out in an otherwise formally suited crowd.

"Genius is not beyond the reach of these students," he told the parents. "You just need to show them how to tap into the genius that lies within them."

One of Our Great Minds of the Information Age

BY PRESIDENT BILL CLINTON

https://www.youtube.com/watch?v=Z0uzicpb1Is

"One of the great minds of the Information Age is a Nigerian American named Philip Emeagwali.

He had to leave school
because his parents
couldn't pay the fees.
He lived in a refugee camp
during your civil war.
He won a scholarship
to university and went on
to invent a formula
that lets computers make
3.1 billion calculations
per second. (Applause.)

Some people call him

the Bill Gates of Africa.

(*Laughter and applause.*)

But what I want to say

to you is there is

another Philip Emeagwali

-- or hundreds of them --

or thousands of them

-- growing up in Nigeria today.

I thought about it

when I was driving in

from the airport and
then driving around
to my appointments,
looking into the face
of children.
You never know
what potential
is in their mind and
in their heart;
what imagination they have;
what they have already
thought of and

dreamed of

that may be locked in

because they don't have

the means to take it out.

That's really what education is.

It's our responsibility

to make sure

all your children

have the chance

to live their dreams

so that

you don't miss

the benefit

of their contributions and

neither does the rest of the world."

Philip and Dale Emeagwali, March 2001

TIME

Reprinted from the archives of TIME magazine:
http://web.archive.org/web/20110311160315/http://www.time.com/time/2007/blackhistmth/bios/04.html

TIME

PHILIP EMEAGWALI: A Calculating Move

Friday, Jan. 12, 2007

PHILIP EMEAGWALI, A CALCULATING MOVE

By Madison Gray

http://content.time.com/time/specials/packages/article/0,28804,1963424_1963480_1963457,00.html

It's hard to say who invented the Internet. There were many mathematicians and scientists who contributed to its development; computers were sending signals to each other as early as the 1950s. But the Web owes much of its existence to Philip Emeagwali, a math whiz who came up with the formula for allowing a large number of computers to communicate at once.

Emeagwali was born to a poor family in Akure, Nigeria, in 1954. Despite his brain for math, he had to drop out of school because his family, who had become war refugees, could no longer afford to send him. As a young man, he earned a general education certificate from the University of London and later degrees from George Washington University and the University of Maryland, as well as a doctoral fellowship from the University of Michigan.

At Michigan, he participated in the scientific community's debate on how to simulate the detection of oil reservoirs using a supercomputer. Growing up in an oil-rich nation and understanding how oil is drilled, Emeagwali decided to use this problem as the subject of his doctoral dissertation. Borrowing an idea from a science fiction story about predicting the weather, Emeagwali decided that rather than using 8 expensive supercomputers he would employ thousands of microprocessors to do the computation.

The only step left was to find 8 machines and connect them. (Remember, it was the 80s.) Through research, he found a machine called the Connection Machine at the Los Alamos National Laboratory, which had sat unused after scientists had given up on figuring out how to make it simulate nuclear explosions. The machine was designed to run 65,536 interconnected microprocessors. In 1987, he applied for and was given permission to use the machine, and remotely from his Ann Arbor, Michigan, location he set the parameters and ran his program. In addition to correctly computing the amount of oil in the simulated reservoir, the machine was able to perform 3.1 billion calculations per second.

The crux of the discovery was that Emeagwali had programmed each of the microprocessors to talk to six neighboring microprocessors at the same time.

The success of this record-breaking experiment meant that there was now a practical and inexpensive way to use machines like this to speak to each other all over the world. Within a few years, the oil industry had seized upon this idea, then called the Hyperball International Network creating a virtual world wide web of ultrafast digital communication.

The discovery earned him the Institute of Electronics and Electrical Engineers' Gordon Bell Prize in 1989, considered the Nobel Prize of computing, and he was later hailed as one of the fathers of the Internet. Since then, he has won more than 100 prizes for his work and Apple computer has used his microprocessor technology in their Power Mac G4 model. Today he lives in Washington with his wife and son.

"The Internet as we know it today did not cross my mind," Emeagwali told TIME. "I was hypothesizing a planetary-sized supercomputer and, broadly speaking, my focus was on how the present creates the future and how our image of the future inspires the present."

Dale, Ijeoma and Philip Emeagwali (MIT, Cambridge, MA, June 8, 2012). Ijeoma works at Google.

"True innovators understand that the technique of the calculus is not isolated from the technology of the computer, which is a tool for solving problems in physics. The innovator's knowledge of all three subjects is part of a connected whole." Philip Emeagwali [April 26, 2010, Geneva, Switzerland]

NATURE'S OWN NUMBERS MAN


Gas trumps oil at COP21

Ecuador in fresh push for investment

upstream

THE INTERNATIONAL OIL & GAS NEWSPAPER

Drillers take aim at Total job in Brazil

Round delay

Gomez costs

Hess to exit China

US INDEPENDENT Hess set to abandon unconventional effort in China. Pages 2&3

Cairn in court

Tullow success

$37.31

Statoil pauses at Sverdrup

Mexico draws in bidders

Dozens of players pitch for onshore blocks.

BEST IN CHINA AND LEADING IN THE WORLD

www.chinasws.com

Published **27 January 1997**

Upstream is the weekly, international oil and gas newspaper that covers the most important technological developments.

Upstream is published in Oslo, Norway.

The three-part review of the contributions of Philip Emeagwali to the discovery and recovery of oil and gas is reproduced below.

"The unorthodox innovator has pushed back the boundaries of oilfield science"—*Upstream*

Page 22 UPSTREAM PROFILE 27 January 1997

The awards keep flowing for computer wizard Dr Philip Emeagwali. The unorthodox innovator has pushed back the boundaries of oilfield science but life in America is tainted by 'pervasive racism'

BARRY MORGAN
from Accra

NIGERIAN-born Dr Philip Emeagwali has an enviable reputation in the oil industry for his achievements in computing, gathering a hatful of awards from around the world.

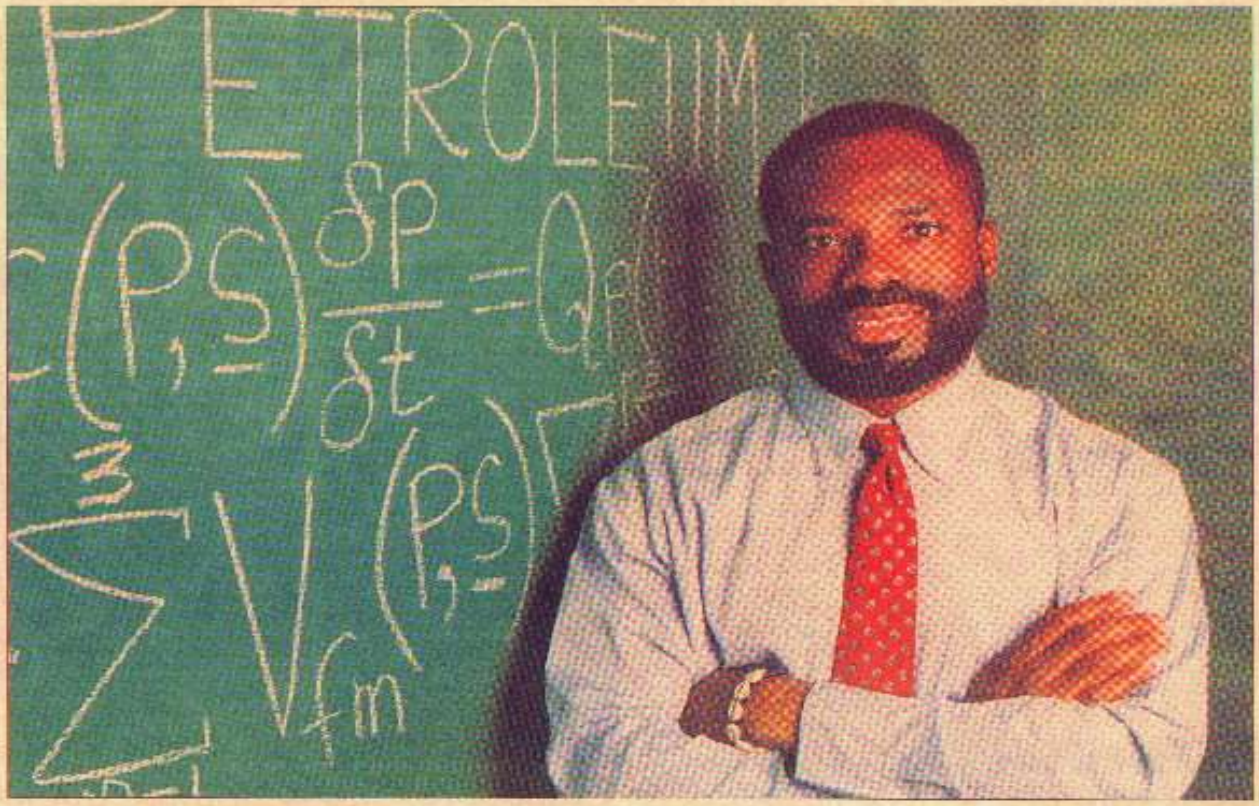
He first shot to fame in 1989 when he won the coveted Gordon Bell Prize for his work with massively parallel computers. He programmed a Cray Connection Machine to compute a world record 3.1 billion calculations per second using 65,536 processors to simulate oil reservoirs.

He has been busy recently on work that could lead to a better understanding of reservoir mechanics and enhance field recovery, and the laurels keep coming.

His home country awarded the Baltimore-based graduate of Michigan University the prestigious 1996 Nigeria Prize, Africa's top scholarly prize, while America's National Society of Black Engineers named him Pioneer of the Year.

At 41, Emeagwali has the aura of a renaissance man and is highly conscious of the example he sets to the younger generation of African American scholars.

"I work very long hours. However, I am not an obsessed scien-



Natural talent: Emeagwali says research and development at the big oil companies is conventional and rational "while my approach is multi-disciplinary, unorthodox, intuitive and nature-inspired"

Nature's own numbers man

Inspiration from hard history

THE DOCTOR and his wife Dale, a fellow academic,

INTERNATIONAL CONGRESS ON INDUSTRIAL AND APPLIED MATHEMATICS

is multi-disciplinary, unorthodox, intuitive and nature-inspired

Nature's own numbers man

Michigan University the prestigious 1996 Nigeria Prize, Africa's top scholarly prize, while America's National Society of Black Engineers named him Pioneer of the Year.

At 41, Emeagwali has the aura of a renaissance man and is highly conscious of the example he sets to the younger generation of African American scholars.

"I work very long hours. However, I am not an obsessed scientist. As long as I am making discoveries I will continue conducting research," he says. "Otherwise I will change to a field that will use some of the transferable skills that I have acquired."

Emeagwali says the oil industry has been progressive in adapting new technologies, noting that one in 10 supercomputers is bought for use in oilfield simulation. "But at the big companies, research and development is conventional, rational and mechanic," he laments, "while my research approach is multi-disciplinary, unorthodox, intuitive and nature-inspired."

He believes oil companies should look beyond their current reservoir simulators. "I will use my nature-inspired study of the evolution of plants over the past 400 million years and the optimised branching structure of trees to design new algorithms and computers that can be used to discover and recover more oil," he says.

Seeing similarities between flow patterns in reservoirs and in the oceans and atmosphere, Emeagwali claims that coming from a low-tech African environment gives him a greater appreciation of the inspiration that can be drawn from nature.

"My new discoveries are so wacky that I might be called crazy. For example, I have found that algorithms, software and computers can be enantiomeric — that is, they have left-handed and right-handed versions like shoes. I would like to apply these ideas to practical problems in the petroleum industry."

He has just formulated a mosaic-like modelling theory for parallel computing along with a new concept for better utilising the fast calculations needed to find and recover more oil.

Emeagwali is proud of his success "as an unorthodox researcher", tying together hard-won expertise in science, mathematics, engineering and computing.

He says of his Cray breakthrough: "Stubborn determination was needed to continue pursuing a line of enquiry which other scientists considered crazy or foolish. No one would collaborate with me or sponsor my work but I refused to give up."

His dogged perseverance paid off. The good doctor will not put a figure on it but was amused by rumours at the time that he was worth $200 million and was the "Bill Gates of Africa".

But Emeagwali would rather be seen pursuing the Nobel Prize than a fat bank account. He sees himself as an innovator. "The new problem-solving approach of designing computer networks by observing and emulating patterns in nature is one that I pioneered. Mine is a logistic and inspirational approach," he says.

He attributes his success to his Igbo background in south-east Nigeria and a "can do" spirit. These are traits he wants to pass on to his young son "who is going to encounter racism in the US which will deny him the opportunity to contribute as much as he can to society.

"I want my son to be inspired by the fact that I was a high school drop-out and ex-refugee who overcame racism and made scientific contributions that benefited mankind."

Making strides in a parallel universe

OIL COMPANIES are now pouring money into massively parallel computers — proof, says Emeagwali, that the technology has broken through initial industry scepticism.

His prize-winning work in 1989 enabled him to develop the first "pseudo-time" approach to reservoir modelling. It proved to the US establishment that "the use of only Dirichlet-type equations in the vicinity of petroleum production wells located near the boundary is better suited to avoid the coning problems caused by the high velocity of converging flows in the vicinity of wells".

The work goes to the heart of a debate that raged in the 1930s over equations governing porous media flow modelling, and which this doughty scientist now sees good reason to revive.

Reservoir models using Darcy's 19th century equations can no longer be held valid near pumping wells with a turbulent flow regime, he claims. He also discovered the analogy between Darcy's equations and geostrophic equations used in weather forecasting, something his industry counterparts still find hard to accept.

Uprooting old models will, he says, be costly and difficult. "Reservoir models have taken hundreds of man years and tens of millions of dollars to construct and it will be impractical to discard them. But they can be modified to incorporate the additional physics used by my new equations." He does not feel his ideas have been under-utilised by the industry and points out that his original goal was simply to demonstrate that massively parallel computers can be used to discover and recover additional oil and gas.

The next challenge, he says, will require a mix of technologies with faster computers that can perform one trillion calculations per second — a feat, Emeagwali predicts, that will be achieved in less than two years.

Inspiration from hard history

THE DOCTOR and his wife Dale, a fellow academic, lead an annual scientific workshop for inner-city youths and he runs a website (http://acm.org/~philip) used as a teaching resource in US classrooms.

The mayor of a Minnesota town appointed him to a Shelter Board, which helps the homeless, and he serves on the board of the African Health Organisation.

Emeagwali was inspired by the 18th century letters of black mathematician Benjamin Banneker to Thomas Jefferson.

He says: "Banneker's amazing mathematical calculations so impressed Jefferson that he was forced to review his opinion of the intellectual capacity of Africans and urged they be freed from slavery."

Emeagwali himself appears to be making a career of overturning conventional wisdom. The scientist is currently researching a book on how the Greeks learned mathematics from Africans.

But despite his successes and evident satisfaction with his professional life, he has strong reservations about "pervasive and deeply ingrained racism" in America.

He says: "The US is one of the worst countries to live in for an ambitious black professional."

I'm the physicist and the mathematician who told a story in which a new technology came alive through three boards: a storyboard, a blackboard, and across motherboards.

The International Congress on Industrial and Applied Mathematics (ICIAM) is the Olympics of applied mathematics. It’s held every four years. Philip Emeagwali was invited to present his system of coupled, nonlinear partial differential and algebraic equations that he solved across a global network of 65,536 computers.

My father and I, followed by my son, broke the tradition of walking in our ancestors' footsteps. My father was a nurse, and my son and I are computer scientists. All three of us abandoned the soil to work in knowledge-based industries.

Fame attracted daily visitors and journalists to the office of Philip Emeagwali. Here he paused for photos. (Courtesy of *Detroit Free Press*, Page 1E, May 29, 1990)

I am the artist that told stories about how the Laws of Motion gave rise to the eternal truths of calculus; timeless truths that will outlast the changing opinions of all times.... and my reinvented algorithms became my fingerprints on the sands of time.

- Philip Emeagwali

My mother married days
after her 14th birthday
and gave birth to me six days
after her 15th birthday.
She was born in colonial
Africa,
in 1939,
where she counted her age
on her fingers and toes
and by her age-grade
affiliation.

- Philip Emeagwali

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after her 14th birthday
and gave birth to me six days
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She was born in colonial Africa,
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- Philip Emeagwali

For countless centuries, my Igbo ancestors were farmers. Sons walked in their father's footsteps, ploughing the same land. Their life expectancy was about 37 years.

Daughters married early, had as many children as they could, and became young widows. My mother married days after her 14th birthday and gave birth to me six days after her 15th birthday. She was born in colonial Africa, where she counted her age on her fingers and toes and by her age-grade affiliation.

- Philip Emeagwali

Transcribed from a lecture delivered by Philip Emeagwali. The video is posted at YouTube.com/emeagwali
The audio is posted at SoundCloud.com/emeagwali

SUMMARY:

The video is posted at emeagwali.com and youtube.com/emeagwali

emeagwali.com
SoundCloud.com/emeagwali
YouTube.com/emeagwali

A ten minute lecture (Transcript)

"Who's Philip Emeagwali?"
I'm the physicist
and the mathematician

who told a story
in which a new technology came alive
through three boards:
a storyboard, a blackboard,
and across motherboards.

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my west African Igbo ancestors
were farmers.
Sons walked in their father's footsteps,
ploughing the same land.
Their life expectancy was about
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My father and I, followed by my son,
broke the tradition of walking
in our ancestors' footsteps.
My father was a nurse, or a nursing scientist,
and my son and I

are computer scientists.
All three of us scientists
abandoned the soil
to work in knowledge-based industries.

I am the artist
that told stories about how
the Laws of Motion of physics
gave rise to the eternal truths of calculus;
timeless truths
that will outlast the changing opinions
of all times....
and my reinvented equations and algorithms
became my fingerprints
on the sands of time.

What is a supercomputer, anyway?

What makes a computer super, anyway?

Once upon a time,

in 1988 to be exact,

the fastest computations in physics

were executed

within only one supercomputer.

In the 1980s, Seymour Cray designed

seventy percent of all supercomputers.

The Cray supercomputers of the 1980s

were powered by

only one extremely fast processor,

dubbed "oxen."

Today, all Cray supercomputers

are powered by thousands of slow processors, dubbed "chickens."

As an aside, the story is told

that back in 1914

Henry Ford

was advised to change the colors of his cars. Henry Ford replied:

"Any customer

can have a car painted any color

that he wants

so long as it is black."

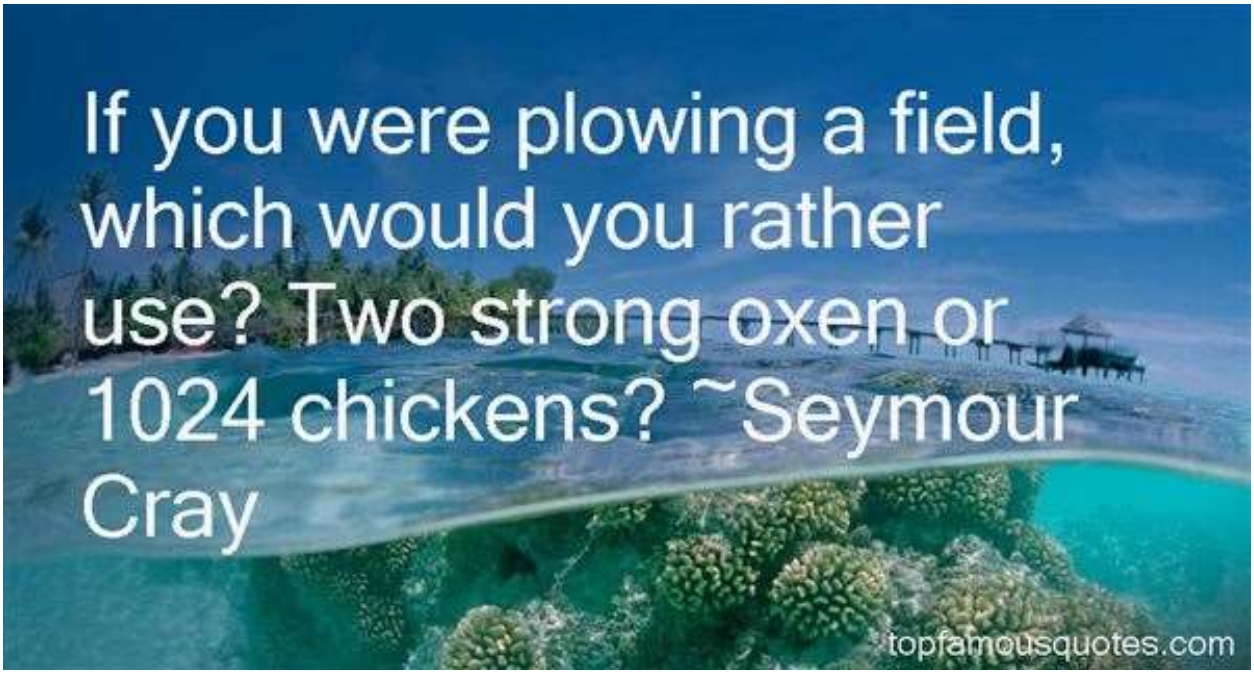
The story is also told that

when Seymour Cray

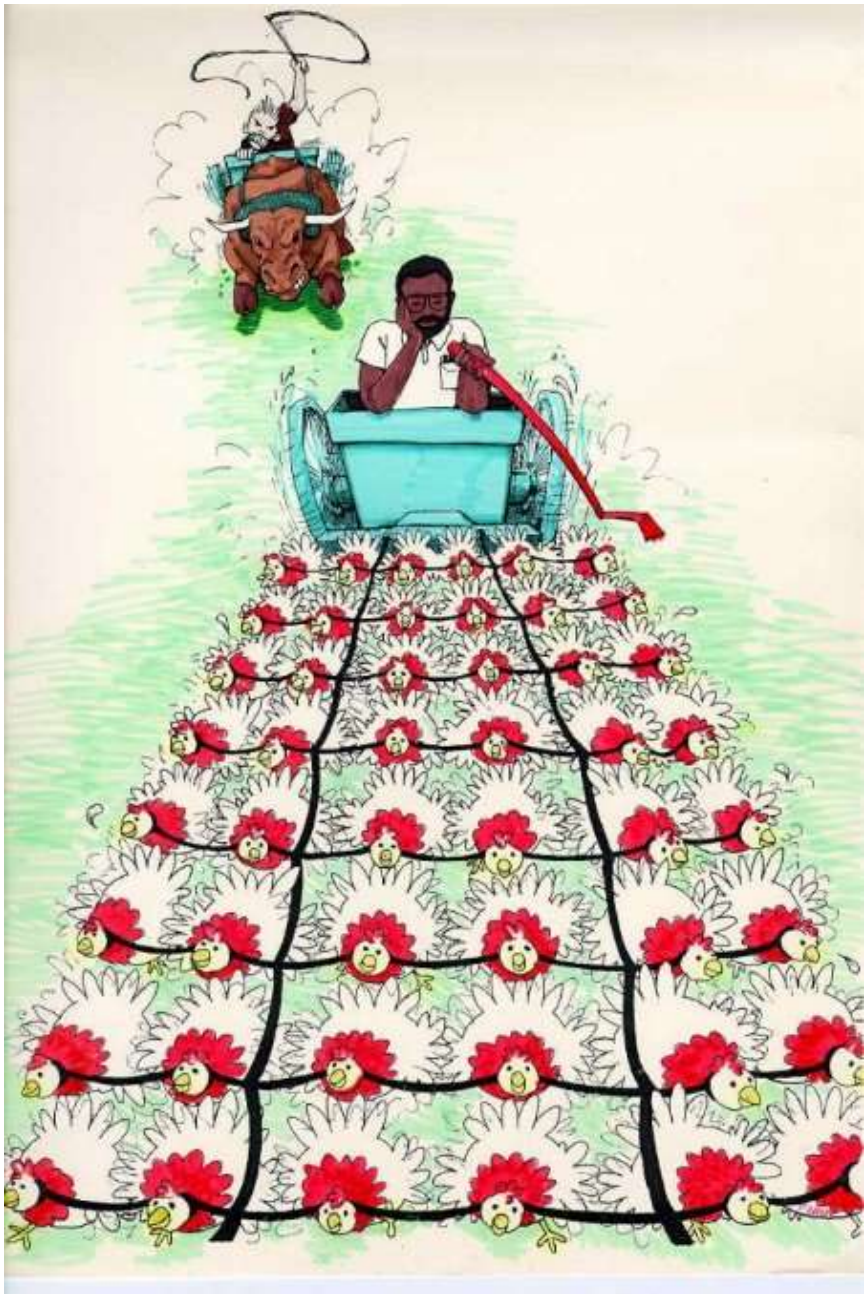
was urged to use several processors

to power his supercomputers,

he retorted:



But there was only one supercomputer
powered by 65,536 "chickens,"
or extremely slow processors.
During the 1980s,
I was the lone wolf 24/7 programmer
of the first and only
65,536-processor powered supercomputer.



I was called "insane"
for spending a decade
on the impossible.
That machine was abandoned because
Amdahl's Law
described in supercomputer textbooks
decreed that
it will forever remain impossible
to achieve a speedup of more than eight
with eight or more processors.
In the November 29, 1989 issue
of *The New York Times* ,

Neil Davenport, the president
of the Cray Computer Corporation
—the sister company to the company that manufactured seven in ten supercomputers—warned,
"We can't find any real progress
in harnessing
the power of thousands of processors."
Cray Research President John Rollwagen
in a UPI (upi.com) article dated September 2, 1985,
described the use of 64 processors as:
“more than we bargained for.”
After it was discovered that

the seemingly impossible is, in fact,

possible,

Nine in ten supercomputers
are used to solve grand challenge problems
in computational physics,
such as recovering petroleum
or foreseeing global warming.

If nine in ten supercomputer cycles

pertained to physics,

then the supercomputer is an instrument of physics.

One in ten supercomputers are used

to discover and recover oil.

The fastest supercomputer

costs up to two billion dollars.

It's powered by more than one million computers.

I discovered

how to use a global network of

65,536 computers

as a supercomputer

that is an internet

to discover and recover more oil and gas,

both offshore and onshore.

In 1989, it made the news headlines that I,

the "African Computer Wizard,"

discovered how to speedup 180 years,

or 65,536 days,

of computations within one computer

to only one day

of computations across a global network of 65,536 computers.

I was the first and lone wolf programmer

because it was then the *terra incognita*

of the fastest recorded computations

in physics.

I wanted to travel uncharted territories
in human knowledge,
and to specifically push the frontiers of calculus

and the fastest computers
and use both as instruments of
the fastest computations
in physics.
My contributions to mathematical physics
is my discovery of thirty-six errors
that corresponded to
thirty-six partial derivative terms
that represented
the components of the temporal
and the convective inertial forces
for the flow of oil, water, and gas
in the temporal and the three spatial
directions.
Those thirty-six mathematical errors
were critical because they occurred
within the nine systems of coupled,
nonlinear partial differential equations.

Those erroneous equations
were used within the petroleum industry
and used for sixty (60) years
to simulate the subterranean motions of
oil, water and gas
from water injection wells
to oil and gas production wells.
I corrected the mathematical error
by balancing the forces so that
Force equals mass times acceleration
at all times and places,
from the storyboard to the blackboard
to the motherboard,
and across motherboards.
I also balanced the systems of differential
and algebraic equations
that arose from the Second Law of Motion

of physics.
A balanced equations yields
more accurate hindcasting
making it easier to extract more oil and gas.

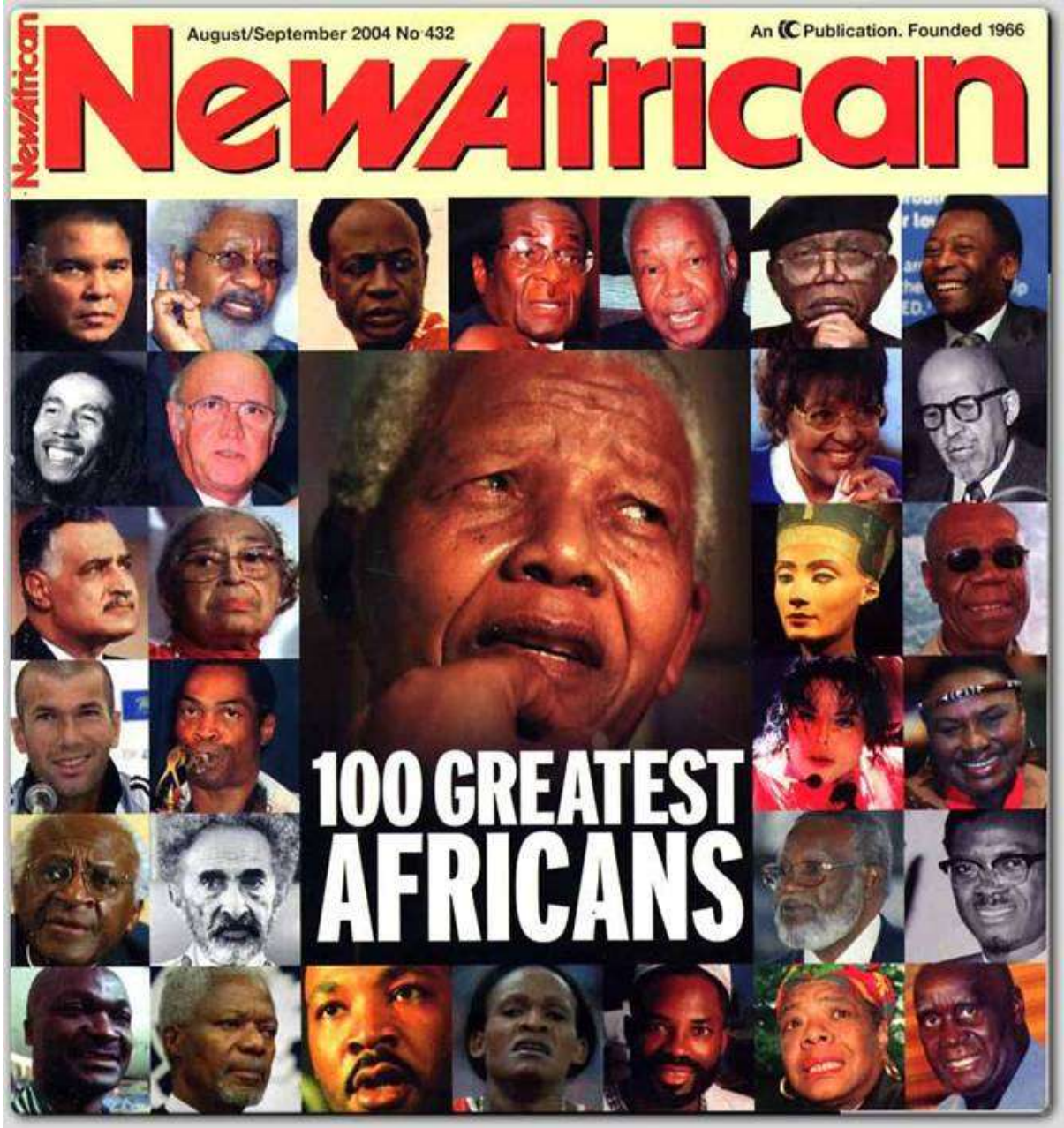
In my search—or re-search—
for new partial differential equations of calculus,
I used the arsenal of rationality
to search for order
within apparent chaos,
to draw analogies
between different phenomena,
to reduce complex systems
to their core essences,
to make a connection
between the laws of physics

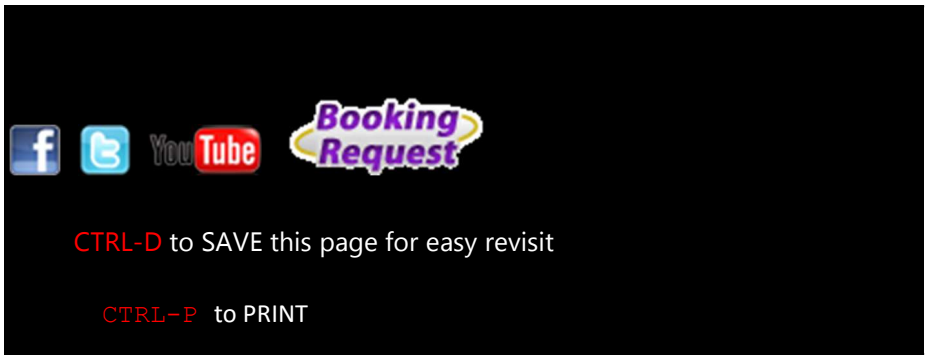
and the partial differential equations of
calculus.
In that theoretical re-search
for new mathematical physics,
I experimentally discovered
how to harness the power of
65,536, or two-to-power sixteen, computers
that were distributed equal distances apart
on the surface of a globe
in the sixteenth dimension.
That is, execute heavy-duty computing
by splitting one grand challenge problem
into 65,536 initial-boundary value problems
and across as many computers.
That discovery
is my contribution to computational physics.

I discovered how to program

a primordial internet
as one cohesive, seamless unit
that emulates one supercomputer
that solves a one computation-intensive
initial-boundary value grand challenge
problem,
such as a global circulation model
that could be used to foresee
unforeseen global warming.
I discovered how to reduce
computations that took
one hundred and eighty (180) years,
or 65,536 days, within one computer
to only one day across
65,536 computers.
I discovered
one hundred and eighty (180) years
in one day....

1,000 pages of transcribed lectures is forthcoming.

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