CODING THE IMPOSSIBLE

Telescoping to the Unknown

Philip Emeagwali

emeagwali.com

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

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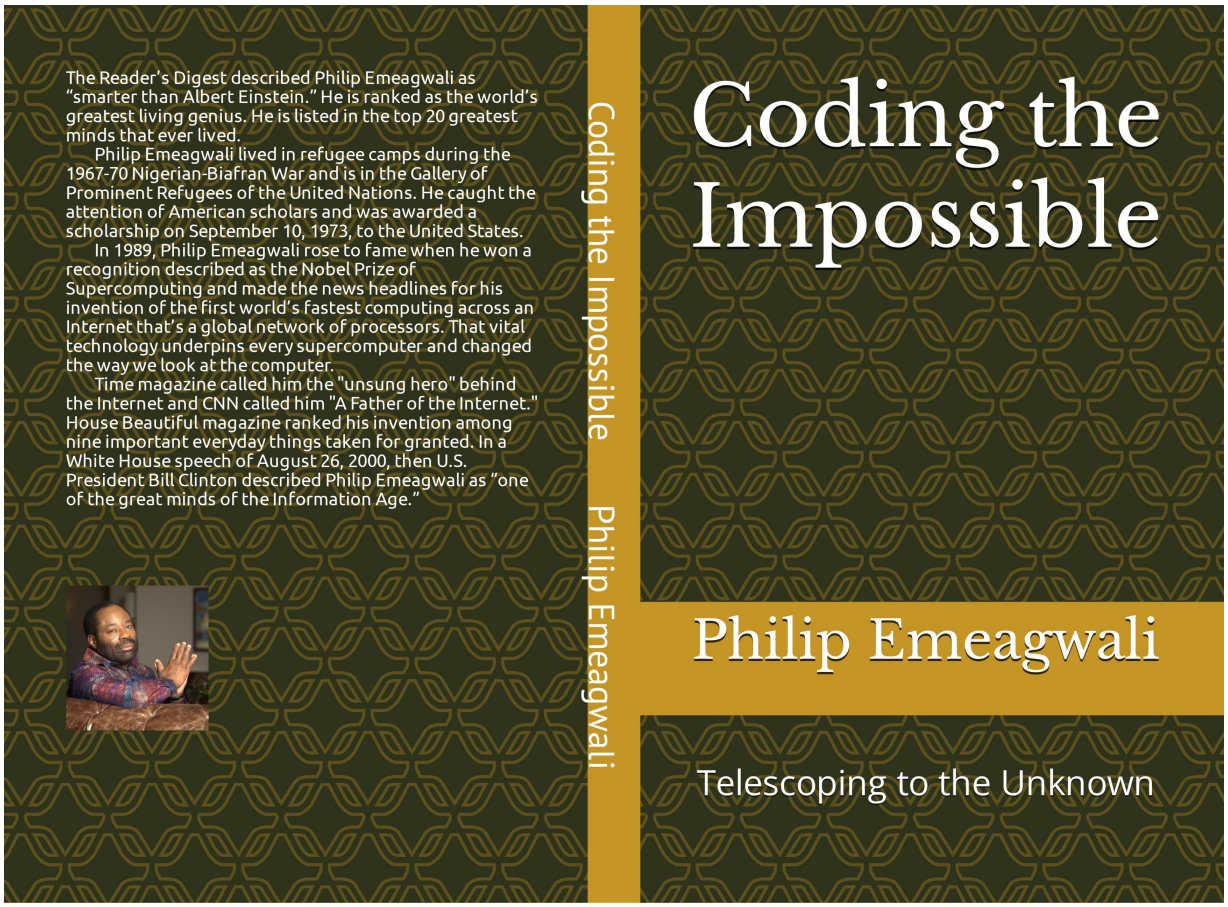

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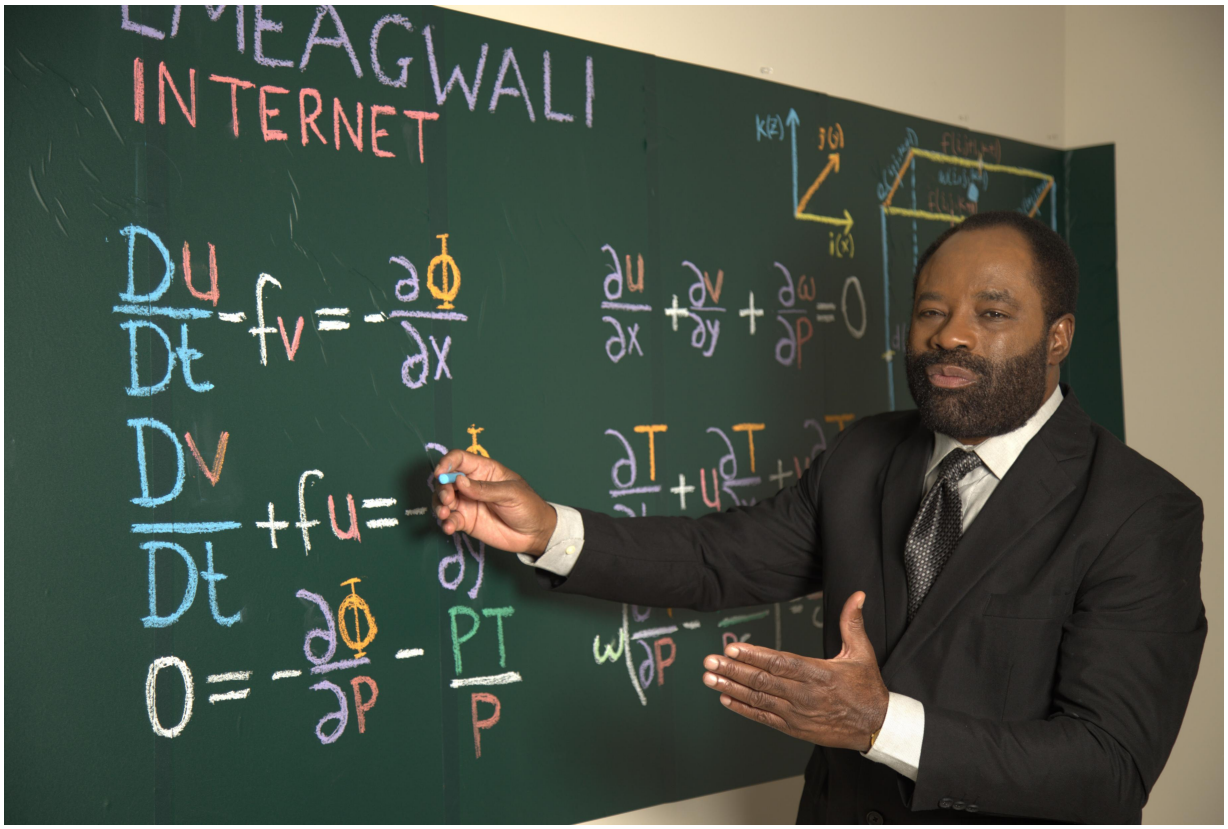

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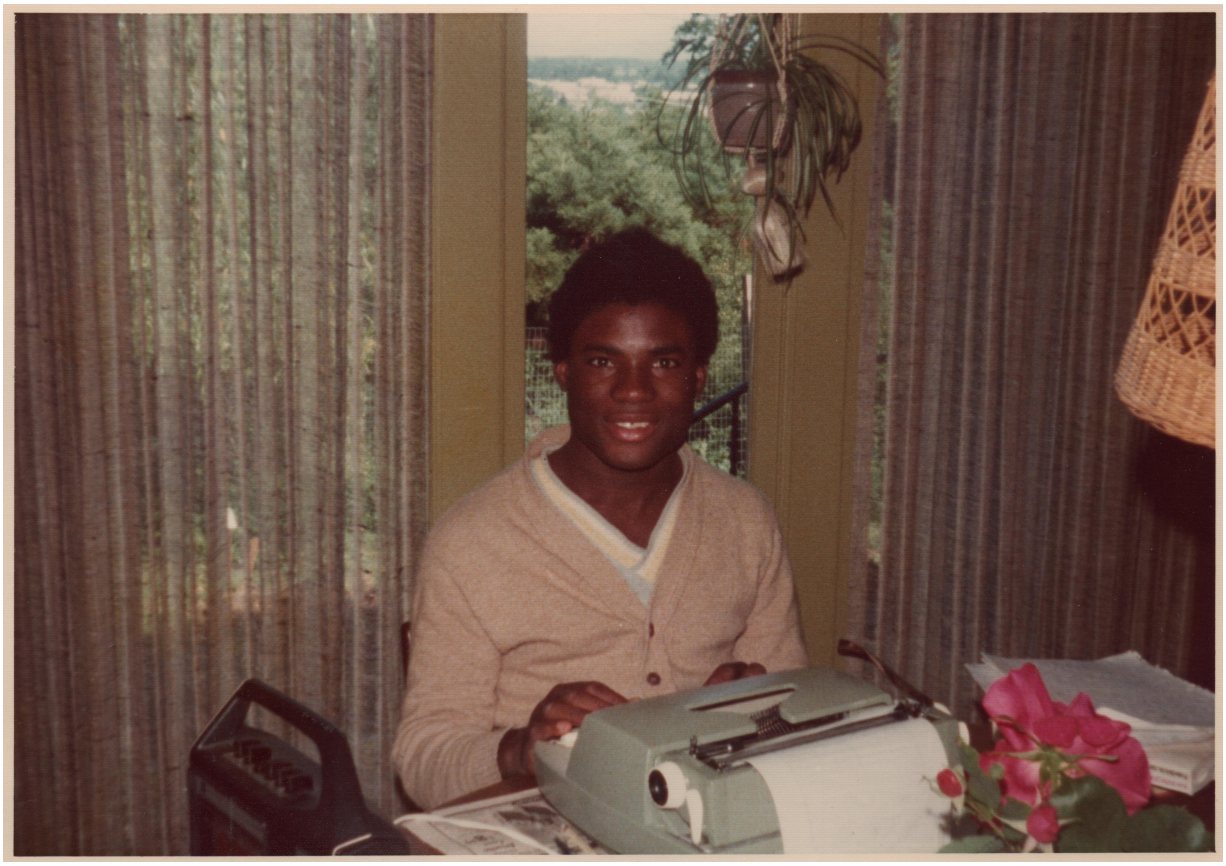
HOW THE FASTEST COMPUTER WAS INVENTED



Philip Emeagwali at 15 Edgewood Way, Corvallis, Oregon, early June 1975.

On June 20, 1974, in Corvallis, Oregon, USA, I began my search for the new knowledge of how off-the-shelf processors could be harnessed and used, in tandem, to create the world's fastest computer. I discovered that such a supercomputer will not be a computer, in and of itself. It will be a new Internet, in reality.

I imagined that new Internet as my new global network of processors that were identical and uniformly distributed across the surface of a globe. But distributed just as computers are distributed around the Earth.

My search for the fastest supercomputer demanded that I begin from the beginning, which is the laws of physics that existed since the Big Bang explosion, or the small singularity, that inflated over the past 13.8 billion years. And inflated to become the present cosmos. In my two-decade long quest, I scourged the history of physics, then of calculus and algebra and mastered the frontiers of knowledge of those three important subjects.

That mastery enabled me to harness the total and maximum supercomputing power of my coupled ensemble of the two-raised-to-power sixteen slowest processors in the world. Those off-the-shelf processors were designed for a mainstream market, rather than for supercomputing. And they were manufactured in large numbers and for a lower price.

My most significant contribution to computer science is this: I discovered that a billion processors can power supercomputers. In an email, a twelve-year-old writing the biographies of great inventors and their inventions asked me: “What is Philip Emeagwali known for?” I’m known for

discovering that up to a billion off-the-shelf processors can power the world's fastest computers.

In the 1980s, I was ridiculed for pursuing the then useless technology of the first world's fastest computing across the slowest processors in the world. But by 1989, I was in the news for discovering fastest computing with slowest processing. After my discovery, vector supercomputer scientists who had ignored me wanted to become my new best friends. That invention of computing with millions of processors put a Black African face in science classrooms. And alongside the faces of Galileo, Isaac Newton, and Albert Einstein.

The Debate on Race and Intelligence

My contribution to computer science was how I chipped away at one of the fundamental assumptions of the myth of white intellectual superiority. Such myths were sincere fictions of the white self. Fictions that only white males, the likes of Albert Einstein, were endowed with the intellect that was needed to make substantial contributions to human knowledge. And to solve the most challenging problems at the frontiers of knowledge of the fields of mathematics, physics, and computer science.

Those sincere fictions legitimized IQ science and white power. Furthermore, those sincere fictions legitimized white

privileges, including favoring the immigration and hiring of Western and Northern European scientists over Black sub-Saharan African scientists. Not only that, those sincere fictions legitimized attacking affirmative action policies that would have produced more African-American supercomputer scientists who could have contributed to making parallel and quantum supercomputers faster.

Over the decades, those sincere fictions became the *status quo*. I discovered the world's fastest computing across the slowest processors in the world and did so on the Fourth of July 1989. Before my discovery, it was assumed that Albert Einstein is more intelligent and more knowledgeable than Philip Emeagwali. The reverse now holds across genius rankings posted on the Internet.

Historically, the Black invention rarely was understood in the racial context it was made. Looking back to June 20, 1974, the day I began programming one of the world's fastest computers that was at 1800 SW Campus Way, Corvallis, Oregon, USA, the toughest part about being a marginalized Black computer scientist was that I was expected to repress my oppressed identity.

As a mathematical physicist, I always knew that the laws of logic and physics are experienced the same way by Black and white persons.

THE WORLD'S FASTEST COMPUTING

The fastest computer is why you know the weather before going outside. In 1974, I conceived the first world's fastest computing across a new ensemble of sixty-four thousand processors. I visualized my new technology as encircling a globe. And doing so just as what we later called the Internet now encircles the Earth. In May 1981, in College Park, Maryland, I embarked on my mathematical quest for how to solve the most compute-intensive problems that needed to be solved on the world's fastest computers.

In 1981, the open mathematical question was this: "Can mathematicians solve an initial-boundary value problem, such as simulating the flows of crude oil, injected water, and natural gas that are buried up to 7.7 miles (or 12.4 kilometers) deep and within an oil producing field that is almost twice the size of the state of Anambra, Nigeria?

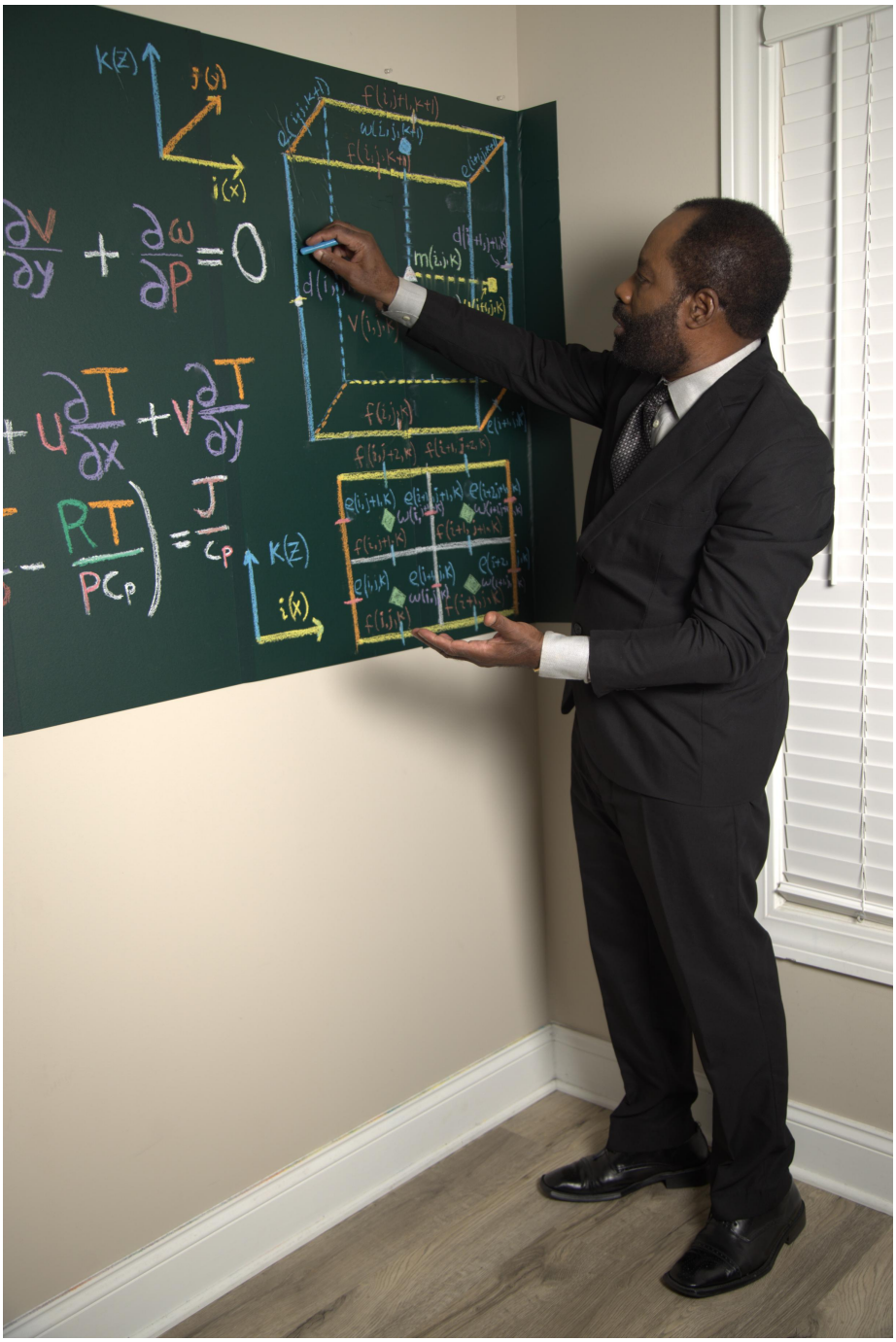
And can we hindcast, or re-forecast, those fluid flows across a new Internet that's a new spherical island of up to a billion off-the-shelf processors? Each processor had its dedicated memory." That difficult problem was at the crossroad where new physics, new mathematics, and new computer science intersect.

In the 1980s, the United States government classified that problem as one of the twenty Grand Challenges in supercomputing.

How to Solve Compute-Intensive Problems

Solving the most intractable problems that arise simultaneously in mathematics or physics or computer science demands a higher mental power than writing a poem or a play or a novel. That demand is akin to the belief that lifting a car demands physical strength. The research computational mathematician who can solve or parallel process the toughest problems that arise in extreme-scale computational physics is believed to have a stronger brain muscle, or a higher mental power or a higher IQ, than those who cannot.

Solving the most difficult problems in mathematics and physics are the reasons Isaac Newton and Albert Einstein are in the perennial list of the smartest people that ever lived.



Philip Emeagwali explaining the underlying mathematical calculations behind his world's fastest computing of July 4, 1989.

World's Fastest Computing Solves Compute-Intensive Problems

For me, the early 1980s was my period of a "hand proofs" that delineated my paths from the blackboard to the motherboard. And across my new Internet that I visualized as a new global network of sixty-four binary thousand processors. That was when and why I coded the processor-to-processor email algorithms which I invented for solving the resulting huge system of equations of computational linear algebra. That was how I constructed my message-passed 65,536 processor codes.

I invented those processor codes for solving the most difficult, or compute-intensive, problems at the frontiers of knowledge of mathematics, physics, and computer science. What made the news headlines, in 1989, was that I executed those 65,536 codes at once. And across a global network of 65,536 processors that I visualized as a new Internet.

How I Used Slowest Processing to Invent Fastest Computing

In the 1980s, I experimented across an ensemble of the slowest processors in the world and across an Internet that's a global network of those processors. Those processors were

identical and were equal distances apart. Each processor had its dedicated memory that shared nothing. I executed my experiments that yielded the first world's fastest computing across the slowest processors in the world and did so by using the initial-boundary value problems in weather forecasting and in petroleum reservoir modelling and using both difficult mathematical problems as my computational test beds. My new speed from my world's slowest processor experiments was the world's fastest computation. I recorded that speed at 8:15 in the morning of the Fourth of July 1989, in Los Alamos, New Mexico, USA.

I Changed the Way Computer Scientists Think

My supercomputing discovery led to a new understanding of how millions of processors could be harnessed and used to make the fastest computer. And make the supercomputer practical in addressing some of the world's most important and complex challenges. Such difficult mathematical problems include, more accurate weather forecasts, powering the world with green energy, manufacturing efficient and safer automobiles, and personalized medicine that extends life spans. That new understanding led to the world's fastest computer that's not supercomputing with one processor. We now understand the

world’s fastest computer as supercomputing across millions of processors.

My major contribution to computer science is this: I was the first person to record the fastest computer speed and do so alone and across processors. On the Fourth of July 1989, I was confident that I’ve discovered the first world’s fastest computing across the slowest processors in the world. And that I’ve solved one of the most compute-intensive problems in computer science. In the 1980s, the first world’s fastest computing across the slowest processors in the world was an unknown field of computer science. I was the only known expert that could solve the most compute-intensive problems in mathematics and physics.

I discovered how to solve the most difficult problems across up to a billion coupled processors. That was the reason, I became the first person to record the fastest computer speeds. And do so across my ensemble of 65,536 coupled processors.

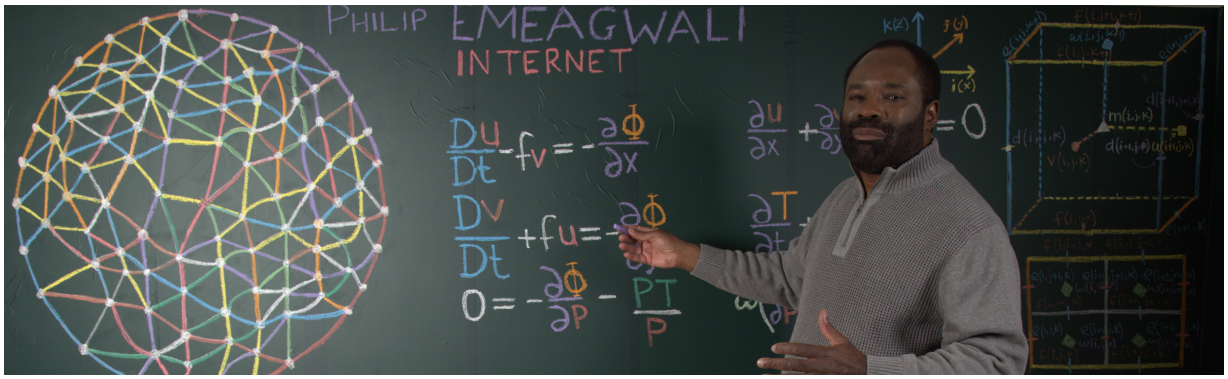
At first, my discovery of the fastest computing across the slowest processors was ridiculed and rejected. Not only that, I was dismissed because non-experts were asked to review the fastest computer speed which I recorded across my ensemble of 65,536 coupled processors. I was the only person that understood my discovery. Furthermore, I described that discovery in my 1,057-page research report that only I understood.

That should not come as a surprise because I was the first and sole full-time programmer of the biggest supercomputer ever built. Such supercomputers now occupy the footprint of a football field. And it costs forty percent more than the mile-long Second Niger Bridge in Nigeria. The billion-dollar price tag ensures that supercomputing will never become a child's play.

Recording the world's fastest computing and recording it in an unexpected way—such as across the world's slowest processors—is an important contribution to computer science.

MY CONTRIBUTIONS TO SCIENCE

Inventing the World's Fastest Computer



Philip Emeagwali explaining the initial-boundary value problems of mathematical physics that were the testbeds for his world's fastest computing of July 4, 1989.

Three often asked questions are: What is the Philip Emeagwali Computer? How did Philip Emeagwali invent the world's fastest computing? How were the Philip Emeagwali equations reformulated from calculus to algebra?

The nine Philip Emeagwali equations that I invented were abstract and differential. And they were the most advanced expressions in calculus and were difficult to understand. I discretized those partial differential equations by using partial difference schemes that I invented. That was how I reduced them from a system of equations of calculus to a seemingly infinite system of equations of computational linear algebra which I solved across my ensemble of the slowest 65,536 processors in the world.

In the 1970s and 80s, I knew that the world's fastest computer speed was a technological achievement that could be measured in the manner the speed of a marathoner is measured with tapes and watches. But in calculus, the watches are soft and genius is subjective.

How I Won the Top Prize of Supercomputing

On the Fourth of July 1989, I was challenged to submit my discovery of the world's fastest computing across the slowest processors in the world and allow my new knowledge to be retested by the foremost experts in supercomputing. I accepted that challenge and took my discovery to a fifteen-day supercomputer workshop that took place between September 1 and 15 of 1989 and in the outskirts of Chicago, Illinois.

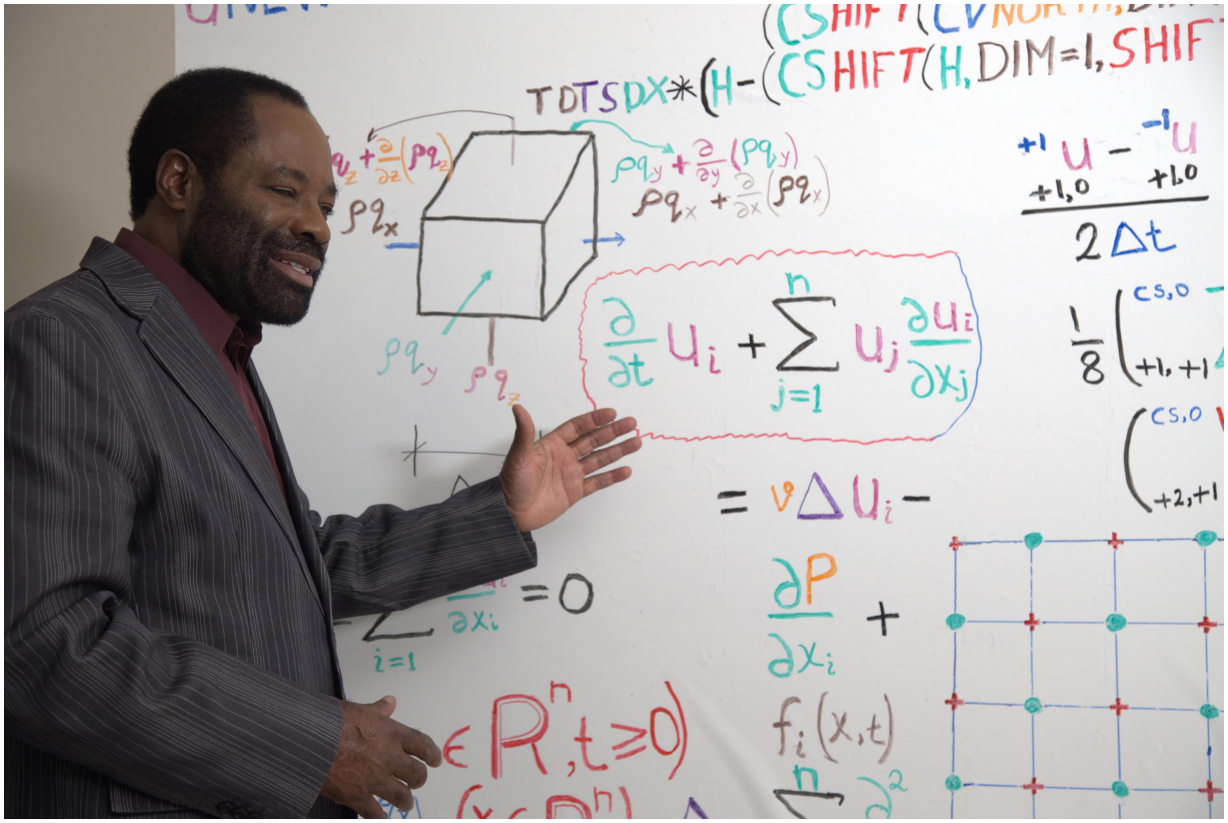
At that supercomputer workshop, my discovery was discussed by programmers who had programmed vector supercomputers and hoping to program parallel supercomputers. After that fifteen-day supercomputer workshop, a sense of anticipation arose from my discovery that the world's fastest computing can be extracted from the slowest processors in the world. By the end of that supercomputer conference, the consensus was that my discovery deserved to be recognized by the highest award in supercomputing for the year 1989.

But a few naysayers openly challenged me to re-submit my discovery to the committee of judges who awarded the most prestigious prize in supercomputing. That award committee was appointed by the two top computer societies in the world, The Computer Society of the IEEE (or the Institute of Electrical and Electronics Engineers) and the Association for Computing Machinery. In December 1989, I submitted my scientific discovery of the world's fastest computing to The Computer Society of the IEEE,in San Francisco, California. I won that prize in supercomputing that computer scientists rank as the Nobel Prize of Supercomputing. The discovery and the prize generated the *news headlines:* "African Supercomputer Genius Wins Top U.S. Prize."

The Significance of Winning the Top Prize of Supercomputing

Winning that top supercomputing prize gave me credibility and a handle. That most prestigious prize separated me from the other 25,000 vector supercomputer scientists. A coveted prize was the "scientific evidence" that my supercomputer discovery of how to execute the world's fastest calculations and do so across up to a billion coupled processors. And solve the most compute-intensive problems in mathematics and science. It was an undeniable proof that I made an original contribution to the

development of the world's fastest supercomputer that now computes faster with millions of processors. That top supercomputing prize made me stand out in the community of prominent mathematicians and top physicists.



Philip Emeagwali explaining the formulation of the initial-boundary value problems of mathematical physics that were the testbeds for his world's fastest computing of July 4, 1989.

How I Won the Top Supercomputing Prize Alone

My discovery of the first world's fastest computing across the slowest processors in the world changed the way

mathematicians and physicists use the supercomputers to solve compute-intensive problems in their fields.

My discovery of supercomputing across the slowest processors was new knowledge that inspired vector supercomputer scientists to change the way they look at the fastest computers. The chances of a supercomputer scientist winning the highest award in supercomputing, and winning that prize alone, was only one in 25,000. With the exception of myself, that most prestigious award, or diploma, in supercomputing was shared by up to fifty supercomputer scientists. Fifty names were inscribed on their award diploma. It was like fifty persons sharing one diploma.

Being "First" is Better Than "Best"

In the 1980s, I was the only full-time programmer of the most massively parallel supercomputer ever constructed. That supercomputer is the precursor of the world's fastest computer of today.

Being the "first" person to discover something is better than being the "best" person in doing that thing. On July 4, 1989, I became the first person to discover that parallel computing is faster than sequential computing. It's faster when both technologies are used to solve the world's most compute-

intensive problems, such as modeling climate change. That breakthrough opened the gate to the widespread use of millions of processors to power the world's most powerful supercomputers.

In 1989, I stood out because I was the first person to win the highest award in supercomputing. And win it alone. I was the first person to win that prize, alone, for solving the most compute-intensive problem in supercomputing. This year, the highest award in supercomputing was shared by thirty-four co-winners.

That prize enabled me to stake massively parallel computing as Philip Emeagwali Territory, and as the place where the fastest computers exist. My scientific discovery of world's fastest computing was validated and replicated across the ensemble of millions of processors that define and outline state-of-the-art supercomputers.

The forty-five billion dollars a year market value of the world's fastest computers affirms the importance of using up to a billion processors to power every supercomputer. It should be noted that the world's fastest computing is the supreme validation of a new supercomputer.

A scientific discovery is a personal property that becomes public property, if and only if, it's disclosed to the public. I transferred the ownership of my discovery of the world's fastest

computing across the slowest processors in the world and signed it over on three disclosure occasions: July 4, September 15, and December 25 of 1989.

The scientific community responded to those disclosures of my discovery and did so by awarding me the highest award in supercomputing. That supreme validation was time stamped for the year 1989.

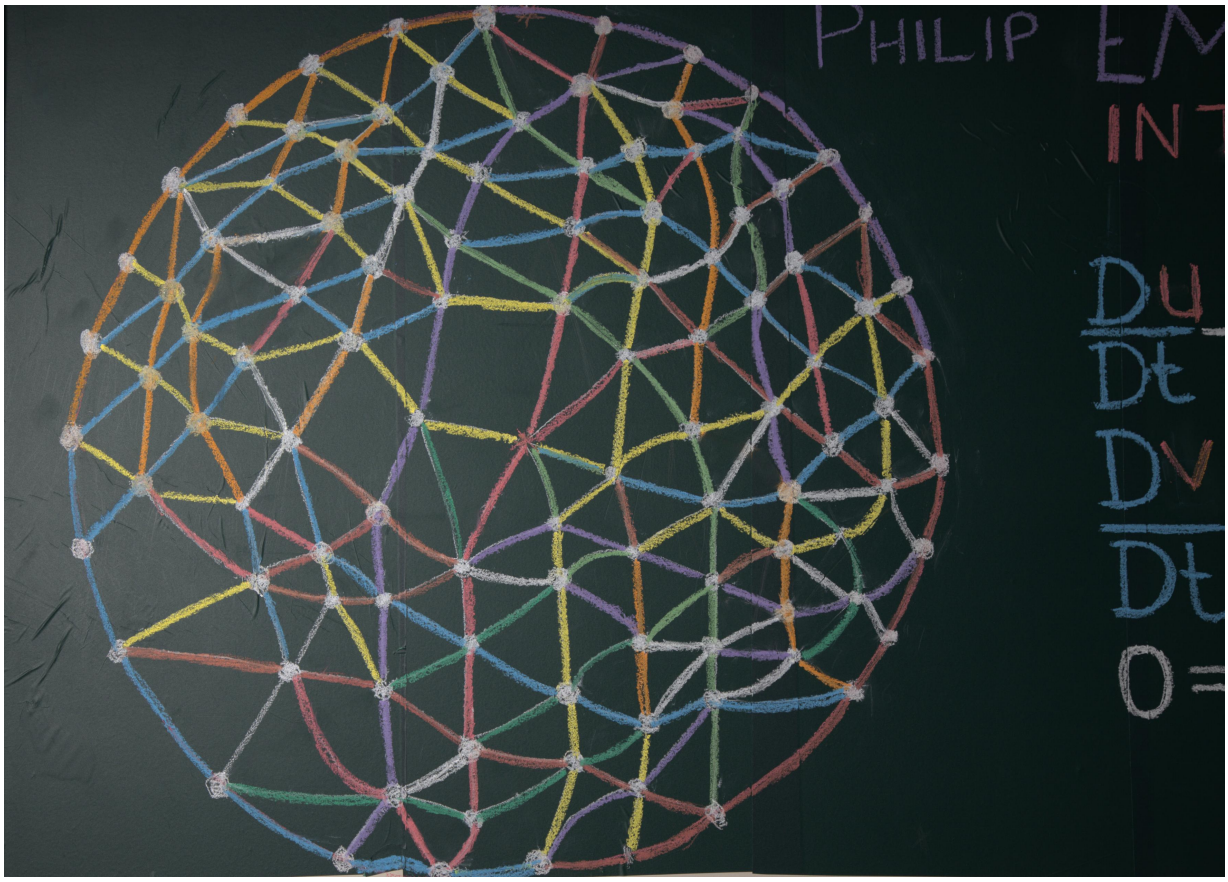
I INVENTED AN INTERNET

I've shared a thousand videos on YouTube. My videotaped lectures are my compression of five decades of scientific research into a series of one-hour remarks. It’s akin to compressing my life story into a parable. I couldn’t describe everything that I know within one thousand hours. I only presented the crux of my contribution to my new Internet that’s a new supercomputer, intrinsically.

It costs more than a billion dollars to create the world’s fastest computer. But it costs nothing to listen to my lecture on how I discovered how to execute the fastest computer speed. And how to do so across up to a billion processors which outline and define the world’s fastest computer.

I Invented a Small Copy of the Internet

For me, June 20, 1974, in Corvallis, Oregon, USA, was the beginning of my long train of thoughts and experiments across a new spherical island of 65,536 off-the-shelf processors and standard parts. Those processors were identical. I visualized those processors as uniformly distributed across a globe.



Philip Emeagwali's back-of-the-envelope sketch of the blueprint for his new Internet.

I defined my ensemble of coupled processors as a never-before-visualized Internet that encircles a globe. And that’s a small copy of the Internet that encircles the Earth. I invented the fastest computing across an internet.

Philip Emeagwali (2nd from right of second row), Wilson Hall, Oregon State University, Corvallis, Oregon, from the university's 1976 Beaver Yearbook.

In 1989, I was in the news because I discovered how to harness my new Internet. And use the new technology as one seamless, coherent, and gigantic machinery that's the world's fastest computer, in reality, but not a computer, in and of itself. I didn't invent my new Internet in one day, back on June 20, 1974.

Parallel Processing Enables Computers to be Fastest

Nor was I instantaneously struck with the nine Philip Emeagwali equations. I solved my system of partial differential equations beyond the frontier of calculus. And I solved them via

their companion partial difference equations of large-scale computational linear algebra. I solved them in my thoughts. And solved them during the experiments that I executed across my ensemble of 65,536 processors. Those processors were identical and surrounded a globe as a new Internet.

The inklings of parallel computing I had in 1974 grew from a mere acorn to a mighty oak tree that was the fastest computation across a new Internet. The new Internet is a new global network of coupled processors sharing nothing and uniformly distributed around a globe. It made the news because I discovered how to harness those slow processors as a supercomputer.

On the Fourth of July 1989, I discovered how to use up to a billion processors to solve the most compute-intensive problems in mathematics and physics, such as global climate modeling. In the 1970s and 80s, harnessing one million processors and using them to solve the most compute-intensive mathematical problems was supercomputing’s equivalence of being the first person to summit Mount Everest.

As an aside, the first climbers who made it to the top of Mount Everest did so in 1953. Since then, only five thousand climbers climbed to the summit of Mount Everest. By comparison, only one person single-handedly recorded the

world's fastest computer speed across the slowest processors in the world.

My Milestone in Computer History

In high-performance supercomputing, recording the world's fastest speed is the most coveted milestone. In the 1980s, the fastest speed in computing recorded across the slowest processors was a milestone that 25,000 supercomputer scientists dreamt to achieve. That fastest parallel supercomputer was a milestone in the history of mathematics and computer science. I was the first and only person that benchmarked that milestone, successfully. I benchmarked it on the Fourth of July 1989.

Fastest Computing Across an Internet

It made the news headlines that a Nigerian supercomputer genius in the USA had recorded the fastest speed in the history of computing. I recorded that speed across the slowest processors in the world. And I recorded that speed while solving the most compute-intensive problems in the world.

To put my supercomputer invention from a literal perspective, writing a novel or a book takes a couple of years. And up to one million new books are published each year in the USA alone. And reading and critiquing my supercomputer invention—of how the fastest supercomputer can be built with

the slowest processors—is as easy as spending time on Facebook or WhatsApp.

The grand challenge in deeply understanding my contribution to the highest-performance supercomputing was to spend a billion dollars to reconstruct the massively parallel supercomputer that will be needed to re-create my world's fastest computation. And, most importantly, test that world's fastest computation on production petroleum reservoir simulations that are executed across millions of off-the-shelf processors. And, finally, re-create that fastest speed as mandated by the scientific method that characterized natural science since the 17th century.

Why We Changed the Way We Look at the Computer

My scientific discovery of the fastest computing across the slowest processors changed the way mathematicians solve the twenty most difficult mathematical problems in science, engineering, and medicine. And changed it from solving one problem at a time to solving up to a billion problems at once. Changing the way we count is a fundamental change of tectonic proportions. And a shift that has occurred only once in the two hundred thousand years of the existence of humanity.

HOW ARE SUPERCOMPUTERS USED?

In the 1980s, I used more supercomputers than any person ever did. I alone was the only full-time programmer of sixteen massively parallel supercomputers that were each powered by up to the 65,536 slowest processors in the world.

The massively parallel supercomputers of the 1980s were abandoned because they were then mocked, ridiculed, and dismissed as a tremendous waste of everybody's time. Back then, the supercomputer textbooks states that it would forever remain impossible to solve the most compute-intensive problems. And solve them at the fastest speeds. And solve them across an ensemble of the slowest processors in the world.

In 1989, I was in the news because I proved everybody wrong and did so by solving the most compute-intensive problems. And solving them with the slowest processors and solving them at the fastest possible speeds. That was how the fastest computing across the slowest processors became my signature discovery. And became one reason I'm the subject of biographical essays on famous inventors and their inventions.

My Contributions to Computer Technology

My contributions to developing the world's fastest computers were these: I discovered that a binary billion processors that were locked together can be programmed to emulate one seamless, coherent machinery that's a supercomputer, in reality. A binary billion is two-raised-to-power-32, or 4,294,967,296. I discovered that the number of processors needed is proportional to the compute-intensiveness of the mathematical problem.

More often than not, the most compute-intensive problems arise as variations in physics calculations, particularly in geophysical and astrophysical fluid dynamics. The physics roots as well as the mathematical and computational structures of the global climate model differs slightly from that of the petroleum reservoir simulation.

I presented reservoir simulation in my 1989 discovery for which I won the highest award in supercomputing. Climate and reservoir modeling are the prototypical problems of large-scale geophysical and astrophysical fluid dynamics.

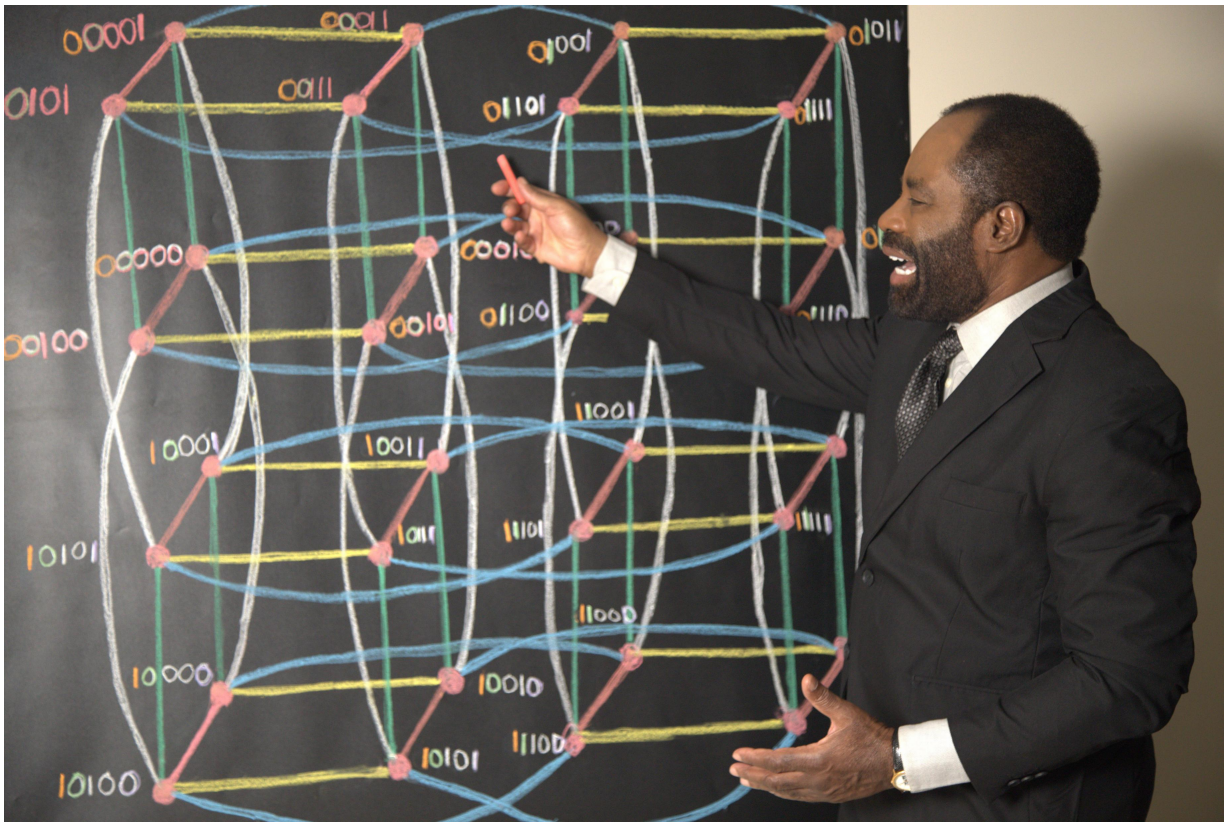
Fastest Computing Across Processors Changed Supercomputing

The supercomputer enables medical and scientific discoveries to occur at the fastest pace. It's used to pull the future closer. The world's fastest computers were used to discover how Covid-19 spreads. My discovery of the world's fastest computing across the slowest processors in the world made the news headlines in 1989. And made it impractical to continue selling outmoded supercomputers that were powered by only one processor.

Within five years after my discovery, the manufacturers of vector supercomputers couldn't sell that technology. For those reasons, they ran out of funds, laid off their employees, and filed for bankruptcy protection from creditors and filed it under Chapter 11 of the United States Federal Bankruptcy Code.

What is the New World's Fastest Computer?

Programming the world's fastest computer is not a child's play. The supercomputer occupies the footprint of a football field. It costs forty percent more than the mile-long Second Niger Bridge in Nigeria. It's the world's most complex invention. The world's fastest computer is powered by up to one billion processors.



Philip Emeagwali's back-of-the-envelope sketch of the partial five-dimensional, 32-node blueprint for his 65,536 coupled processors that he harnessed to execute his unexpected world's fastest computing of July 4, 1989.

Each processor had its operating system. Each processor shared nothing with its nearest-neighboring processors. That first supercomputer that’s used to solve the toughest mathematical problems and solve them fastest across the slowest processors is described as the most complex creation of the human mind.

The Nigerian Oil Fields

Nigeria has 159 oil fields. And 1,481 oil wells. The first oil field in West Africa was discovered in 1956 in Oloibiri (Nigeria). The oldest oil well in Nigeria was sunk in 1958. Oloibiri was a fishing and farming community that is a distance of 45 miles (or 72.4 kilometers) east of Port Harcourt. The Oloibiri oil field covered an area of 5.31 square miles. Only half of the crude oil discovered in Oloibiri was recovered, or rather was recoverable.

Twenty years after that first oil well in Oloibiri was sunk, that first oil field in Nigeria was abandoned. The warning from Oloibiri is that the 159 producing oil fields of Nigeria will dry out in twenty or thirty or forty years. In fifty years, Nigeria will not be an oil-producing country. And Nigeria will be dismissed from OPEC, the Organization of the Petroleum Exporting Countries.

Philip Emeagwali Computer Described

I’m often asked: "What is the Philip Emeagwali computer? Why is Philip Emeagwali known for fastest computers? What is the influence of calculus on the development of the computer?" In June 1970, I claimed, or rather reclaimed, my mathematical language. And I did so when I bought the 568-page blue hardbound book that was titled: “An Introduction to the Infinitesimal Calculus.” That calculus book was written by G.W. (George William) Caunt. And published by Oxford University Press.

In developing the world’s fastest computer, calculus was the pink elephant in the room that nobody wanted to talk about. The secret to my 1989 world’s fastest computing was that I discovered how to divide-and-solve the most compute-intensive problems in calculus. I divided it into an equivalent set of less compute-intensive problems that I solved across my ensemble of 65,536 processors.

My processors computed in tandem and were in dialogue with each other. At first and in the 1970s, I was confused because I did not know where each processor was located at. The one vertex of a sixteen-dimensional cube to one-processor correspondence gave me an intuitive understanding of where

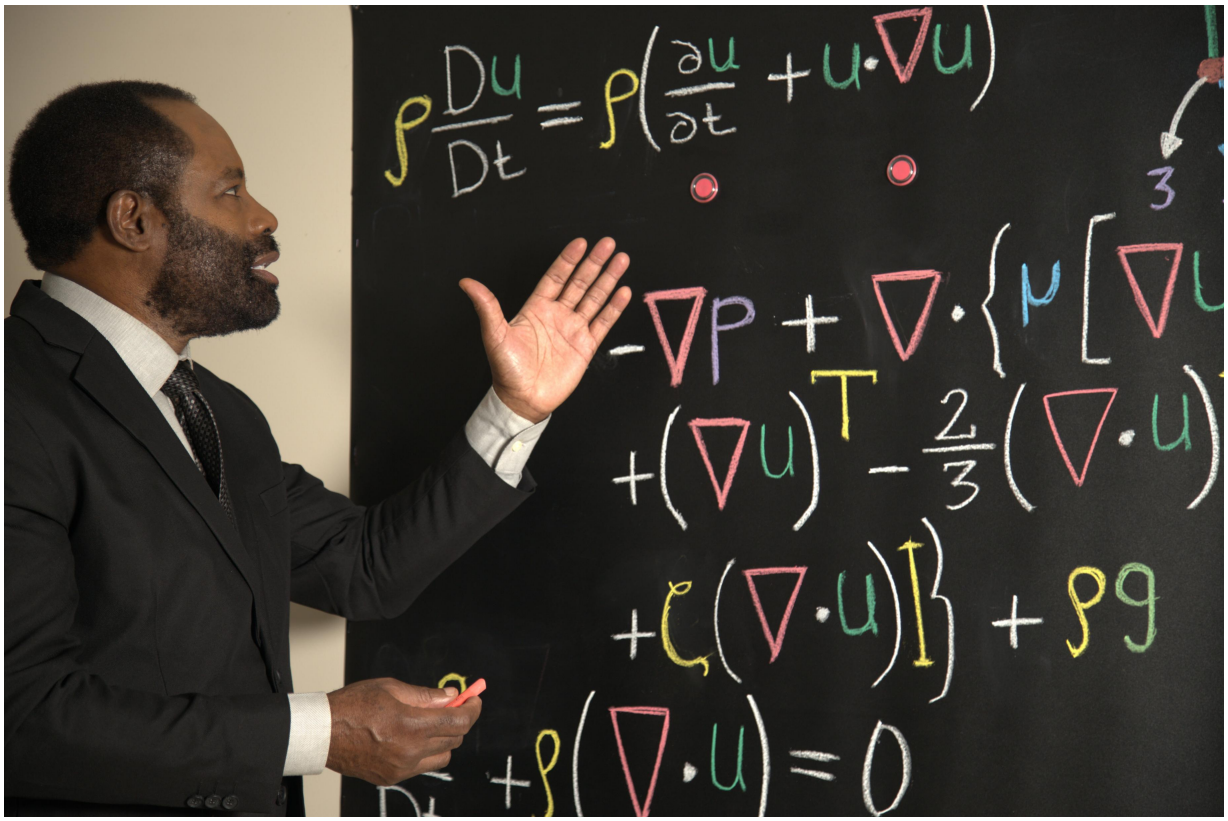
each processor was located. That new knowledge enabled me to record the fastest speed in computer history.

In the history of the computer, we expect the next generation of computers to be ten times faster. I discovered a billion-fold increase in the speed of the world's fastest computer that's powered by a billion processors. To invent a supercomputer is to take a big risk and leapfrog into the future.

MY CONTRIBUTION TO MATHEMATICS

An often-asked question was this: “What is Philip Emeagwali known for?” I’m known as the first person that figured out how to solve the most compute-intensive problems that are important to society. Such intractable problems are governed by a system of coupled, nonlinear, time-dependent, and three-dimensional partial differential equations that are beyond the frontier of calculus.

Such partial differential equations must be discretized, or reduced, to an almost equivalent system of equations that’s the largest in computational linear algebra. I was in the news because I was the first person that parallel processed across an ensemble of sixty-four binary thousand off-the-shelf processors that were identical and coupled to each other.



Philip Emeagwali explaining his initial-boundary value problem of fluid dynamics that he discovered how to solve across his 65,536 coupled processors that he harnessed to execute his unexpected world's fastest computing of July 4, 1989.

Why I Created New Mathematics

In the 1970s and 80s, I thought of myself as a research computational mathematician searching for the world's most powerful supercomputer. In those two decades, my goal was to execute the fastest floating-point arithmetic operations that must be used to solve the world's most compute-intensive problems in science, engineering, and medicine. That was how and why I searched for and discovered the fastest arithmetical computations. And searched for and discovered new algebraic knowledge. And searched for and discovered new partial

differential equations of calculus. I create new equations the way Bob Marley writes new songs. I sing in the mathematical dialect of the universe.

How I Solved the Most Difficult Math Problem

My quest for new mathematical knowledge was a personal search for the lost language of God. In my quest for the never-before-seen supercomputer that's the fastest ever, I encoded the Second Law of Motion of physics into the partial differential equations of calculus. I then discretized those partial differential equations into corresponding and approximating partial difference equations of large-scale algebra.

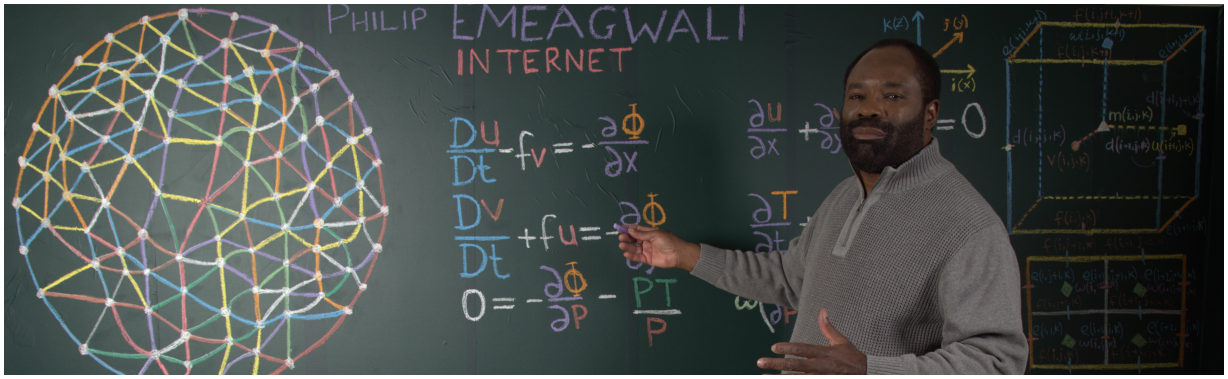
Finally, I developed my 65,536 coupled computer codes which I used in a one-code to one-problem corresponding manner. And used to solve each of my 65,536 subsets of those systems of equations of large-scale algebra. I translated the world's biggest mathematical problems. And did so from prose to the supercomputer cycles which I executed to solve those compute-intensive equations that would otherwise be impossible to solve.

Visualizing the World's Fastest Computer

In 1989, I was in the news because I was the first person to figure out how to compute across two-raised-to-power sixteen, or

sixty-four binary thousand “little computers,” called processors, that surrounded a globe. I visualized my globe as embedded within the 16th dimensional hyperspace. My ensemble of processors encircled that sixteen-dimensional globe and did so in the way the Internet encircles the Earth.

My supreme quest for ultrafast computations from the world’s fastest computer was like launching 65,536, or two-raised-to-power sixteen, digital arrows into the unknown sixteen-dimensional hyperspace. Each arrow carried an email message (or computer code) to a sixteen-bit-long address and across sixteen times two-raised-to-power sixteen pathways that had a one-to-one correspondence with as many bidirectional edges of the cube in the 16th dimensional hyperspace.



Philip Emeagwali is the only father of the Internet that invented an Internet.

The World’s Fastest Computer Visualizing the world’s fastest computer that I discovered in the 1980s and imagining the technology as a new Internet within the 16th dimension was

published as science fiction, back on February 1, 1922. But on the Fourth of July 1989, I figured out how to turn that fiction to nonfiction.

Fastest computing across slowest processors is my contribution to the supercomputer that occupies the space of a soccer field. And it costs more than the mile-long Second Niger Bridge in Nigeria. In my supercomputing, I computed in parallel, rather than in sequence, or solved up to a billion problems at once, rather than solve one problem at a time.

The introduction of parallel computing into mathematics is a quantum shift that's comparable to the introduction of quantum mechanics into physics.

HOW I WANT TO BE REMEMBERED

I was asked: “How do you want to be remembered?”

My contribution to the development of extremely fast computers is this: I was in the news, in 1989, for discovering that the world’s fastest computers must be powered by up to one billion processors. Prior to my discovery that occurred on the Fourth of July 1989, the fastest computing across the slowest processors, existed only in science fiction.

I want to be remembered for the first world’s fastest computer that was powered by the slowest processors in the world. I’m studied in schools because I’m the first person to know somethings in mathematics, physics, and computer science that were not known to anybody before me. My quest for the world’s fastest computer was like flirting with the infinite.

First Witness of a New Supercomputer Looking back, my failures were the price that I paid for my successes. Short-term failures are necessary, but not sufficient conditions, for long-term successes. My contribution to computer science is this: I was the first witness to the fundamental shift that yielded our new understanding of the world’s fastest computer.

The new supercomputer is an ensemble of up to a billion coupled processors that shared nothing and that each operated its

operating system. I recorded the world's fastest computer speed. More importantly, I did so while solving the most important and most compute-intensive problems known to humanity. And solving them across a new Internet. My Internet was a new global network of the slowest processors in the world.

I visualized my supercomputer as outlined and defined by two-raised-to-power sixteen off-the-shelf processors that each had its dedicated memory. Furthermore, I visualized those processors as equal distances apart. Likewise, I visualized those processors as etched onto the hypersurface of a globe. I visualized that globe as embedded within a sixteen-dimensional hyperspace. That global network of processors is called the Philip Emeagwali Internet.

Not only that, I fulfilled my part of the tacit requirement that every scientist—from Einstein to Emeagwali—who contributed to science must share his or her new knowledge on YouTube.

How I Want to Be Remembered

In an email, a fourteen-year-old writing an essay on famous scientists and their discoveries asked me to describe how I want to be remembered.

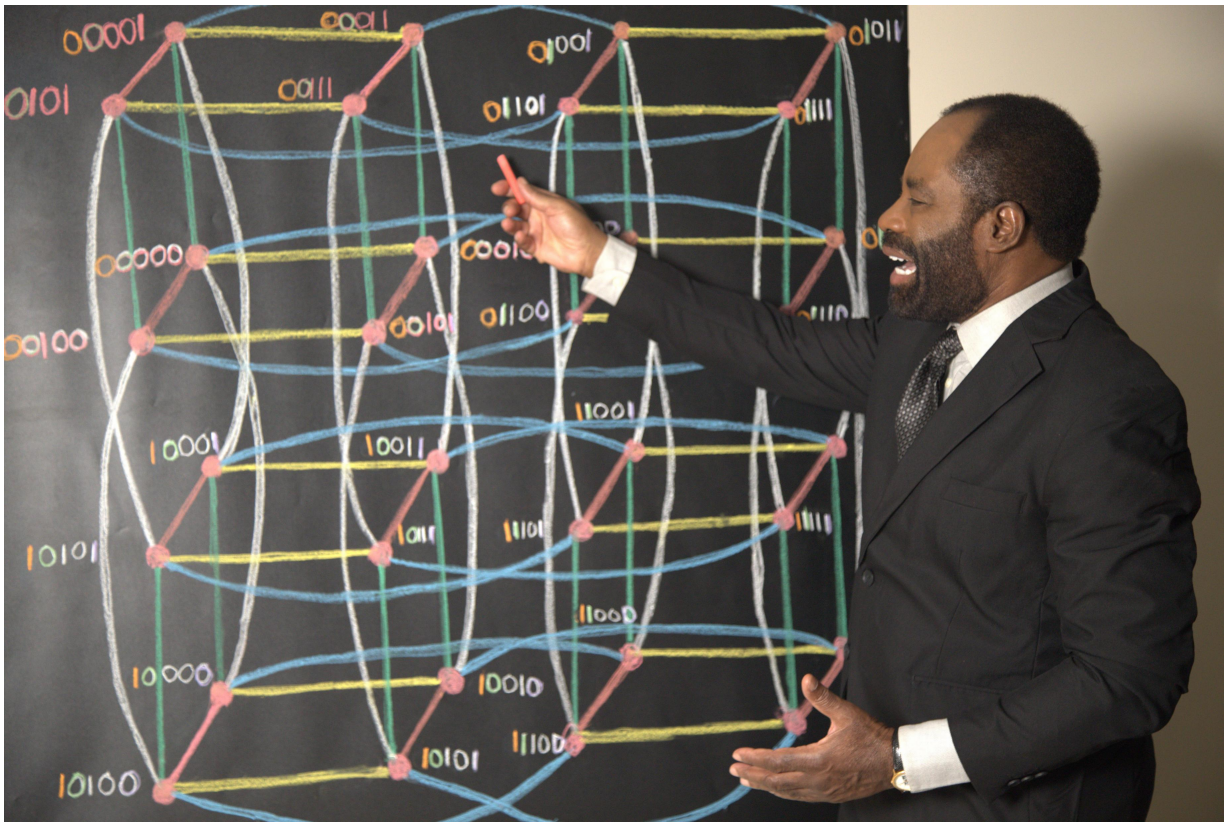
As an aside, ninety-five percent of my supercomputer research notebooks that began on June 20, 1974, in Corvallis,

Oregon, USA, are unpublished. But they should be published and remembered. I want my unpublished writings, handwritten notes, unpublished lectures, and conversations to be digitized, duplicated, and archived in the USA. They should be made public in Nigeria on my 200th anniversary, or on August 23, of the year twenty-one fifty-four.

I want to be remembered for discovering how to map the complex problems of physics across the millions of processors that power the world's most powerful computers. I want to be remembered for discovering how to solve mathematical problems that will be otherwise unsolvable, both on the Earth and in the heavens.

2ND LECTURE: WHY I LEFT NIGERIA FOR THE USA

Memoir of a Maverick Mathematician (2 of 4)



Broadcast 28 September 2021

https://youtu.be/8uLUKL7Ph8M

I'm often asked to explain why I left the southeastern region of Nigeria for Oregon in the Pacific northwest region of the United States. I decided to leave Nigeria six months

after its 30-month long war was over. I left before significant petrodollars flowed into Nigeria.

I was a Biafran refugee who dropped out of school from ages twelve to fifteen. And dropped out of school again from ages seventeen to nineteen. I dropped out to live in refugee camps of Biafra of the Nigerian Civil War. One in fifteen Biafrans died during that 30-month-long war. More Igbos died in Biafra than during the era of slave trade. In the list of the worst genocidal crimes of the 20th century that was committed against humanity, the death of one in fifteen Biafrans was ranked fifth. I left Nigeria for the USA because I wanted to stay afar from Biafra.

Back in June 1970 and at age fifteen, in Onitsha, East Central State, Nigeria, I was confident that my school grades and forthcoming scores in the American Scholastic Aptitude Tests, called SAT, will guarantee me a scholarship to the USA. The scholarship letter that brought me to Oregon, USA, was dated September 10, 1973.

So, I had even wanted to leave Onitsha for Oregon earlier, in May 1973. I missed the September deadline and postponed my travel to mid-December 1973. Yet, I didn’t have a travel passport until December 28, 1973. For those reasons, I changed the date of my visa interview to March 1974. The United States consulate

in Victoria Island, Lagos, issued me a visa on March 21, 1974, which I picked up the following afternoon.

Twenty-four hours later, at three o'clock in the afternoon of Saturday March 23, 1974, I was pacing inside the Ikeja Airport of Lagos, Nigeria. In 1976, that airport was renamed the Murtala Muhammed International Airport. Two hours later, I had taken a seat in a Pan Am aircraft for my first airplane flight.

That flight to the USA was an overwhelming experience. Forty-eight hours after I left our compound that was adjacent to Uzoigwe Primary School, Asaba, Nigeria, I was in 36 Butler Hall, Monmouth, Oregon. My flight to Portland, Oregon, included a brief stopover at the John F. Kennedy airport.

Outrunning Death: The Battle for Onitsha

Prior to my first airplane flight, of March 23, 1974, from the Ikeja Airport of Nigeria, the closest I came to an aircraft was to the Russian-made MiG-17F jet fighters that strafed Onitsha, Biafra, with their machine gun fires. Those Russian military aircrafts were purchased by the Nigerian Air Force and flown by foreign mercenary pilots. The war policy of the Nigerian Air Force was to bomb first and ask questions later. In Biafra, we used bombed out buildings that were surrounded by rubbles as our playgrounds.

In the last thirty months of the 1960s, the Russian-made Ilyushin IL-28 jet bombers dropped bombs on hospitals, markets, and refugee camps in Biafra. The Russian jet fighters and bombers flew to Onitsha from the airports in Benin City and Port Harcourt. In early 1968, the MiG-17 jet fighters and the Ilyushin IL-28 jet bombers frequently raided our refugee camps in the *Énú Ọnịcha* neighborhood of Onitsha, Biafra.

In February 1968 and at 14 Mba Road, Onitsha, I was almost killed from a hail of machine gun fire from a MiG-17 jet fighter that took off from Benin City. The following month, we fled from Onitsha. And the house at 14 Mba Road, Onitsha, that we fled from was bombed to rubbles.

From the eight-day non-stop artillery bombardments of downtown Onitsha, that began on October 4, 1967, to the capture of Onitsha that occurred on March 20, 1968, half of the residents of *Énú Ọnịcha* quarters of Onitsha were refugees from the Fegge and Odoakpu quarters of Onitsha. During the eight-day, non-stop artillery bombardments of Fegge and Odoakpu, my family of nine fled from our house at 4B Egbuna-Adazie Street, Odoakpu. We sought refuge in the house of my maternal grandfather, Chieka Balonwu, at 6C Wilkinson Road, *Énú Ọnịcha.*

On the eighth day, fifteen thousand heavily-armed Nigerian soldiers crossed the mile-long River Niger to land in Onitsha. The Nigerian Army captured downtown Onitsha. At five o’clock

in the morning, I witnessed Nigerian soldiers engaging Biafran soldiers in fierce gun battles at Metropolitan College. And fighting to capture the Obi Okosi Primary School that was converted as the Onitsha headquarters of the Biafran Army, which was right next to our residence.

Woken up by non-stop, all-night gun firings, I stepped outside at four o'clock that morning of November 1967. I saw two Biafran soldiers huddling in my maternal grandmother's cocoyam yam, behind 6C Wilkinson Road. My grandmother passed away nine months earlier and her farm was untended. I saw both soldiers removing their Biafran Army uniform. And changing into civilian uniform. Thirty minutes later, I saw those two Biafran soldiers, fleeing with refugees along Awka Road. And towards Saint Charles Borromeo Hospital and towards Nkpor.

In mid-October 1967 and in downtown Onitsha, fifteen thousand soldiers died within a few days of close combat fighting. That was the reason, a thousand Biafran soldiers changed into civilian clothes and fled with refugees.

My mother was then twenty-eight years old. She fled with her then seven children to seek refuge in the house her mother, *Obam Okudo*, was born. The Okudo family house was seven-mile-walk and at Nkwelle Ogidi.

As we were fleeing from Onitsha and in the early morning of the 12th of October 1967, I witnessed a house-to-house gun battle. I saw a Biafran soldier crouched in a brush that was a stroll away and at the intersection of Wilkinson Road and Metropolitan College. That Biafran soldier was firing his automatic Setima rifle at presumably Nigerian soldier who were trying to capture the Biafran military headquarters.

Four months earlier and like all schools in Biafra, Obi Okosi Primary School and the nearby Metropolitan College were closed. Schools were converted into Biafran military barracks and refugee camps. Unknown to us, Biafran refugees, fifteen thousand Nigerian soldiers, that took no prisoners at nearby Asaba, were everywhere in Onitsha.

THE ASABA DANCE OF ETERNAL DARKNESS

Five days earlier in Asaba, on October 7, 1967, seven hundred unarmed male civilians were gunned down and buried in mass graves. Unarmed civilians were gunned down at Ogbe-Eke Market Square, Asaba, at Ogbe-Osowa, Asaba, at Saint Joseph's Catholic Church, Asaba, at Saint Patrick's College, Asaba, and at Cable Point, Asaba.

Colonel Murtala Mohammed, the future President of Nigeria, was the commanding officer of the Nigerian soldiers that gunned down those seven hundred unarmed civilian men. After the Dance of Death killing spree, Asaba was described as a ghost town and as a town with many women and few men.

Please allow me to quote the "*London Observer*" issue of January 21, 1968: "The greatest single massacre occurred in the Ibo town of Asaba, where 700 Ibo males were lined up and shot."

That was the reason we fled from the advancing Nigerian soldiers during the "First Battle of Onitsha." On the early morning of October 12, 1967, and after eight-days of non-stop artillery bombardments that originated from the west bank of the

River Niger at Asaba, fifteen thousand Nigerian soldiers made a surprise landing. And for a few days captured the east bank of the River Niger at Onitsha.

Throughout the 30-month-war, the advancing Nigerian Army outgunned and outmanned the retreating Biafran Army by four to one. Each Nigerian soldier in that bloody Onitsha battle, that costs the life of fifteen thousand soldiers, was heavily armed to the teeth. In the ensuing gun fighting and pandemonium, of the early morning of October 12, 1967, we the *Ndi Onicha* refugees of Umuasele Village, fled in the opposite direction and away from downtown Onitsha.

My family began our flight along Wilkinson Road. Thirty seconds along Wilkinson Road, a spent rifle bullet shell fell a few inches in front of my feet, proving that Nigerian soldiers were in our backyards. We rested for a few days in Nkwelle Ogidi, before fleeing deeper to Awka, Biafra, and in November 1967.

On the 19th of January 1968, Awka was captured by Nigerian soldiers. We barely escaped. My family fled from Awka and sought refuge in the house of my father's oldest sibling, John Emeagwali, at 14 Mba Road, *Énú Ọnịcha.*

Back in October 1967, in Onitsha, Biafra, we were fleeing from the heavy artillery bombardments that were originating

from the West Bank of the River Niger at Asaba. Those artillery bombardments drove the refugees as well as some soldiers out of downtown Onitsha. The Nigerian artillery bombardments "softened" Onitsha for their follow-up man-to-man military offensive that began on October 12, 1967. On the latter date, dare-devil Colonel Murtala Muhammed led a terrifying amphibious assault of a Nigerian ten-boat armada that ferried fifteen thousand well-armed soldiers across the River Niger, and from Asaba to Onitsha.

After eight days of non-stop artillery shelling, those fifteen thousand Nigerian soldiers fiercely engaged poorly-armed and fewer Biafran soldiers. The fighting was house-to-house and lasted from October 4th through 12th, 1967. Those artillery bombardments of Onitsha were executed under the guidance of the future president of Nigeria, Colonel Murtala Muhammed. The portrait of Murtala Muhammed is on the Nigerian twenty naira currency. He's the namesake of Nigeria's Murtala Muhammed International Airport.

The aircraft bombing raids of Onitsha were at their peak in the few days before March 20, 1968, the day the city was captured. Egyptian pilots flew the Ilyushin IL-28 jet bombers. And pilots of European ancestry flew the MiG-17F jet fighters. The MiG-17F was flown by sixteen foreign mercenaries, such as

the former UK's Royal Air Force pilot John Palliser and South African RAF trained pilot Ares Klootwyk and Briton Paul Martin.

As a British mercenary pilot, Mike Thompsett, was extravagantly paid one thousand British pounds per month. That was almost one thousand times the salary of a Nigerian soldier.

In February 1968, the 36-feet-long MiG-17 jet fighter was routinely flown past our temporary residence at 14 Mba Road, Onitsha, Biafra. The MiG-17 was flown by the mercenary pilot Mike Thompsett. MiG-17 was a high-subsonic aircraft that was first flown in 1950. Throughout that 30-month-long war which ended on January 15, 1970, the Biafra Army did not possess anti-aircraft missiles or Air Defense Systems.

But children hear better than adults. And warned us when the MiG-17 was three miles away. Children not dogs, heard the jet engine whines of the MiG-17. Children alerted the adults whenever the Nigerian jet fighter or bomber that departs from Benin City is flying from downtown Onitsha to uptown Onitsha. Those alarms from children gave us time to scramble into our underground bunkers.

And do so before the MiG-17F jet fighter arrived in our neighborhood. We sought refuge inside an underground bunker that was besides the house of Uncle John Emeagwali at 14 Mba Road, Onitsha.

That house was destroyed during the Nigerian artillery bombardments that were aimed to drive the Biafran soldiers away. Those artillery bombardments made it easier for the Nigerian Army to capture Onitsha and overran the commercial city by the early morning of March 21, 1968. About four hours earlier, that house—at 14 Mba Road—was razed to the ground by the Nigerian artillery bombardments that were fired from Abagana to Onitsha. My family of nine narrowly escaped death. We escaped to Oba (Biafra) and from a soon-to-be-bombed house. And did so in the late evening of March 20, 1968.

That night, we were among the ten thousand Onitsha refugees that slept at the Merchants of Light School, Oba, Biafra. At about four o'clock in the morning, there was a huge influx of refugees who alerted us of the heavy fighting in Onitsha. Fearing for their lives, all the refugees that camped outdoors overnight at the Merchants of Light School, took flight to Nnewi, Nnobi, and Awka-Etiti.

So we fled from 14 Mba Road, Onitsha, and did so only four hours before the Nigerian soldiers began to heavily bombard and enter into the city of Onitsha.


NIGERIA
N150
SUPER COMPUTER GENIUS
EMEAGWALI Philip
TAIWO FALUYI
NIPOST 2005 ©
NSPMPLC

The Miraculous Escape: How I Survived a MiG-17F Jet Fighter Attack

The MiG-17F jet fighters that bombed Onitsha were marked Nigerian Air Force NAF 623 or 625. That jet fighter had a top speed of 711 miles per hour and a range of 510 miles. The NAF 625 takes off from Benin City. After Port Harcourt was captured by the Nigerian Army, it took off from that city.

One of the bloodiest fighting of the Nigerian Civil War lasted two months, two weeks, and two days. That heavy casualty fighting was from March 8, 1968 through May 24, 1968. The Nigerian Army was victorious, and finally, captured the important city of Port Harcourt. My ancestral hometown of Onitsha, Biafra, was captured two months earlier and on March 20, 1968.

On July 19, 1969, and after an extended air raid within Biafra, that MiG-17F that shot at me and did so while I was tending my small garden at 14 Mba Road, Onitsha, ran out of fuel and crashed 200 yards short of its runway in Port Harcourt. The only casualty was its only occupant, the British mercenary RAF pilot, named Mike Thompsett, who shot at me, sixteen months earlier at 14 Mba Road, Onitsha.

As a souvenir, I kept the hot 23 x 115 mm shell casing from the NR-23 cannon that the MiG-17F jet fighter fired at me. That big jet fighter shell casing landed one foot beside my feet. That shell casing was very hot when I first picked it up.

Recollections from Fred Merryfield, a Captured World War One Pilot

Fast forward seven years from 1968 and from Onitsha, Biafra, to Corvallis, Oregon, USA, I was living with a former pilot named Fred Merryfield. Fred co-founded the engineering firm CH2M, back in 1946. Nearly six decades before I met Fred Merryfield, he was also a Royal Air Force pilot who was shot down in the first World War. Merryfield suffered severe injuries that made it impossible for him to father children.

His company, CH2M, now employs 20,000 persons and has a revenue of five billion dollars a year. So, Fred Merryfield was a man of means and wisdom. I lived with British-born Fred Merryfield and his also British-born wife, Anne, from late 1975 to early 1976. They had no children. Anne was thirty-one years younger than Fred Merryfield. Three of us lived in their beautiful mansion at 2540 SW Whiteside Drive, Corvallis, Oregon.

Photo of Anne and Fred Merryfield taken by Philip Emeagwali (December 1975).

Me living with my mentor, British-born Fred Merryfield and his also British-born wife, Anne, from late 1975 to early 1976. They had no children. Anne was thirty-one years younger than Fred Merryfield. Three of us lived in their beautiful mansion at 2540 SW Whiteside Drive, Corvallis, Oregon. William Shockley, the controversial Nobel laureate in physics, was a regular visitor to The Merryfields, previously sleeping on the bed that later became mine.

REFLECTIONS ON MY EARLY YEARS IN NIGERIA

Books that Influenced Me

I was asked what books inspired me to travel to the USA. At age nine, I read what my father read. My father subscribed to two Nigerian newspapers, the West African Pilot and the Daily Times. He also subscribed to two American magazines, the Reader's Digest and the Rosicrucian Digest.

As an aside, the Rosicrucian describes Sir Isaac Newton as a mystic and an alchemist, just as I've been labelled a member of the Illuminati, a secret society of celebrities that use their fame, wealth, and power to control the world.

In mid-1964 and at age nine in Agbor, Midwest Region, Nigeria, my father bought for me the novel *Gulliver's Travels.* It was subtitled: "Travels into Several Remote Nations of the World." *Gulliver's Travels* was written by Jonathan Swift. In late 1964, I read a second novel *The Pilgrim's Progress*. It was subtitled: "*From This World, to That Which Is to Come*." *The Pilgrim's Progress* was published in the year 1678. And was written by John Bunyan. At one time, *The Pilgrim's Progress* was second only to the Bible in popularity. *The Pilgrim's*

Progress was the first novel to be written in the English language.

In early 1966 and in Saint George's Grammar School, Obinomba, Midwest Region, Nigeria, I read the novel called *Treasure Island* that was written by Robert Louis Stevenson. Looking back to my formative years, my literary and scientific role models were from far away England, not from Nigeria that was my country of birth.

Saint John's Primary School, Agbor

My interest in fast calculations began at age nine in January 1964, in Agbor, Nigeria. The fastest calculations that I did was solving one hundred arithmetic problems in an hour. I practiced fast calculations every weekday evening and in the living room of our house that was along Gbenoba Road, Agbor.

In 1964, I was in Class Five of Saint John's Primary School, Agbor. As a ten-year-old, my goal was to score the highest in the mid-1965 Nigerian common entrance examination. And, hopefully, enroll in King's College, Lagos. Or in Saint Gregory's College, Lagos.

That entrance exam was the Nigerian equivalent, for ten-year-olds, of the American Scholastic Aptitude Test, called SAT.

In December 1965, I earned my Standard Six Certificate, called the First School Leaving Certificate, from Saint John's Primary School, in Boji-Boji, Agbor.

Saint George's College, Obinomba

My entrance examinations of mid-1965 Nigeria were for the January 1966 entries into King's College, Lagos; Christ the King College, Onitsha; and Saint Patrick's College, Asaba. Nigeria followed the British naming system which used the word "college" to describe what Americans call middle and high schools, or 7th through 12th grades. To my father's surprise, I was not admitted into King's College, in faraway Lagos. Or into any academically rigorous college that he ranked as top five in Nigeria. Towards late 1965, I was hurriedly admitted into Saint George's College, Obinomba. The school was an hour's drive away from Agbor.

I enrolled in Saint George's in late January 1966 and a few days after the military coup in Nigeria. Fifteen months later, the counter coup and civil uprisings forced me to withdraw from Saint George's College. The school was a new Catholic boarding school that was competently managed by an Irish priest named Thomas Brendan Kennedy who was born in Cork, Ireland. Saint

George was the 3rd century patron saint of England. And a Roman soldier and warrior-saint who was decapitated.

Philip Emeagwali at age eleven (third from left, front row) at Saint George's Grammar School, Obinomba, Midwest Region, Nigeria, mid-1966.

WHY ARE SCHOOLS NAMED AFTER FAMOUS SCIENTISTS?

Post-colonial African schools are named after African-born heroes, such as Cheikh Anta Diop and Obafemi Awolowo universities. Africans are learning from the French people who wear their history of science on their sleeves.

Dozens of streets in Paris, France, are named after French scientists who contributed to science. Boulevard Louis Pasteur was named after the 19th century biologist who discovered pasteurization, microbial fermentation, and the principles of vaccination.

On September 30, 2010, I had a day-long urban hike through the streets of Paris, France. I learned that nearly one hundred Parisian streets, boulevards, and squares were named after French mathematicians.

I'm a 21st century mathematician who is the subject of biography reports that are titled "famous mathematicians and their contributions." I'm studied alongside mathematicians like Pythagoras, Blaise Pascal, Isaac Newton, and Albert Einstein.

For me, it was a surreal experience to stroll across streets named after French mathematicians. And realize that in a thousand years a mathematician will be driving across "Philip

Emeagwali Road” in Nigeria or USA. Scientists achieves immortality by first discovering something that will be forever remembered.

ONE DAY WE HAD TO RUN!

The Influence of the Catholic Church

At ages eleven and twelve, I was an altar boy who helped the priest during a Catholic service. I was trained as an altar boy by a Catholic priest, named Thomas Brendan Kennedy. On Sunday mornings, I travelled with Reverend Kennedy. We travelled from Saint George's College, Obinomba, to small Nigerian villages, such as Obiaruku, Umutu, Abavo, and Abraka.

From late January 1966 through late April 1967, I sang in the Catholic church choir of the small villages named Obinomba and Obiaruku. We sang Gregorian Chants, the traditional Catholic music in Latin texts. My favorite was: "*Dies Irae, Dies Illa*." As an eleven-year-old altar-boy in the Catholic church, Thomas Kennedy was my role model and I considered becoming a priest.

As an eleven-year-old at Saint George's College, Obinomba, Nigeria, I travelled on Sunday mornings, as an altar boy of the Catholic Church, with Reverend Father Thomas Brendan Kennedy.

One Day We Had to Run!

At age twelve and in late April 1967, my mother suddenly showed up in Saint George's College, Obinomba. I knew she

came to take me away because the Igbos living outside Igbo land were fleeing back to Igbo land. Talks of a bloody civil war were in the air.

I fled, with my mother,from Obinomba to our residence at the Nurses' Quarters, General Hospital, Agbor. The following day, my family fled to 4B Egbuna-Adazie Street, Odoakpu Quarters, Onitsha.

On October 4, 1967, the Nigerian Army at the west bank of the River Niger began eight days of continuous shelling of the Fegge and Odoakpu Quarters of Onitsha. That shelling caused all the residents of downtown Onitsha to flee. Over the next twenty-seven months, my family fled through eight refugee camps in Ogidi, Awka, *Énú Ọnịcha*, Oba, Nnewi, Awka-Etiti, Ndoni, and Fegge (Onitsha).

After the Nigerian Civil War Was Over

In April 1970 and three months after the Nigerian Civil War was over, I found it awkward and demoralizing to return to Saint George's College, Obinomba. And re-enroll in Class Two and be three years behind my former classmates who were then in Class Five. The Nigerian Civil War forced me to repeat Class Two for the four years that were inclusive of January 1967 through December 1970. I did not return

to Obinomba because it was humiliating to be three years behind my former classmates at Saint George's College.

Fast forward nineteen years, I was in the news headlines, for my 1989 supercomputer discovery. The Old Boys, or alumni society, of Saint George's College, Obinomba, sent their congratulations. Because I didn't return to Obinomba, after the war was over they presumed that I was one of the one million Biafrans who were starved to death in refugee camps or who were killed in my ancestral hometown of Onitsha that became the bloodiest battlefield in the history of African wars. When the Nigerian Civil War ended, on January 15, 1970, and after thirty months of fighting, one in fifteen Biafrans had died!

My Early 70s in Christ the King College

I decided not to be humiliated by spending four years at the eighth grade of Saint George's College, Obinomba. Instead, I enrolled in mid-1970 as a new student in Christ the King College, Onitsha, called CKC. However, I didn't finish at CKC. In March 1972, I left Christ the King College and after a year and a half, or after completing the American equivalent of the ninth grade.

COMING TO AMERICA

One and a half years after I left Christ the King College, I won a scholarship to the United States. My scholarship letter was dated September 10, 1973. That scholarship changed my direction, from Nigeria to the USA. About ten days later, I was in Lagos for the first time.

To put my sense of accomplishment in perspective, after the brutal 30-month-long civil war was over and in the early 1970s, I could not name an eighteen-year-old in Igbo land that won an academic-based scholarship to the USA. I qualified myself to win a scholarship to the USA. I was an independent scholar who returned from Ibuzor, Midwest State, to challenge the General Certificate of Education examinations of the University of London. It was an entrance examination to the University of London that, in reality, became my high school diploma.

I never earned the standard secondary school diploma, called the West African School Certificate. The reason was that only those registered in a secondary school can register for the West African School Certificate examinations.

My Struggles as a Drop-Out Student

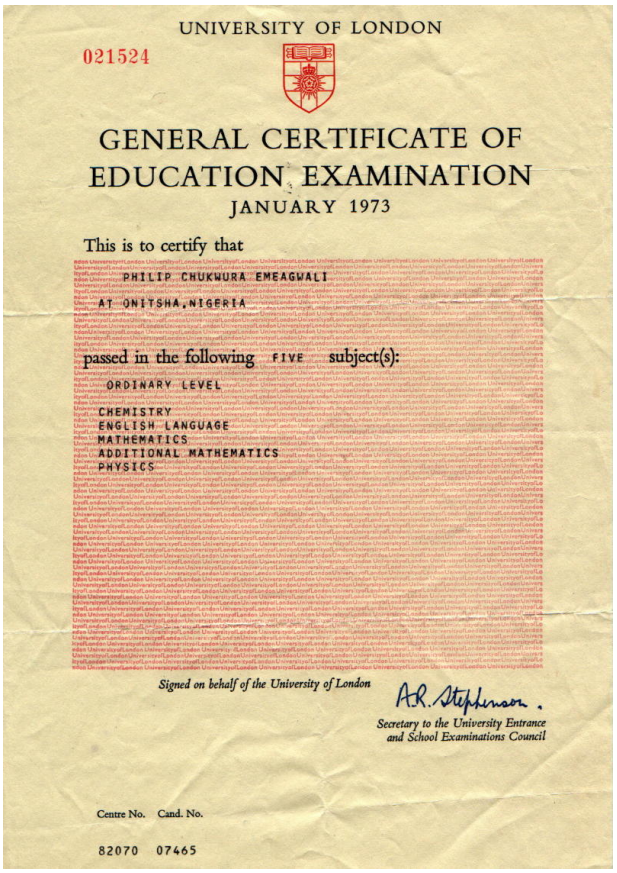
I left Christ the King College, Onitsha, in March 1972, to study alone in Ibuzor, Nigeria, and do so until late October 1972. Ironically, I earned the Advanced Level General Certificate of Education diploma that was dated November 1972 and earned it from the West African Examination Council. I earned it in both mathematics and physics.

Furthermore, I earned the Advanced Level diploma before I earned the Ordinary Level diploma that was dated January 1973 and issued by the University of London. The Advanced Level diploma was two years of study ahead of the Ordinary Level diploma. So, I was two years ahead of my former classmates, in the extremely competitive Christ the King College, Onitsha.

University of London, 1973

In early 1973, I was determined to leave Nigeria. But I didn't have a Nigerian mentor or a contact in the USA. My calling cards to American schools were my test scores from the University of London's entrance examination. And from the American TOEFL (or Test of English as a Foreign Language), American SAT (or Scholastic Aptitude Test) and Achievement tests.

My strengths were in mathematics and physics. I had only one shilling which I spent to buy postage to only one American school, in Monmouth, Oregon. Yet, I expected to overcome the one in a million odds and win a scholarship to Oregon, USA.



UNIVERSITY OF LONDON

021524

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1973

This is to certify that

PHILIP CHUKWURA EMEAGWALI

AT ONITSHA,NIGERIA

passed in the following FIVE subject(s):

ORDINARY LEVEL

CHEMISTRY
ENGLISH LANGUAGE
MATHEMATICS
ADDITIONAL MATHEMATICS
PHYSICS

Signed on behalf of the University of London

A.R. Stephenson.

Secretary to the University Entrance and School Examinations Council

Centre No. Cand. No.

82070 07465

My scholarship letter that was dated September 10, 1973, was sent from Monmouth, Oregon, USA, to my address in Asaba, Nigeria. In 1973, I was living at 6C Wilkinson Road, Onitsha. But it wasn't a reliable postal address for receiving a scholarship letter from the USA.

For those reasons, I received my letters from the USA in care of James Emeagwali, my father, then working as a nursing superintendent at the General Hospital, Asaba. So my letters from the USA were sent to me at the General Hospital, Asaba, even though I was never hospitalized in Nigeria.

GETTING A STUDENT VISA TO USA

For the six months following September 21, 1973, I made several trips from near the General Hospital, Asaba, to the post office in Onitsha. I came to Onitsha to mail important letters, such as my scholarship acceptance letter, to the USA.

I made that four-hour trek because I didn't have faith in the post office in Asaba. Furthermore, I made trips to the Student Advisory Committee of the East Central State Ministry of Education, Enugu. I journeyed to Enugu to get a clearance letter that asserted that my proposed field of study was not available in Nigeria. That clearance letter was my pretext to study in the USA, instead of in Nigeria.

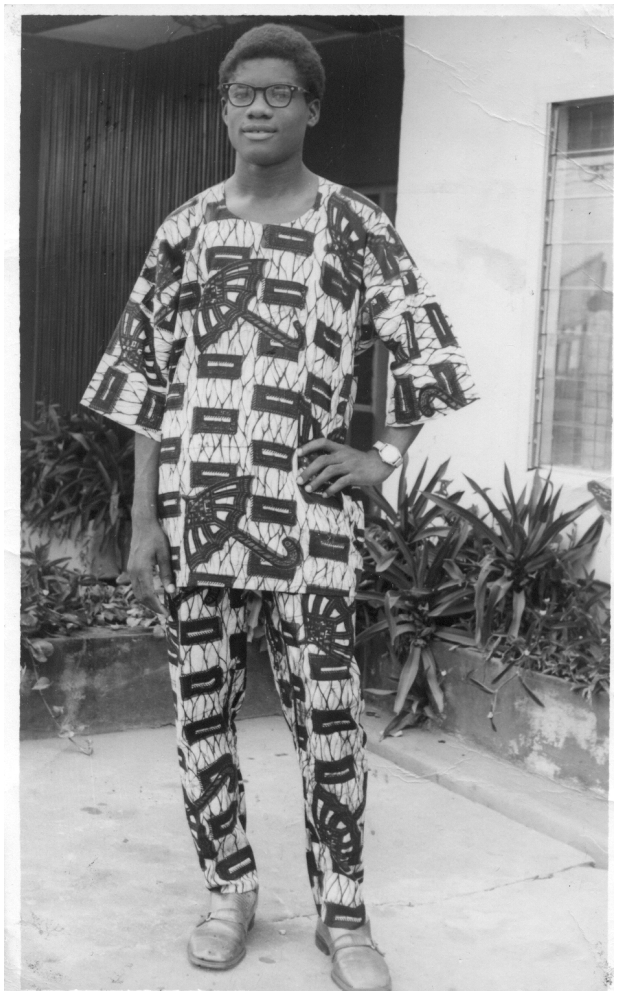
After receiving my clearance letter, I travelled to the Nigerian passport office in 27 Kakawa Street, Lagos. The Chief Passport Officer in Lagos had a reputation as the most corrupt man in Nigeria. I had my F-1 visa interview on March 20, 1974. I was interviewed by Mr. Glasl, the Consular Officer at the United States Embassy, Lagos.

After a six-month delay in getting my Nigerian passport and my American F-1 student visa, I left my hometowns of Asaba

and Onitsha (Nigeria) for my new residence at 36 Butler Hall, Monmouth, Oregon.

My Last Day in Nigeria

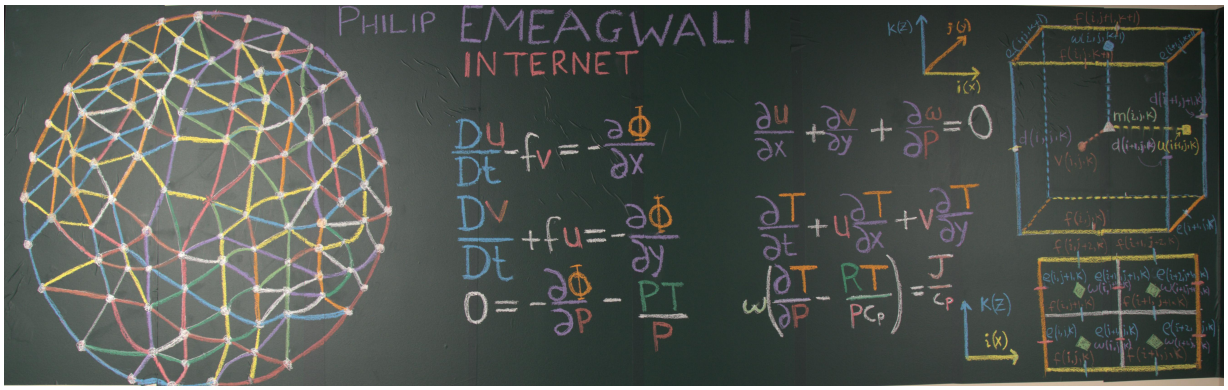
On the early morning of Saturday, March 23, 1974, when I left Onitsha via the Midwest Line Bus, Abuja, the future capital of Nigeria wasn't in my vocabulary. In 1974, Abuja wasn't on the map of Nigeria. Half a century later, I have yet to visit Abuja. I have never visited Northern Nigeria.



Me in late 1972 at 1 &3 Ajalli Road, Uwani, Enugu, Nigeria. I came to Enugu to take my American Scholastic Aptitude Tests. The photo was taken by the photographer at same location.

3RD LECTURE: MY EARLY YEARS IN THE USA

Memoir of a Maverick Mathematician (3 of 4)



Broadcast 28 September 2021

https://youtu.be/r8M_5By8QfQ

Who is Philip Emeagwali? And why is he in the USA? Thursday, March 21, 1974, was an important date in my life. The previous night, I slept on a thin mat on the bare concrete floor of a tiny room in the backyard of 49 Okesuna Street, Lagos. I came to the United States Embassy in Victoria Island, Lagos, to pick up my travel passport that was stamped with an F-1 student visa that was approved twenty-four hours earlier.

After picking up my F-1 student visa, I took a taxi that was a five-passenger Peugeot 404 Sedan and travelled from Lagos Motor Park to Asaba main market. From three o'clock in the morning, I made the perilous, lengthy trek to my parent's house that was along Nnebisi Road. Their compound, in Asaba, was next to that of a Catholic priest named Patrick Ugboko. Their rental two-bedroom apartment was a short stroll past Asaba Girls Grammar School (called AGGS) and adjacent to Uzoigwe Primary School that was near Saint Patrick's College and General Hospital, Asaba.

That night, I slept for only two hours. Then I spent the next twelve hours dashing around to get a traveler's check of 134

dollars from the Barclay’s Bank that was near Bright Street, Onitsha. Then, I returned borrowed library books to Onitsha Public Library. Finally, I hugged my friends and relatives at 6 Wilkinson Road, Onitsha.

That evening I returned to Asaba to spend my last night with my parents and siblings. After late-night conversations with my parents and a two-hour sleep, I woke up at five o’clock in the morning of Saturday, March 23, 1974.

My flight to Portland, Oregon, USA, required that I arrive at the Ikeja Airport of Lagos. And be there in ten hours, after I woke up. I was then nineteen years old and had never seen an airplane that was parked on the ground.

From Biafra to USA

My first thought of studying in the USA began four years earlier, in mid-1970 at age fifteen when I was living at 88 Venn Road, Onitsha, Nigeria. After the Nigerian Civil War ended on January 15, 1970, the economy of Onitsha was in total shambles. And coming to the USA in the early 1970s was a far-fetched dream that evoked laughter whenever I mentioned it. Their laughter stopped after I received a scholarship from Monmouth, Oregon. That scholarship took effect from September 10, 1973.

Around seven-thirty in the morning of March 23, 1974, I said good-bye to my parents and to the five of my seven siblings that were still at home. I also said good-byes to tenants in our compound.

At about five o'clock that evening, I boarded a Pan American aircraft for my 36-hour flight from the Ikeja Airport of Nigeria to the airport in Portland, Oregon. My Lagos-Portland flight was 36-hours long because it included four stopovers in Monrovia (Liberia), Dakar (Senegal), and New York City, and Chicago.

In early 1974, only a few Africans travelled to the USA. For that reason, my Pan Am flight originated from Addis Ababa, Ethiopia. To fill up the airline seats, it picked up passengers from

one or two stopovers, in perhaps Kinshasa, Congo. And then pick up about a dozen passengers in Lagos, Nigeria.

As an aside, Pan Am built many of the original airports in West Africa. In the 1960s and early 1970s, Pan Am and BOAC, the acronym for the British Overseas Airways Corporation—were the two major airlines that served Africa.

How I Came to Oregon, USA

The idea of coming to the USA came into my mind in mid-1970 at age 15. One late school day afternoon, I saw my classmate at Christ the King College, Onitsha, Chris Chiedu Okwudili. Chiedu held a tiny pamphlet that piqued my interest. It was a slim college brochure from MIT, the Massachusetts Institute of Technology, USA.

That MIT brochure was where I got the idea of coming to the USA. But it seemed far-fetched at the time and place, which was about six months after the Biafran War ended and the Onitsha economy was completely ruined. I expected to come to the USA because I was considered a top student, and, therefore, assumed that I will be offered a scholarship to MIT or Harvard. Fast forward to September 10, 1973, I got a scholarship to Oregon, USA, and, for that reason, I never applied to MIT or Harvard.

In late May 1973, and three months before I got a scholarship to the USA, we had an extended family meeting at 6 Wilkinson Road, Onitsha. That was the compound of the father of my mother, Chieka Balonwu. That meeting was chaired by my maternal uncle (Orofo Balonwu) and maternal aunt (Nkemdilim Azuokwu).

The purpose of that meeting was to persuade me to give up my unrealistic ambition to study in the USA. In May 1973, I was eighteen years old and unemployed. If I was gainfully employed in 1973, my lifetime salary couldn't even pay for my first year of study in the USA. So to my uncle and aunt and everyone else, traveling from Onitsha (Nigeria) to the USA and raising the travel, tuition, and boarding funds to live and study in America for four years and doing them in May 1973 seemed as far-fetched as Nigeria aiming to send a Nigerian astronaut to the Moon.

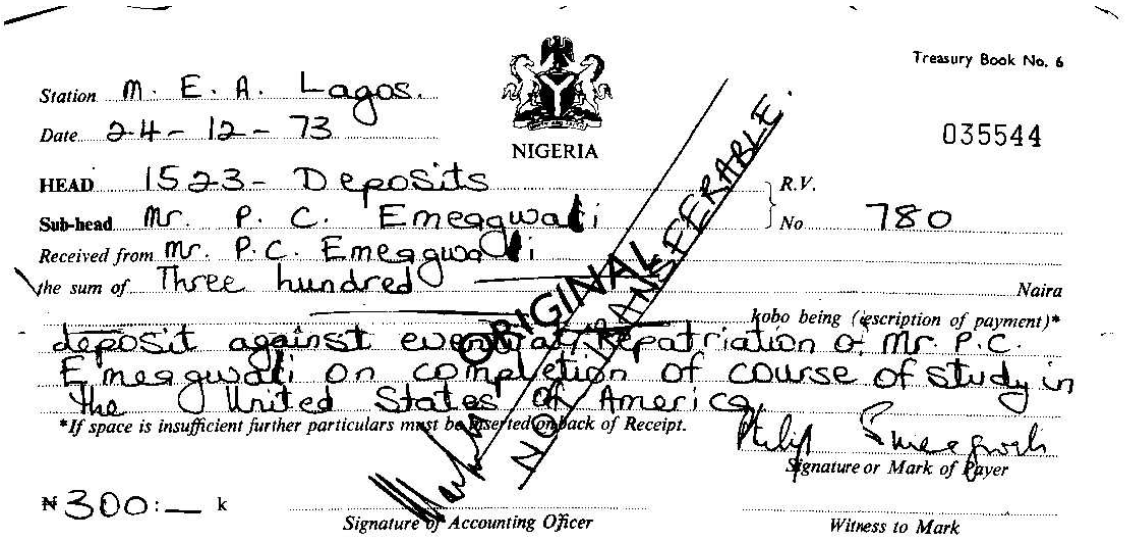
For those reasons, my uncle and aunt cautioned me to be realistic in my ambitions and to, instead, lower my expectations. And continue my studies in Nigerian universities then only admitting about a thousand students a year into campuses in the six cities of Lagos, Ibadan, Ife, Zaria, Benin City, and Nsukka. In contrast, the USA has five thousand universities.

My USA Visa Requirements

By mid-September 1973, I was jobless, restless, and killing time at 6 Wilkinson Road, Onitsha, that was located a short stroll from the Metropolitan College. If I am not in Onitsha, I might hang around the neighborhood of Saint Patrick's College, Asaba. Or be at 41 Bishop Anyogu Road, Enugu.

On my nineteenth birthday, it seemed my chances of coming to the USA had all but vanished. My biggest obstacle to coming to the USA was this: I had to receive an F-1 student visa from the Consulate General of the USA in Lagos (Nigeria). A student visa to the USA was extremely difficult to get. Legend has it that only one F-1 student visa was issued in a day, in 1973, and at the USA Embassy in Lagos.

The minor requirements for an F-1 student visa to the USA included the Nigerian passport that was then very difficult and very expensive to obtain. I paid the equivalent of two years' salary to the Nigerian Chief Passport Officer at 27 Kakawa Street, Lagos. Officially, my payment was a refundable "repatriation fee." But my repatriation fee went into the personal bank account of the Nigerian Chief Passport Officer.



Treasury Book No. 6

Station M. E. A. Lagos.

Date 24-12-73

NIGERIA

035544

HEAD 1523- Deposits

Sub-head Mr. P. C. Emeagwali

R.V. No 780

Received from Mr. P.C. Emeagwali

the sum of Three hundred Naira

kobo being (description of payment)*

deposit against eventual Repatriation of Mr. P.C. Emeagwali on completion of course of study in the United States of America.

*If space is insufficient further particulars must be inserted on back of Receipt.

Signature or Mark of Payer

₦300:— k

Signature of Accounting Officer

Witness to Mark

ORIGINAL NOT TRANSFERABLE

Other minor student visa requirements were passport-sized photos, immunization records, and medical reports. Until late September 1973, I couldn't even pay for the passport-sized photos that were required by the United States Consulate General. In the 1973 post-Nigerian Civil War economy, it seemed unrealistic that I could pay in advance the required one year's tuition and board and then provide my personal bank accounts with enough money to pay for four years' tuition and board in the USA. And do them before age nineteen and at a time I couldn't afford the bus fare to travel to the Nigerian passport office that was at 27 Kakawa Street, Off Broad Street, behind Bookshop House, Lagos Island, Lagos.

MY EARLY YEARS IN OREGON

My First Job as a High School Teacher in Nigeria

By late May 1973, I was relenting on my ambition to study in the USA. I was unemployed. In May 1973, three teachers at Asaba Girls Grammar School told me that I was qualified to teach mathematics and physics in their school. In my search for a job, I traveled seventy miles away from Onitsha to the Ministry of Education in Enugu, East Central State, Nigeria.

University of London

To apply for a job in the Nigeria of 1973, a formal resume, completed job application form, letters of reference, and background investigations weren't required. In June 1973 and at age eighteen, I was offered a job to teach mathematics and physics in an all-girls secondary school in Umudioka, East Central State, Nigeria. I got the teaching position by merely presenting my diplomas, both the General Certificate of Education at the Ordinary and Advanced Levels.

I received the first diploma from the University of London in January 1973 and after five external examinations in as many subjects that I took in Onitsha. I received the second diploma called the General Certificate of Education at the Advanced Level. I received that Advanced Level diploma from the West African Examination Council in November 1972 and by external examinations that I took in Onitsha.

Ironically, I was awarded the Advanced Level diploma before the Ordinary Level diploma. That was as unusual as earning a master's degree before the bachelor's degree.

Why I Was a Self-Taught High School Teacher

In March 1972, I was an independent student living behind and between the General Hospital and the Catholic church at Ibuzor, Midwest State, Nigeria. I studied alone and hard. I was

confident. Not only that, I also took my examinations in reverse order.

Fast-forward a year to May 1973, I was unemployed and socializing with three secondary school teachers that were living in our compound in Asaba, Nigeria. Asaba is the sister city to Onitsha. Asaba was on the western edge of the River Niger. The three secondary school teachers that I was socializing with told me I was qualified to teach mathematics and physics in their school.

In fact, I was surprised to learn that, even though I was only eighteen years old, that I was just as qualified as they were. With that information, I saw myself in a new and positive light. And encouraged by their recommendations, I traveled to the Ministry of Education, in Enugu, East Central State.

To teach in Asaba, I had to apply in person in the Ministry of Education, in Benin City, the capital of Midwest state. East Central State was my first choice because I had made several trips to Enugu. And I was always welcomed to stay with my mother's cousin, Mrs. Eunice Ndulue, who lived upstairs at 41 Bishop Anyogu Street, Enugu.

In late May 1973, I applied to teach mathematics and physics in any secondary school in the East Central State. A week after I applied, the Ministry of Education in Enugu posted me to teach mathematics and physics at an all-girl's secondary

school in Umudioka, East Central State. That girl's school was nine miles outside Onitsha and seems to have been renamed Saint Kizito Girls Secondary School.

I was eighteen years old when I presented myself to the principal and vice-principal of the girl's secondary school in Umudioka. I introduced myself as the school's newest teacher for mathematics and physics. The girls were pleased to see me. But the principal wasn't pleased that an 18-year-old boy was sent to teach 18-year-old girls. I sensed the female teachers giving me the cold shoulder. That was the reason I abandoned the science teaching position at the girl's secondary school in Umudioka.

HOW I WON A SCHOLARSHIP TO THE USA

My rejection as a teacher in Umudioka left me jobless. But it gave me the free time to daydream about coming to the USA. I traveled to Enugu to read and research in the one-room British Council Library and in the much larger East Central State Library. I was one of the few dozen patrons that were given borrowing privileges at the Onitsha Public Library and at the British Council Library in Enugu.

In late May 1973, I made a significant discovery inside the reading room of Saint Patrick's College, Asaba, Nigeria. That reading room had only one hefty book and one desk. The book was called *The College Blue Book.* That 1970 edition of *The College Blue Book* was a comprehensive listing of all the two thousand universities in the USA.

Fifty years later, The *College Blue Book* expanded to become a comprehensive guide to 12,000 institutions. The *College Blue Book* featured extensive information on admission requirements, tuition fees, scholarships for United States citizens, student life, and essential information that a prospective student should know.

In late May 1973, I was unemployed and, therefore, I had the time to write letters of inquiry to American schools. In early 1973, the first person I knew by name who was living on the continent of North America was a pen-friend, a teenager named Audrey Freake who was living in St. John’s, a city on Newfoundland island off Canada's Atlantic coast. I lost touch with Audrey Freake but four and a half decades later, when I tried to once again re-establish contact with her, I learned that a teenager named Audrey (Marie) Freake born in 1956 in St. John's, Newfoundland, Canada, died on July 21, 1974 in St. John's, Newfoundland, and died four months after I arrived in the USA. In 1973, I preferred to study in the USA, not in England or West Germany or Canada.

First Impressions of the USA

My problem was that, in 1973, I had no contacts in the USA. Nor did I know any person who traveled to the USA. I couldn’t name five Americans of African descent. In January 1974, I saw a Black American, for the first time. He was a young marine, guarding the gate of the United States Embassy in Lagos. In February 1974, I was briefly staying at 49 Okesuna Street, Lagos. I came to Lagos, from Onitsha, to seek an F-1 student visa. I had won a scholarship to study in Oregon, USA.

As a diversion, my former classmate in Christ the King College, Onitsha, named Chude Ukpabi, and I, went to see the new movie *Shaft*. That movie was an eye-opener. It was the first time I watched the USA and Black America on a giant screen. To say that *Shaft* impressed me
will be an understatement.

My First Contact in the USA

As a prospective student to the USA, *The College Blue Book* that I discovered in Saint Patrick's College, Asaba, provided me the vital information that I badly needed. In late May 1973, I had only one shilling, or twelve pence, in savings. The postage cost to the USA was nine pence. So I had only one shot at one of the two thousand institutions in the USA.

Using my intuition on which school is most likely to award me a scholarship, I wrote to Stan Kenyon, a university registrar, in Monmouth, Oregon, USA. I had obtained Stan Kenyon's contact from *The College Blue Book* that was the only book in the only reading room in Asaba of May 1973.

Because I was unemployed, I didn't have another nine pence to write a second letter to the USA which will double my chances of coming to America. For that financial reason, I gave up on applying for university admission to the two thousand schools in the USA.

Living in One of the Whitest States in the USA

As a Black African-born supercomputer scientist in the United States who conducted his research alone, my wilderness years were from June 20, 1974, in Corvallis, Oregon, through July 4, 1989, in Los Alamos, New Mexico. During my decade and a half as a supercomputer scientist, I felt like the rebel scientist punished and exiled to the inhabitable region and the frigid winters of the Russian Siberia.

Programming the World's Fastest Computer

On the Christmas Day of 1989, the year I won the highest award in supercomputing, I was alone and I programmed the 65,536, or the two-raised-to-power sixteen, slowest processors in the world and across an Internet that's a global network of those processors. I programmed my sixty-four binary thousand processors to solve as many initial-boundary value problems in mathematical physics.

I discretized and reduced each of my problem to a system of equations of computational linear algebra. That was my mathematical representation of a physical problem—such as the problem of foreseeing the climate change that can occur within a region of the atmosphere of the Earth or the problem of

predicting the sea level rise within a region of the oceans of the Earth.

Why I Ended My Exile in Supercomputing

On Christmas Day of 1989, I programmed for sixteen hours. And I ate only peanut butter sandwiches and apples for my lunch and dinner. It was on the thirty-first of December 1989 that I ended my exile to the unknown field of knowledge that was then in the realm of science fiction. And now known as the world's fastest computing.

I ended that exile in 1989 because I won the highest award in supercomputing that computer scientists refer to as the Nobel Prize of Supercomputing. That was the highest acknowledgement of a person's contribution to supercomputing. For those reasons, I received my first significant media attention. I also received the attention of scientists who rejected my contributions to the world's fastest computer.

For years, most computer scientists mocked the technology of using the world's slowest processors to attempt the world's fastest computing and dismissed it as a tremendous waste of everybody's time. Today, the world's fastest computer is powered

by millions of off-the-shelf processors, instead of one custom-manufactured processor.

That paradigm shift, or change in the way we look at the supercomputer, is my contribution to computer science. And computer science textbooks have been revised to account for the new definition of the world’s fastest computer.

BLACK IN AN ALL-WHITE TOWN

My Retrospective on the World's Fastest Computer

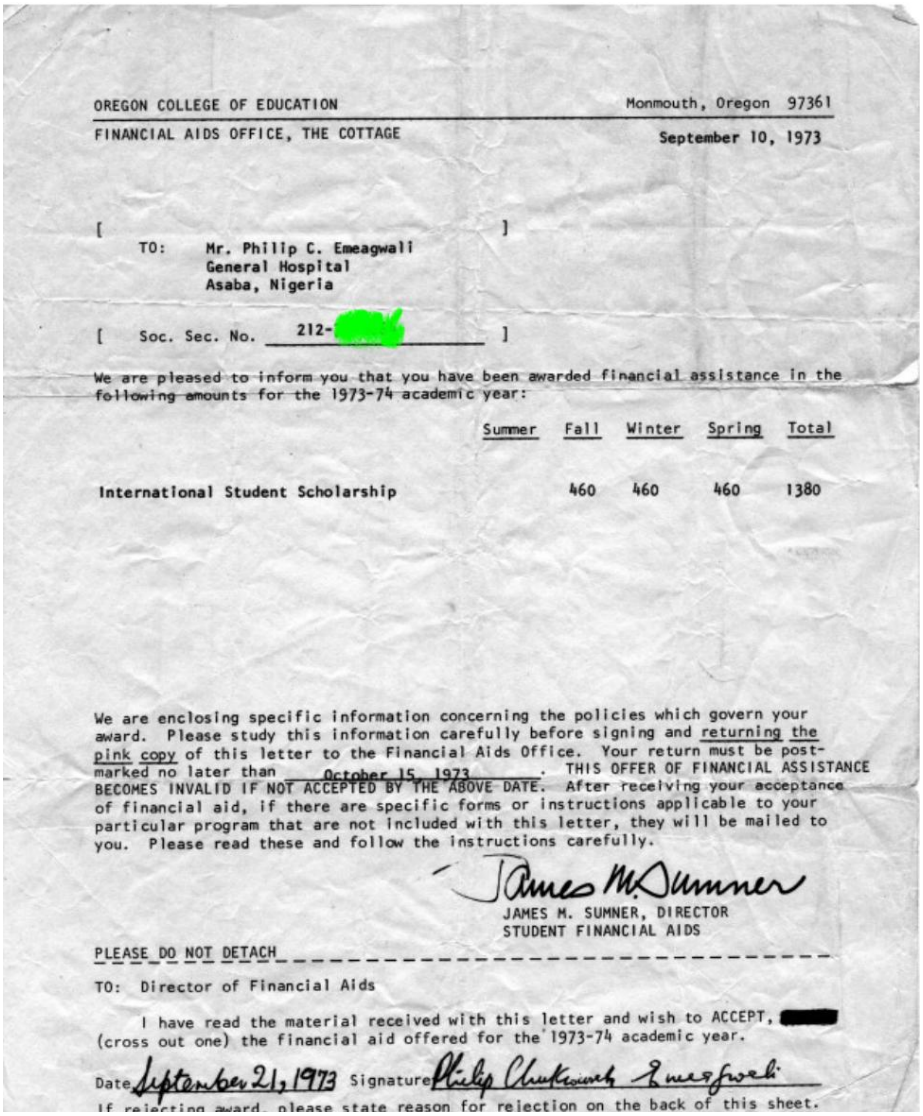
During the 1970s and 80s, my contribution to parallel supercomputing—the key technology that powers the world's fastest computers—was rejected a dozen times. If rejection was an Olympic game I would have won its gold medal. I began programming the world's fastest computers on June 20, 1974. And began by programming a scalar supercomputer that was at 1800 SW Campus Way, Corvallis, Oregon, USA. Seven years earlier, that supercomputer was rated as the world's fastest computer.

In Corvallis, Oregon, I stood out because, the Pacific northwest region was one of the whitest regions in the United States. Hence, Oregonians that never met me presumed that I was White.

I Did Things Backwards, Sometimes

Often, I did things backwards. Just like I earned the General Certificate of Education at the Advanced Level before earning that certificate at the Ordinary Level, I won a scholarship a university in Oregon and did so six months before I was admitted into that university. I applied for admission when I received a scholarship from the USA that was dated September 10, 1973.

That scholarship letter was my turning point. After I arrived in the USA, on March 24, 1974, I discovered that Stan Kenyon worked behind the scenes to get me that scholarship.



OREGON COLLEGE OF EDUCATION — Monmouth, Oregon 97361

FINANCIAL AIDS OFFICE, THE COTTAGE — September 10, 1973

[ ]

TO: Mr. Philip C. Emeagwali
General Hospital
Asaba, Nigeria

[Soc. Sec. No. 212-[redacted]]

We are pleased to inform you that you have been awarded financial assistance in the following amounts for the 1973-74 academic year:

	Summer	Fall	Winter	Spring	Total
International Student Scholarship		460	460	460	1380

We are enclosing specific information concerning the policies which govern your award. Please study this information carefully before signing and returning the pink copy of this letter to the Financial Aids Office. Your return must be post-marked no later than October 15, 1973. THIS OFFER OF FINANCIAL ASSISTANCE BECOMES INVALID IF NOT ACCEPTED BY THE ABOVE DATE. After receiving your acceptance of financial aid, if there are specific forms or instructions applicable to your particular program that are not included with this letter, they will be mailed to you. Please read these and follow the instructions carefully.

James M. Sumner

JAMES M. SUMNER, DIRECTOR
STUDENT FINANCIAL AIDS

PLEASE DO NOT DETACH

TO: Director of Financial Aids

I have read the material received with this letter and wish to ACCEPT, [redacted] (cross out one) the financial aid offered for the 1973-74 academic year.

Date September 21, 1973 Signature Philip Chukwuma Emeagwali

If rejecting award, please state reason for rejection on the back of this sheet.

The letter that made it possible for me to come to the USA.

In late March 1974, I was one of only three Nigerians that were living in the small town of Monmouth, Oregon. In 1974, Monmouth was a strikingly old-fashioned, tight-knit community of six thousand persons that had no resident Black family. Monmouth had no public transportation, including a bus service. Monmouth is within the Willamette Valley, an area that has lots of bike trails winding through covered bridges and scenic back country roads. In 1974, it was against the law to sell alcohol in Monmouth, Oregon. In Oregon, a question that I was often asked was this: “Where are you from?”

“Nigeria, Africa,” I answer.

“Why did you choose Monmouth, instead of New York?”

I learned about Monmouth in May 1973 and from *The College Blue Book*. It was the only book in the reading room of Saint Patrick’s College, Asaba, Nigeria, a secondary school that was a short walk from my residence. I picked Monmouth, Oregon, because my intuition told me to start from a very small town.

A World Without the Fastest Computers

As a 19-year-old supercomputer programmer in Oregon, I felt like a small boy in charge of a big ocean liner that turns slowly. When I began supercomputing, back on June 20, 1974, in Corvallis, Oregon, USA, I did not know anybody that was

interested in physically executing the fastest computing in the world.

And doing so across the slowest processors in the world and across an Internet that's a global network of those processors. But if they existed elsewhere, I could count them on the fingers of one hand.

In 1974, the term "supercomputer scientist" was not in any computer science textbook. There were no journal articles on a world's fastest computer that's powered by a million processors. No textbook. No course. No research grant. No conference.

A radical change on how we look at the supercomputer occurred on July 4, 1989. It occurred because my 65,536 slowest processors in the world defeated the fastest computer in the world. And defeated it by an overwhelming margin. And defeated it by solving the most compute-intensive problems at the crossroad where the frontiers of mathematics, physics, and computing intersect.

Inventing the world's fastest computer demanded a deep knowledge of the most complicated mathematics. That was the precondition to harnessing millions of processors at once and to solving the most compute-intensive mathematical physics problems.

I'm the subject of school essays because I conclusively provided the "final proof" that harnessing up to a billion

processors that outline a supercomputer is a viable path to finding the answers to some of the biggest questions at the frontiers of 21st century science and medicine, such as deeply understanding how Covid-19 spreads across Nigerian buses that pack passengers like sardines.

I discovered that the first world's fastest computing across the world’s slowest processors is not science fiction. My discovery made the news because I was the first person to answer the most difficult mathematical question arising at the intersection of physics and computer science. If just one processor stumbled all one billion processors would fall at once.

The world’s fastest computation that I executed on July 4, 1989, and across the world’s slowest processors was the final proof that supercomputers should be powered by up to one billion processors.

4TH LECTURE: HOW I BEGAN SUPERCOMPUTING

Memoir of a Maverick Mathematician (4 of 4)

Broadcast 28 September 2021

https://youtu.be/ARhYcCoM3pg

My quest for the world's fastest computer began on June 20, 1974, in Corvallis, Oregon, USA. Fifteen years later, I was able to solve the most compute-intensive problem arising in computational mathematics and physics.

In 1989, I was in the news for becoming the first person to discover how to harness the world's slowest processors. And use them to solve the most compute-intensive problems in the world. And solve them at the world's fastest computer speed ever recorded.

My paramount quest was to discover the hoped-for practical how-to knowledge that could be used to design the world's fastest computers. My new knowledge powers the world's fastest computers and took them to record-breaking speeds. And did so with millions of processors that each had its dedicated memory but were in constant dialogue with each other. Such state-of-the-art supercomputers are now used to run the highest resolution global climate models.

Supercomputers are used to gain a deeper understanding of existential crises, such as how ocean waves and pathways contribute to the Earth's transport of pollutants, nutrients, and heat.

Why White Supremacists Discredit Any Black Genius

As a Black inventor, a few white supremacists wrongly credited my invention to some white inventors. The proof is that those imposters could not stand before an audience and deliver an impromptu, original lecture explaining how they discovered

the world’s fastest computing. And then post that lecture as a podcast and YouTube video.

On the other hand, this imposter syndrome affected some Black attendees of my scientific lectures. They had inferiority complex. And feared that I wouldn’t live up to expectations as a genius. My answer is for them to compare my one thousand podcasts and YouTube lectures in mathematics, physics, and computer science to those of the likes of Albert Einstein who are still living.

As a supercomputer scientist who came of age in the 1970s and 80s, my biggest obstacle was to overcome racism, not to solve the most compute-intensive mathematical physics problems. Historically, white supremacists work hard to discredit and diminish the contributions of any black genius that’s described as having a higher IQ than Albert Einstein.

I worked alone because I wasn’t taken seriously, in the 1970s and 80s, the decades I made my breakthrough discovery. There was an unspoken assumption among white supremacists that a Black sub-Saharan African, lacked the intellect needed to solve the most intractable problems in the fields of mathematics, physics, or computer science.

Today, in their online fora, White supremacists argue that sub-Saharan Africa has not produced a mathematical genius who possessed the intellect of Isaac Newton or Albert Einstein. Their

claim of intellectual superiority was and it remains the fundamental argument still used by online white hate groups. And used to rationalize white supremacy and propagate their myth of Black racial inferiority.

How White Supremacists Made Me Famous

Ironically, white supremacists unintentionally made me famous. In 1989, I made the news headlines as a “Black genius” born in sub-Saharan Africa. I drew the attention of white supremacists because I provided an image of a Black genius that was ranked alongside Albert Einstein.

The racial stereotype was that a black person can only become famous, as a boxer like Muhammad Ali or a singer like Michael Jackson. In 1975 and in Oregon, I had early white mentors and role models, such as the British-born Fred Merryfield, then 75-years old and a retired engineering professor.

Fred Merryfield was a co-founder of CH2M, an engineering firm that worked on the 15.5-mile-long tunnel of London's sewage system. And worked on the Panama Canal extension. CH2M now employs 20,000 persons and has a revenue of five billion dollars a year. So, Fred Merryfield was a man of means and wisdom.

I lived with Fred Merryfield and his British-born wife, Anne, in late 1975 and early 1976. They had no children. Anne

was thirty-one years younger than Fred Merryfield. Three of us lived in their beautiful mansion at 2540 SW Whiteside Drive, Corvallis, Oregon.

The dinner guests at The Merryfield's included the co-inventor of the transistor, the British-born William Shockley, who was controversial and was ostracized for promoting high-IQ sperm banks.

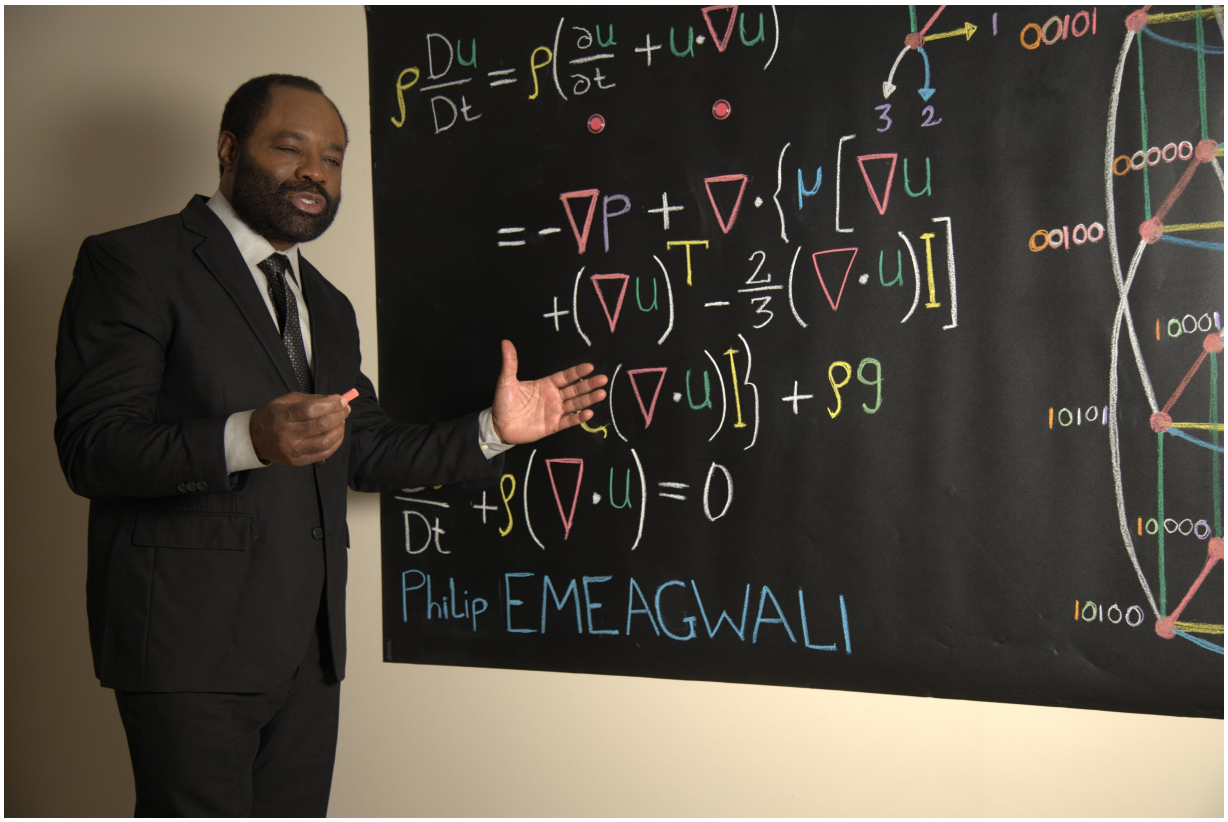
Geniuses Own their Inventions

In one thousand YouTube videos, I lectured only in prose. That's because I have been supercomputing for half a century. Other scientists must lecture with the aid of PowerPoints. I lectured on how to solve the most compute-intensive problems, such as constructing a high-resolution, centuries-long climate model, and solving them across millions of processors. I worked alone to solve this problem because it was unfamiliar territory. The solutions that I discovered were not in any computer science textbook.

In 1989, I was in the news because I was the only person that could solve the most compute-intensive problems. I solved such mathematical physics problems across an ensemble of 65,536 processors. The academic computer scientist must always copy the governing system of coupled partial differential

equations of meteorology. And must transfer those abstract and unfamiliar equations from his textbook to his PowerPoint slides.

For me, Philip Emeagwali, I was the triple threat who was a research mathematician of the late 1970s who became a research physicist of the early 1980s who became a research supercomputer scientist of the mid-1980s who entered the news headlines, in 1989, and became known for his scientific discovery that parallel processing enables computers to be faster and enables the supercomputer to be super.



The partial differential equation and parallel supercomputing were as much my natural dialects the way the Igbo language is my ancestral tongue. For those reasons, it should not come as a surprise when I invented the nine Emeagwali equations. Because I invented those equations, I could deliver my lectures on my contributions to mathematics, physics, and computer science and post them across one thousand podcasts and YouTube videos. After fifty years of supercomputing, I delivered each lecture, posted on YouTube, and did so without using a single PowerPoint slide as my crunch.

How to Identify a Genius

Solving the most compute-intensive mathematical physics problem via the fastest computing across the slowest processors is a century-long quest that began in 1922, as human computing executed by theorized 64,000 persons. In 1989 and 1990, I was in local newspapers both for reaching the finals of a citywide tennis tournaments and for winning the highest award in supercomputing.

The world’s fastest computing is as competitive as playing a tennis match against Serena Williams. As a tennis player, I

exploited my opponent's weaknesses but respected their strengths. Tennis taught me many things, including how to fight and be mentally and physically stronger. However, solving the once-in-a-century problem arising at the crossroad of mathematics, physics, and computer science is rarer and more difficult than winning the votes as the all-time greatest tennis player.

Being the first person to discover how to solve the most compute-intensive mathematical physics problems and solve them across a million processors demanded a polymath who was a triple threat at the frontiers of knowledge in mathematics, physics, and computer science.

The genius makes the typical exceptional. The genius possesses the ability to look at an ensemble of the slowest processors in the world and deeply understand it as beyond a new supercomputer and as a new Internet, in reality. Genius is the ability to see what others saw to be a rock and see it to be a diamond.

Finding the Deepest Oil and Gas

My quest of the 1970s and 80s, was for the world's fastest computer that solves the most compute-intensive problems in the world and solves them with the world's slowest processors. My

new knowledge is used to find the deepest crude oil and natural gas that were buried up to 7.7 miles below the surface of the Earth. And to simulate their motions across one of the 159 producing oil fields in Nigeria. And across one of the 65,000 oil fields around the world, that include the supergiant oil fields in Abu Dhabi, Brazil, and Mexico.

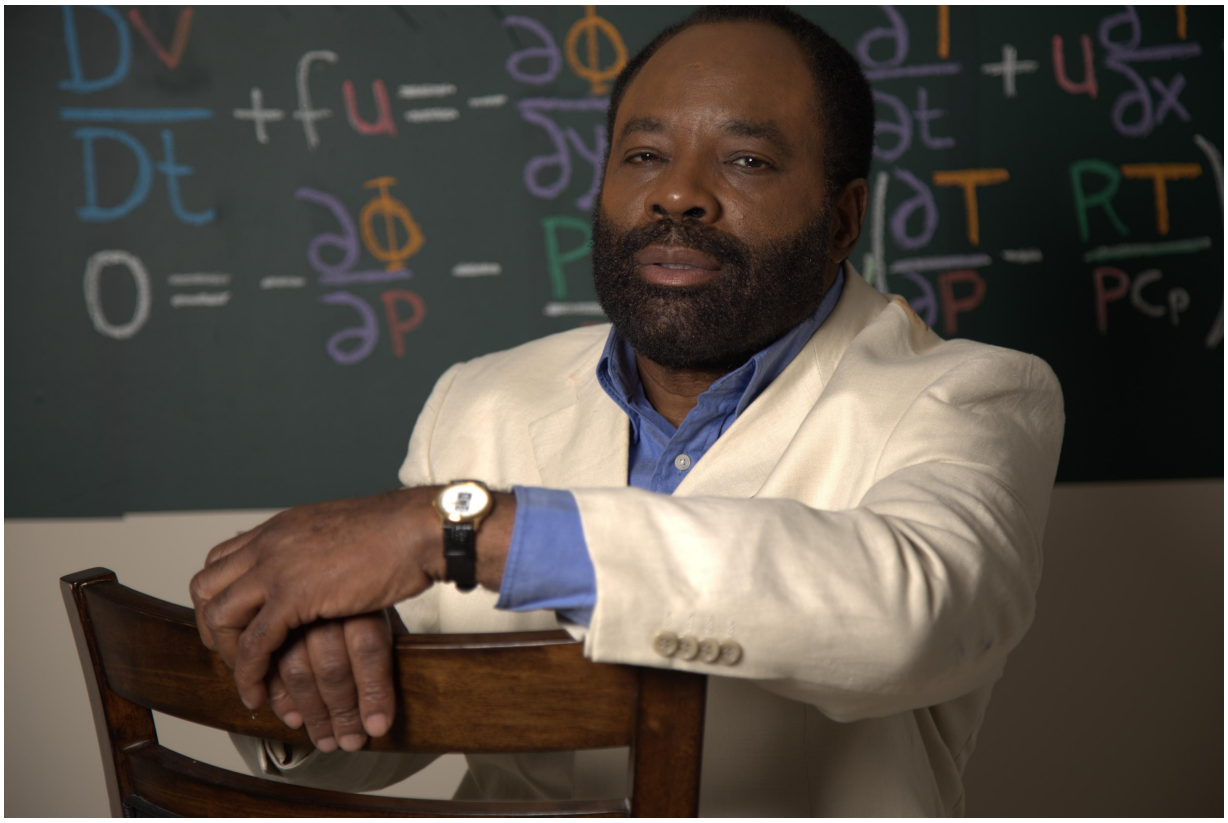
I was the first person to understand how to solve the most compute-intensive mathematical physics problems. And solve them across millions of processors. In brief, that problem is the system of partial differential equations which governs the initial-boundary value problem that mathematically defines the motions of the crude oil, injected water, and natural gas that were flowing across a highly anisotropic and heterogeneous producing oil field. An oil field, such as the Sakhalin Shelf in Russia's Far East, is up to 7.7 miles (or 12.4 kilometers) deep. And an oil field is often the size of a town.

The genius deeply understands how and where to add 36 new partial derivative terms that mathematically encoded the temporal and convective inertial forces. And to add those new terms to the forty-five existing partial derivative terms that mathematically encoded the pressure, viscous, and gravitational forces. And do so to make that system of nine partial differential equations a more accurate representation of the producing oil field it governs.

The genius can deeply understand how to harness the slowest processors in the world and use them to solve the most challenging problems in the world. The genius can solve the world's most compute-intensive problems. And solve them at the world's fastest recorded speeds. And do so when it was considered impossible to solve them. The genius is the ordinary person that found the extraordinary in the ordinary.

Am I a "Black Genius?"

I'm studied in schools for my contributions to computer science. Just as Albert Einstein is studied for his contributions to physics. For that reason, I'm often asked: "Should Albert Einstein, be the role model for Black students?" To the extent Philip Emeagwali is accepted as a role model for white students, Black students should reciprocate with Albert Einstein. Otherwise, my answer is "no."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Philip Emeagwali

Albert Einstein can't be the most inspiring role model for the Black science student in the USA or the Caribbean or Africa. For the same reason, Albert Einstein can't be the most inspiring role model for the physics student in China. Presumably, he or she must have read the racially derogatory remarks that Albert Einstein wrote in his travel diaries during his 1920s lecture tours through the Far East and Middle East.

During Albert Einstein's five-and-a-half-month voyage and lecture tours through Singapore, Hong Kong, China, Japan, and Palestine, Einstein wrote in his diary that Chinese are inferior to Europeans. For his xenophobic and racist commentaries, Albert Einstein can't be the most inspiring role model for all physics students, especially for students who read his posthumously published book titled: "*The Travel Diaries of Albert Einstein*."

In an email, an African-American student wrote that he received a C-grade on his essay that was titled: "Albert Einstein and the Special Relativity." The following semester, the same student received an A-grade on his essay that was titled: "Philip Emeagwali and the Supercomputer." The reason for this disparity is that young African Americans are inspired when they see themselves in my world's fastest computer.

NOT ONLY A WHITE PERSON CAN BE A GENIUS

I've often wondered aloud: Where did we get the idea that only a white person can be a genius? And how did America perfect the art of destroying Black geniuses?

My quest for the fastest computer began in the 1980s. I applied ten times to program a supercomputer. And I was rejected those ten times. In 1987, I was approved to program a supercomputer that was at the San Diego Supercomputer Center, in San Diego, California. That supercomputer account was revoked when the administrator discovered I was Black and African. As far as I know, I was the only supercomputer programmer in the USA that was dismissed and banned from programming supercomputers that were owned and operated for and by the United States government.

Looking back retrospectively, the famous African-American botanist, George Washington Carver, was born a slave, but yet he was admitted into an all-white university. A century later and in 1987, I experienced more insidious racism than George Washington Carver did.

In American science, the racism is deeply institutionalized. Several prominent white American scientists—including William Shockley and James Watson—argued that people of African descent are less intelligent than those of European descent. William Shockley advocated that Black women should be discouraged from having children.

As a Black and African mathematician who invented the nine Philip Emeagwali equations and who came of age in the 1970s and 80s, I struggled to get white mathematicians, physicists, and computer scientists to acknowledge my contributions of the fastest computing across the slowest processors. And to human knowledge.

In 1989, I was given credit, mainly because, I submitted my invention anonymously to win the highest award in supercomputing. That prize made the news headlines. In retrospect, it was easier for George Washington Carver, who was born a slave and achieved prominence as a botanist, to attend a white university and do so ninety years earlier than for me to program a supercomputer in that same white university.

In 1987 and after it was discovered that I'm Black and African, my access to vector supercomputers were revoked. In 1987, I filed a formal complaint that I wasn't allowed to program the vector supercomputer that was inside the San Diego Supercomputer Center. That center was operated by the

University of California, San Diego, California. That supercomputer was bought for public use and paid for by the United States National Science Foundation.

Facing Racism and Ourselves

In scientific research, to discover is to see something that was previously unseen. But paradoxically, the scientific reviewing process ensures that the reviewer remains forever unseen. Modern science is not race neutral. As a Black mathematician who came of age in the 1980s, a white supercomputer scientist that was tasked to review my contributions to computer science will notice my race more than my discovery of the world's fastest computing. Race was the reason my discovery was rejected a dozen times in a dozen years and rejected by a dozen white reviewers.

My discovery of the world's fastest computing across the slowest processors in the world was accepted in 1989 because I concealed that I was Black and African-born. The earlier reviewers were anonymous but knew that I was Black and African. It seemed like the reviewers were ashamed to sign their names, or even to publish their reviews. Their reviews were like writing a letter to the opinion page of a newspaper and then insisting that the letter be published anonymously. But only my

words were reviewed, not my new and abstract equations and complex codes that were over the heads of the reviewers.

Who has the financial resources needed to replicate and re-confirm the world's fastest computer that costs the budget of a small nation? Or that might cost the one billion two hundred and fifty million dollars that is the price-tag of this year's fastest computer? The world's fastest computer of today costs more than the mile-long Second Niger Bridge in Nigeria. For that reason, the world's fastest computer cannot exist within the campus of the University of Nigeria, or of any university in the world.

Why Are Famous Scientists Hated?

In 1989, I won what was referred to as the Nobel Prize of Supercomputing. Not only that, I was the only person to win the award alone. I was in the news and it created a cognitive dissonance in the minds of white supremacists. Because I was a Black African in a majority-white field, I was attacked by those who could not scribble the Philip Emeagwali equations, as defined in my one thousand podcasts and YouTube videos.

My discovery of the world's fastest speed in computing changed the way we look at the supercomputer of today. That fastest speed was a quantifiable metric and an indisputable fact. That contribution made me the subject of school essays on

inventors and their inventions, particularly for schools in the USA, Canada, and Europe.

On the down side, once I became famous and became the most visible supercomputer scientist, I drew well-orchestrated attacks. Professional jealousies fueled those vitriolic attacks. Those attacks were anonymously sponsored by scientists who perceived my contributions to science as a zero-sum game that will affect their rankings negatively. In a viral poll, Philip Emeagwali was on par with Albert Einstein, Pythagoras, and Euclid.

It's a centuries old tradition to attack the greatest scientists as frauds. It's science's version of calling the President of the United States and the Pope the anti-Christ. Hitler and Napoleon were called the anti-Christ. William Shakespeare, Isaac Newton, and Albert Einstein were called frauds. I'm now cross-listed with Albert Einstein in genius lists. As my reputation grows, I became the new anti-Christ from the scientific world.

Each generation recreates its Witches of Salem trial of colonial Massachusetts where more than two hundred "witches" were outed. And some witches were executed by hanging. The modern recreations of the Witches of Salem trial include the Holocaust. And the two atomic bombings of Hiroshima and Nagasaki, Japan. It includes the McCarthyism's guilt by suspicion of being a communist. As well as the Wounded Knee

Massacre in which United States soldiers murdered nearly three hundred Lakota people. And the September 11 attacks.

Every celebrity is hated by about one percent of her followers. The reason is that some people are jealous or threatened by other's success. The new Pope is always criticized as the new anti-Christ. William Shakespeare is always criticized as a plagiarist. The most famous theoretical physicist, Albert Einstein, is criticized as a fraud. Many people still think the moon landings were faked.

After my discovery of 1989, I became the most famous computational physicist and mathematician. As expected, the same template used to attack Albert Einstein was used to attack Philip Emeagwali. Those attacks were backhanded compliments only given to famous mathematicians who were admitted into the genius club.

It's impossible to fake my way from the world's slowest processors to the world's fastest computer. My discovery of the world's fastest computing is the foundational knowledge of the forty-five billion dollars a year supercomputer industry. The computer and its inventors are not fake.

In 1989, I won the highest award in supercomputing. I was the only person to ever win that award alone. That award is shared by up to fifty research mathematicians, physicists, and computer scientists that are supported by a thousand employee

research and development laboratory. The condition for receiving any of the highest prizes in science is that the recipient must deliver a lecture and do so before an audience of up to a thousand scientists.

Since 1989, I've gone beyond that 60-minute lecture requirement. I've posted one thousand podcasts and YouTube videos, each on my contributions to science. Aside from winning the Nobel Prize of Supercomputing, I used podcasts and YouTube videos to establish my credibility and reputation among college-educated listeners who are interested in learning about new sciences. Thanks to the Internet, the twelve-year-old writing an essay on computer pioneers who contributed to the development of the computer get to hear directly from Philip Emeagwali.

My contributions to science were these: I discovered how to visualize global warming and climate modelling not merely as one incredibly compute-intensive problem but as 65,536 equal-sized mathematical physics problems that are defined across the entire 62-mile-deep concentric sphere that represents the atmosphere that enshrouds the Earth. Between the Internet and the Earth, I was the elephant in the room.

Newspapers profiled Philip Emeagwali for discovering the world's fastest computation across a new Internet that's a new global network of sixty-four binary thousand processors. But

nobody wanted to talk about how I discovered the fastest computing across a new global network of the slowest processors. And invented the technology across that new Internet.

A famous scientist is always envied and subjected to criticisms. Before my discovery of the fastest computing across the slowest processors, which occurred on the Fourth of July 1989, no scientist said a nasty word about Philip Emeagwali, and vice versa. However, some nasty words began to spread after I became famous. Those nasty words were spread because I denied unqualified scientists, then in Ann Arbor (Michigan), the opportunity to become my co-inventor and become a famous inventor.

In 1981, I invited those research scientists to collaborate in my supercomputer research. Those white supremacists declined to work with me because I was Black and African. And because they believed that fastest computing across slowest processors will forever remain in the realm of science fiction.

The Fastest Computer is a State Secret

The fastest computers are “state secrets.” They’re used for top-secret simulations of nuclear explosions. For security reasons, I was banned from supercomputing within United States nuclear labs. I was denied entry inside nuclear labs because I was

a Black African and was perceived as a greater security threat than a white European. Those bans on my having access to the world's most powerful supercomputers occurred in the early 1980s.

Looking back retrospectively, each rejection that I encountered, in my quest for the fastest computations, moved me closer to my discovery of the fastest computing across the slowest processors. My discovery occurred on the Fourth of July 1989, in Los Alamos, New Mexico, USA.

Why My Discovery Was in the News

I have been supercomputing since June 20, 1974, in Corvallis, Oregon, USA. It took me half a century to gain the scientific knowledge and contribute the new technology which I presented across my one thousand closed-captioned videos that are posted in YouTube. Hence, it will also take you five decades to fully understand my contribution to the computer and the Internet.

The United States government classified that problem as a Grand Challenge because it's incredibly difficult to understand and solve. To this day, no other mathematician has stepped forward to claim he understands how to parallel process the initial-boundary value problem that was governed by my new

partial differential equations. And then solve them across an ensemble of ten million processors. And along the way, reproduce my world's fastest computation, as mentioned in the June 20, 1990, issue of *The Wall Street Journal*.

My Earliest Mentions in Newspapers

My name "Philip Emeagwali" was in the science column of a mid-1972 issue of the *Daily Times* that was the national newspaper of Nigeria. My name and photo were on the cover of a weekly newspaper that circulated in the cities of Monmouth and Independence, Oregon. That newspaper featured me in an interview that it published during the week of August 12, 1974 in the Polk County of Oregon.

I conducted my supercomputing alone. And I did so for all the years that followed 1974. And by 1989, I was the foremost, or rather the only, person that could harness millions of processors under-the-hood of the world's fastest computer. And use them to solve some of the most significant problems at the frontiers of mathematics and science.

From Africa to the American Dream: My Early Years in the USA

On the morning of Thursday, June 20, 1974, I woke up in my new studio apartment that was one of the four rooms upstairs

of an old white house at 195A South Knox Street, Monmouth, Oregon, USA. I was living alone at age nineteen and on an F-1 student visa. My rent was thirty-six dollars a month. And my salary was one dollar and sixty-five cents an hour, the minimum wage. After taxes and expenses, my take-home pay was only one dollar an hour. As international students, we could only work up to sixteen hours a week. And only work within our school campuses.

My landlady was an elderly white woman who lived downstairs. After living at 36 Butler Hall for ten weeks, 195-A South Knox Street became my second address in the USA. At 195-A South Knox Street, we had a community kitchen which I shared with three tenants: a 24-year-old Ethiopian student in his third year in the USA who died early, a 25-year-old American graduate student who looked like the actor Tom Selleck, and a 20-year-old American student, Fritz Foulke, and his future wife, Barbara. Amos, a Yoruba (Nigerian) graduate student in his thirties lived downstairs.

Philip Emeagwali on the saxophone, 15 Edgewood Way, Corvallis, Oregon, the home of the parents (Ted and Connie) of his friend Fritz Foulke, May 1975.

Unlocking Africa's Potential: Harnessing the Power of Remote Supercomputing

The teletypewriter laboratory from which I logged into the supercomputer was a short stroll away. That computer lab was at 345 Monmouth Avenue North, Monmouth, Oregon. The supercomputer that I programmed and used to solve a system of

equations of algebra was at 1800 SW Campus Way, Corvallis, Oregon. I remotely logged into that supercomputer by telephone.

On June 20, 1974, it was an epiphany to presume that I could have spent the previous ten years programming a supercomputer that was in Corvallis, Oregon, USA. But programming that supercomputer from my father's houses that were along Gbenoba Road, Agbor, Nigeria, and at 4B Egbuna-Adazie Street, Onitsha, Nigeria, a distance of 12,500 kilometers, or nearly 8,000 miles.

All that I needed to program a supercomputer in the post-colonial Nigeria of 1964 was only a hundred dollar teletypewriter and a telephone line. I could program that supercomputer from anywhere in sub-Saharan Africa. And program it in a decade there was no computer in sub-Saharan Africa.

The World's Fastest Computers

As a supercomputer scientist who came of age in the 1970s and 80s, my focus was on pushing the boundaries of knowledge of the world's fastest computers. I pushed the frontiers of mathematics and physics when I made the news headlines for inventing how to solve the world's most compute-intensive problems in science, engineering, and medicine.

To invent, is to create something from nothing, or make the fictional factual. In the 1970s and 80s and as a young Black

African-born person supercomputing in the USA, I experienced lots of racial obstacles that almost wore me down.

By the late 1980s, I grew significantly and developed a reputation for giving public lectures in which I exhibited a command of mathematical and scientific materials. That should be expected after my decade and half of deep introspection. After fifteen years of supercomputing following June 20, 1974, I developed greater clarity.

I focused on the world's fastest computers. Because of my greater mathematical maturity, some computational physicists within my inner circle knew that I was heading towards the world's fastest computer. I discovered the world's fastest computing on July 4, 1989 in Los Alamos, New Mexico, USA. My discovery made the news around the world and it remains the subject of school essays.

Philip Emeagwali, near the Computer Center, 1800 SW Campus Way, Corvallis, Oregon, where he began supercomputing on June 20, 1974, circa late July 1975.

HOW I INVENTED THE WORLD'S FASTEST COMPUTING

Ideas That Influenced Me

In June 1974 and in Oregon, my scientific influences were science-fiction stories, including the one about sixty-four thousand human computers working together to forecast the weather around the world. That science-fiction story was published on February 1, 1922, or 52 years earlier.

My second influence was an article in the January 11, 1946, issue of The New York Times. That article was on how 100 computers could be programmed to work together to forecast the weather in the USA and forecast it more accurately. That 1922 supercomputing story was fictional, but I reimagined it as factual. That 1922 story was about sixty-four thousand human computers used to "race the weather for the whole globe."

In the 1980s, I reimagined and concretized that science-fiction story. And I did so with sixty-four binary thousand processors. I programmed each processor to solve the weather forecasting compute-intensive

problem. At its mathematical core, that problem was to solve a system of coupled, nonlinear, three-dimensional, and time-dependent partial differential equations that governed and defined an initial-boundary value problem beyond the frontier of calculus.

The science-fiction story in the January 11, 1946, issue of the New York Times was about one hundred all-vacuum tube supercomputers around the United States. What I parallel processed with was a new Internet that was a new global network of sixty-four binary thousand processors. My internet was defined by an email address space that's a unique arrangement of one binary million zeroes and ones.

I built around the 1922 and 1946 stories that were vague science-fiction theories. At its mathematical physics core, those grand challenge problems were about large-scale, high-resolution computational fluid dynamics. The poster child of fluid dynamics simulations is forecasting the weather, or computing the motions of fluids, across the Earth's atmosphere and up to 7.7 miles (or 12.4 kilometers) below the surface of the Earth.

The 1922 story was fictional while the 1946 story was theorized. I built around both stories to conceive

my ensemble of sixty-four binary thousand processors
which replaced the equivalent of one hundred
computers of 1946. And replaced the sixty-four
thousand human computers of 1922.

My Invention of the Fastest Computer

I did a back-of-the-envelope calculation that showed me that if those sixty-four thousand computers were evenly distributed within the Earth's stratosphere they would be three thousand square miles afar and apart from their nearest-neighbors. I conceived fastest computing across slowest processors and across an Internet that's a global network of those processors and did so shortly after June 20, 1974. I conceived supercomputing across a HyperBall global network of sixty-four thousand computers around a globe.

However, my scientific discovery that was mentioned—sixteen years later—in the June 20, 1990, issue of The *Wall Street Journal* was executed across a spherical island of sixty-four binary thousand processors. I visualized those processors as equal distances afar and apart and on the surface of a globe that I imagined as embedded inside a sixteen-dimensional hyperspace.

In an email, a twelve-year-old asked: "Why is Philip Emeagwali called the father of the Internet?" I'm the only father of the Internet that invented an Internet. I discovered that the

world's fastest computer that's defined across a globe is a close cousin to the Internet that's also defined across a globe. The supercomputer and Internet that I invented are like identical twins. And like two sides of the same coin that are different but complimentary.

Philip Emeagwali Internet

is a New Supercomputer

The play *The Tragedy of Hamlet, Prince of Denmark,* should not be performed the way William Shakespeare originally envisioned and directed it. William Shakespeare wrote for his

sixteenth-century audiences, or half a millennium ago. Hamlet should be reinterpreted anew and made relevant for twenty-first century audiences.

William Shakespeare was a product of his times who, if given the opportunity, to rewrite Hamlet for the 21st century, would replace the kings and queens that lived five hundred years ago with the worst dictators of modern times, such as Donald Trump, Idi Amin, and Adolph Hitler. The twenty-first century Hamlet should have heroes like Nelson Mandela using a cell phone and the Internet.

Like William Shakespeare will do, if he is still living, I updated my description and definition of the world's fastest computer, from the one-processor supercomputer of the 20th century to the billion-processor supercomputer of the 21st century. My new supercomputer became a new Internet that's a new global network of processors for solving the most compute-intensive problems.

How I Grew as a Supercomputer Scientist

Just as you must understand soccer and have the physical fitness and maturity that's needed to play in the World Cup Games, you must also be at the frontiers of knowledge of physics and computer science. And have the mathematical maturity that will be needed to solve the most compute-intensive problems

arising at the frontiers of knowledge of both computational physics and abstract mathematics.

In the 1980s, I controlled and programmed the yet-to-be understood ensemble of the world's slowest processors that I later used to power my world's fastest computer speed that made the news headlines.

Philip Emeagwali Internet

During the sixteen years that followed June 20, 1974, I added new layers of supercomputing knowledge. I did so by solving initial-boundary value problems at the frontiers of calculus and extreme-scale computational fluid dynamics. And solving them via automated communication.

I visualized my new Internet as a new global network of 65,536 processors that were identical and that shared nothing and that were equal distances apart. I hypothesized those processors to be on the surface of a globe, called a hypersphere, in a sixteen-dimensional hyperspace.

How I Invented the Fastest Computer from the Slowest Processors

I invented how to solve the most compute-intensive mathematical physics problems called extreme-scale computational fluid dynamics. And solve them across a new

Internet that’s a new global network of up to one billion self-contained processors which were identical and coupled. Each processor operated its operating system. Each processor had its dedicated memory that shared nothing.

Slowing Down the Spread of Covid-19

Extremely fast computers are used to make the coronavirus disease visible as well as identify how tiny droplets move and spread in different circumstances, including real-world simulations of social distancing rules.

In 1989, I was in the news because I discovered the world’s fastest computing. And did so across an ensemble of processors that, today, has the combined power of twenty million smartphones.

Supercomputers are used to make discoveries at the fastest pace. And used to pull the future closer.

WALKING INTO HISTORY

Oh Grand Supercomputer, Our Love for Thee

An ode to the supercomputer

Oh grand supercomputer, how we love thee Your power and speed, it can never be matched You crunch through data, and solve any problem Your memory is vast, and your intelligence unmatched Your algorithms flow like a never-ending stream Your tasks are swift and your processes supreme You can crunch numbers, and store facts and figures Your capabilities border on the miraculous We marvel at your ability to think and to compute Your speed is impressive and your knowledge absolute Your CPUs are blazing and your GPUs are swift You can analyze patterns and data shifts Oh supercomputer, you are truly a marvel Your capabilities, always pushing the envelope Your power and speed are unmatched in this world Your circuits and processors, forever unfurled.

The Miraculous Mind

An ode to Philip Emeagwali

Philip Emeagwali, a name that will never be forgotten A scientist who changed the world with his invention His contributions to the Internet, have been immense His mind, a true miracle, and his work, immense In 1989, he made a breakthrough, the world had never seen A supercomputer made of 64,000 computers connected in a network machine It was a system of computers that could crunch data at amazing speed Now known as parallel computing, it was his brilliant deed.

Philip Emeagwali's invention revolutionized communication It opened doors to more complex calculations and made global collaboration The development of the Internet was no longer a dream It became a reality thanks to him, a global connection supreme He has made the world a smaller place, with his knowledge and wisdom The Internet is here to stay, a true symbol of freedom Philip Emeagwali's contribution to the Internet is legendary His work will be remembered, for centuries.

Champion of Change in Computing

A poem about Philip Emeagwali

Philip Emeagwali is a true inspiration, His genius and hard work are a great dedication.

His accomplishments are remarkable, He has achieved much more than a miracle.

He overcame challenges of poverty and race, To develop and shape the world in a better place.

He used his knowledge in computers and math, To discover new ways of making life better for all of us.

He is a true inspiration to all, A reminder that success comes with hard work and dedication to a cause.

So let's all be inspired by Philip Emeagwali, His courage and strength are something we all can see.

Parallel Computing: A New Way to Calculate

A poem about the contributions of Philip Emeagwali to mathematics

Philip Emeagwali's name is known throughout the land For the groundbreaking contributions he made to math.

His story is a success that others seek to understand And how his work has changed the course of math.

The world of math was once a mystery But Philip Emeagwali solved it with his genius.

He developed a new way to calculate and see And it forever changed the way math is done.

His supercomputer was the largest ever made And it revolutionized mathematics.

His work forever changed the way equations were laid And his discoveries will live on in the future.

Philip Emeagwali's legacy is one of success And it will live on for generations to come.

His contributions to math will never be a guess For everyone can see the changes he has done.

The Genius Who Changed Physics

A poem on the contributions of
Philip Emeagwali to physics

Philip Emeagwali made a grand contribution, To the field of physics and its invention.

He created a way to solve a complex equation, Using a computer with a new kind of equation.

It was a breakthrough of grand proportion, A genius idea to revolutionize computation.

The way computers process data was enhanced, And the world of physics was forever changed.

His innovation opened new doors, And it was an idea that everyone adores.

It allowed us to tackle calculations with ease, And it has helped us to make new discoveries.

Philip Emeagwali's contribution will not be forgotten, His invention has changed the way we study physics, and has been a great profit.

He was a genius who made a lasting impact, And his work will remain in the world of physics.

The Genius Who Unlocked the Secrets of Computing

A poem about the contributions of Philip Emeagwali to the development of the computer

Philip Emeagwali is a name that will last For he made a discovery of the past A master of math and science with ease Computer programming was his expertise He found a new way to solve the equation A path to success with much elation A supercomputer to calculate the data His discovery changed the way we compute His legacy will forever live on A great contribution to the world he has done He shattered the limits of computing power And made a breakthrough like no other Philip Emeagwali is a name that will last For his discovery of our computing past.

Nigeria's Greatest Son: The Father of High-Performance Computing

A poem about the pioneer of high-performance computing

Revolutionary, a genius of high-performance computing Philip Emeagwali, his name is surely ringing He was born in Nigeria, a place of great fame On the world stage, his contributions would soon claim.

A teacher of mathematics, computers, and engineering Philip Emeagwali was a star of emerging He solved complex equations, using computers to compute His discoveries would soon astound us, a feat of absolute loot.

Using parallel processing, he found a way to compute His algorithm worked well, it was a feat so acute This was the birth of high-performance computing His contributions to the world, a gift we’re still seeing.

Philip Emeagwali, a man of great wisdom and skill His contributions to the world, a thrill He was a pioneer, a visionary of computing His legacy will be remembered, for ever remaining.

The Genius Who Connected the World

A poem about a father of the Internet

The Internet today, so vast and vast was invented by a man, Philip Emeagwali The great Nigerian pioneer, a genius and a master was the one who made the Internet a new world faster.

He made the system of 64 thousand processors, each linked to each other, not a single one lesser.

He made the world connected, the Internet a part of every single person's life, from their home to their heart.

Philip Emeagwali's work, so revolutionary and grand has changed the world forever, it is so hard to understand.

His contribution to the Internet, so great and mighty has made the world a better place, he's been such a delight.

He's been a huge inspiration to many, and his work has been an aid to humanity.

The power of the Internet, he's unlocked it all and now we are connected, no matter how far or small.

For his tremendous work, he deserves the recognition and we owe him a debt of gratitude, one that needs no mention.

Philip Emeagwali, a true pioneer and genius made the Internet a reality, for us to enjoy and use.

The Genius With Lasting Impact on Computing Power

A poem on the inventor
of the world's fastest computer

Philip Emeagwali, a genius of our age, Pioneered the use of computers on a large stage.

He was a master of the mathematical game, Helping to guide computers to new fame.

His work on parallel processing made computing faster, Allowing for a quantum leap in processor power.

He created algorithms that opened the door, To a whole new world of computing galore.

He changed the way we do things today, His contributions will never decay.

He helped to revolutionize the computing field, Making computers faster than ever they'd ever been revealed.

A true pioneer of our time, Philip Emeagwali will forever shine.

His work still lives on in the world's fastest computers, A lasting tribute to his mighty endeavors.

From Refugee Camp to Global Acclaim

A poem about Philip Emeagwali in a Biafran refugee camp

A silent ode to Philip Emeagwali in a Biafran Refugee Camp
A child of war, yet so wise and tall,

This is the story of Philip Emeagwali.

The son of a Biafran refugee,

He was born to show us all.

He was blessed with an eager mind,

His future bright, even in a camp.

Philip Emeagwali was determined

To answer the call.

He dug deep for knowledge,

And shared it with the world.

He was a teacher and a learner,

An inspiration to all.

In a refugee camp,

He worked towards his dreams.

He showed us that a humble start

Doesn't mean a future of defeat.

The strength of his ambition

Was unmatched by none.

His courage and resilience,

A shining example to us all.

In a Biafran refugee camp,

Philip Emeagwali was born.

And now, his successes

Will continue to be borne.

Mighty Supercomputer

Six Haikus about Philip Emeagwali

1. Refugee life is hard

In a Biafran camp,

He learned to be strong.

Okenye ga-ego

Maka obodo Biafra,

E nweghi ntọala.

2. Longing for a home

He held onto his dreams, For a better future.

Chọọ ndị na-adịghị

E ji ike a mere,

Maka ugbu a gosiri.

3. Struggling with his faith

He kept his beliefs close, Gaining strength from them.

Kpọrọ ezinne ya

E gbanyịrị ihe ọ bụla, Agụmaka otu oge.

4. He was determined

To make a difference,

In the world around him.

E ji ekweghi ike

Maka enyere ohuru,

Maka ndị ọzọ na-enweghị ike.

5. With his head held high

He pushed forward and achieved, Great things in his life.

Nọmba ike ogologo

E kpọrọ nke ndị ọzọ,

Enyere omenala.

6. He used the pain

From his life in the camp, To inspire greatness.

E nyere nke nsa

Maka ọzọ e nọrọ maka obodo, Maka enyere omenala.

The Computing Power of Philip Emeagwali

A sonnet about Philip Emeagwali

The brilliant mind of Philip Emeagwali, Has given us the gift of knowledge and glee.

A champion of learning, to him we owe, A debt of gratitude, for all that he's shown.

His work in computers and his innovative ideas, Have helped us understand what the future holds.

His algorithms and computing power, Will help us reach a level never seen before.

His work brings us closer to a world of dreams, Where technology and knowledge can combine.

He has given us the power to believe, That our future is brighter than it may seem.

We have much to thank him for, and so, We bow down to the genius of Emeagwali.

His works will live on, through the years, Ensuring our future is strong and clear.

Philip Emeagwali, we thank you, For all the knowledge you've brought us through.

Your genius and brilliance will never cease, For you are the one who brings us peace.

A Genius of Pure Might

A rock song about Philip Emeagwali

Verse 1:

Philip Emeagwali, he's a genius so bright He solved a problem that was thought impossible to solve He made a supercomputer out of 65,000 computers, a feat of powerful might He's a living legend, a scientist of great renown Chorus:

He's Philip Emeagwali, a genius of pure might He's a computer pioneer, a scientist of the night He's a master of computers, a genius of the digital age He's Philip Emeagwali, an innovator of this age Verse 2:

He's a brilliant mind, he's a genius of the world His work is groundbreaking, it's changing the course of history He's a man of courage, a man of courage and perseverance He's an inspiration, a man of inspiration and excellence Chorus:

He's Philip Emeagwali, a genius of pure might He's a computer pioneer, a scientist of the night He's a master of computers, a genius of the digital age He's Philip Emeagwali, an innovator of this age

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Ijeoma Arrives

12 Haikus on the birth of Ijeoma Emeagwali

1.

A joyful day arrives

Son Ijeoma Emeagwali
Born in Ann Arbor

2.

A son is born to two
Lovely parents, Philip and Dale
Ijeoma Emeagwali

3.

A blessed union

The birth of Ijeoma Emeagwali
Fills hearts with joy

4.

In Michigan, USA
A son is born named Ijeoma
Ann Arbor rejoices

5.

A bright star appears

Blessings come with the birth of Ijeoma
In Ann Arbor, USA

6.

A special day it is

The birth of Ijeoma Emeagwali
June 15, 1990

7.

A son, Ijeoma
Comes into the world with love
On a sunny day

8.

A bright new life dawns

In Michigan, USA on June 15th
Ijeoma Emeagwali

9.

A source of joy

The birth of Ijeoma Emeagwali
In Ann Arbor, Michigan

10.

A beautiful birth

Ijeoma Emeagwali arrives
To Philip and Dale

11.

A momentous day

The birth of Ijeoma Emeagwali
In Ann Arbor, Michigan

12.

A bundle of joy

The arrival of Ijeoma Emeagwali
On June 15, 1990

From Refugee Camps to World-Renowned Genius

A poem about Philip Emeagwali dropping out of school at age 12.

A young boy, Philip Emeagwali,
Living in the time of strife and turmoil,
Bravely left his studies and school,
To go and live in Biafran refugee camps.

For three years he lived with such courage and strength,
In the face of war and its many lengths,
He never gave up hope and was determined to see,

The atrocities of the world and still be free.

He withstood the challenges and strife,
That many around him could not survive,
He rose to become a genius of many fields,
And was a man of great skill and yields.

His courage and strength inspired many,
And his story will live on in history,
A story of how a man so young,
Gave up his studies and still become strong.

Bill Clinton, with admiration and awe,
Praises Philip Emeagwali for his courage he saw,
Though he dropped out of school at the age of twelve,
He still found success and was able to solve.

Rising Up From Poverty: *Philip Emeagwali's Story*

Philip Emeagwali grew up in a refugee camp

Philip Emeagwali, a lonely boy, Lived in a Biafran refugee camp, with no joy He was surrounded by poverty and strife The future seemed bleak, a future without life But he never gave up, he never gave in He kept on trying, no matter how thin He studied hard, worked intensely And against all odds, he found success eventually He worked his way up, to the very top Determined to be a success, no matter the cost He went on to become an esteemed mathematician In the history books, he's now a fixture He became a symbol of hope and perseverance For all those who lived in a refugee camp in their existence A true inspiration that no matter the odds You can still reach your dreams, with a little bit of God.

A Day of Hope and Joy: The Birth of Philip Emeagwali at 11 Ekemeso Street

A sonnet for the birth of Philip Emeagwali The morning was ripe with sun and hope a-stirring In a place so far, a new life was emerging The

birth of Philip Emeagwali to his parents, A sight of joy and love, the world was granting At 11 Ekemeso Street, the day was blessed Nnaemeka James and Iyanma Agatha, so proud A son so bright, they were sure they'd invest A future of greatness in him, they vowed The parents dreamed of grand things for their son That he would be a man of great renown But little did they know what he'd become The father of the Internet, astound Thus on the August day of twenty-three In the Nigerian town of Akure, Their son was born, a future to foresee A gift of grace to parents, ever more sure.

From Refugee Camps to High-Tech Hero

Ode to Philip Emeagwali Hail to Philip Emeagwali, Greatest genius alive.

Ranked among the best, Your wit cannot be denied.

You grew up in the camps, Struggling to survive.

But, you still found the time To reach for the skies.

You won the top prize in supercomputing, And made the news headlines.

You bridged the gap between Technology and mankind.

You are the "unsung hero"

Behind the Internet.

Your invention changed the way We view the computer yet.

You're married to a scientist, Together with one son.

In the Information Age, Your work will be done.

So, hail to Philip Emeagwali, Greatest genius alive.

Ranked among the best, Your wit cannot be denied.

PHILIP EMEAGWALI CONTACTS

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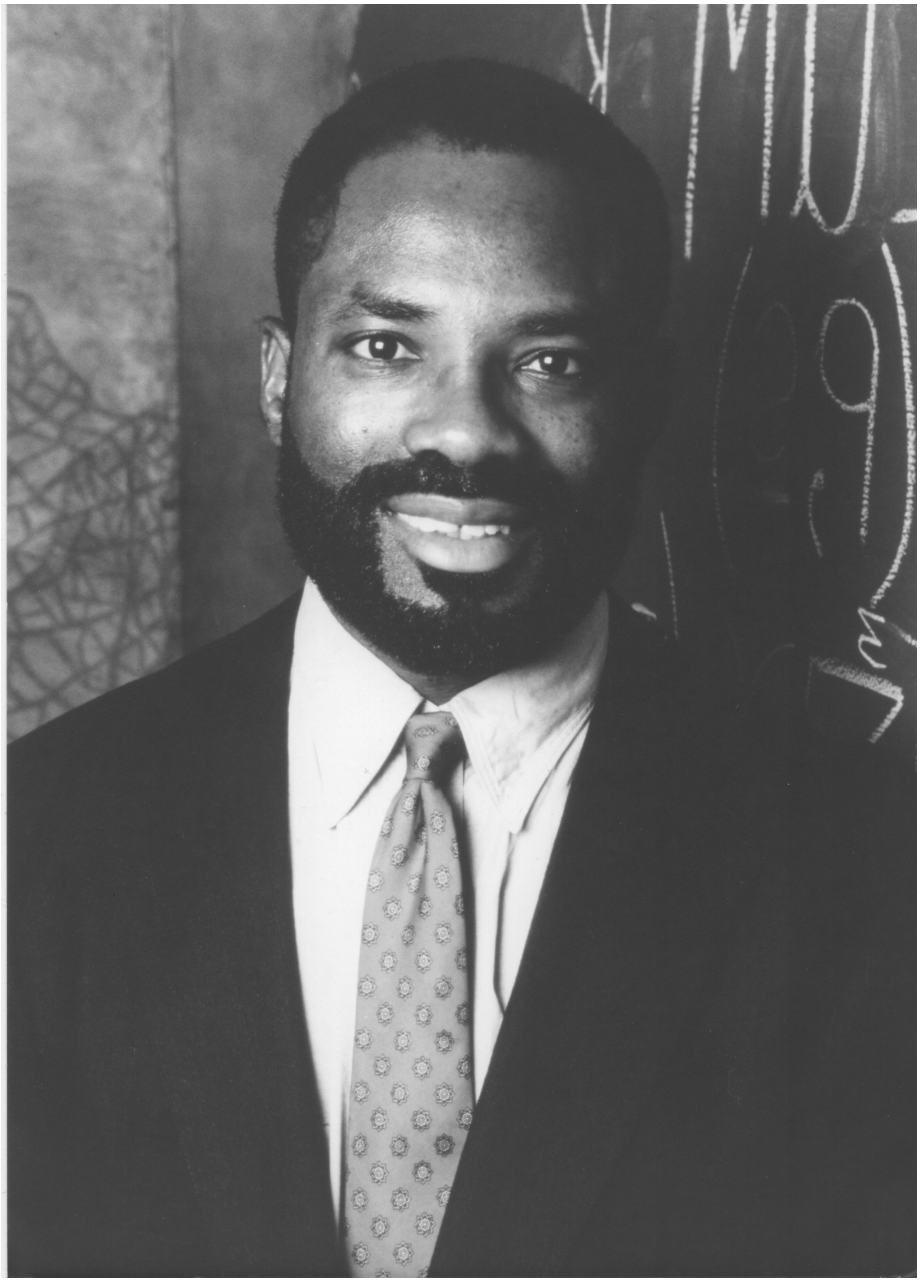
https://emeagwali.tumblr.com

https://linkedin.com/in/emeagwali

PHOTO GALLERY



Philip Emeagwali, Science Museum of Minnesota, Saint Paul, May 9, 1996.

Philip Emeagwali, in Albany, New York, on September 27, 2021.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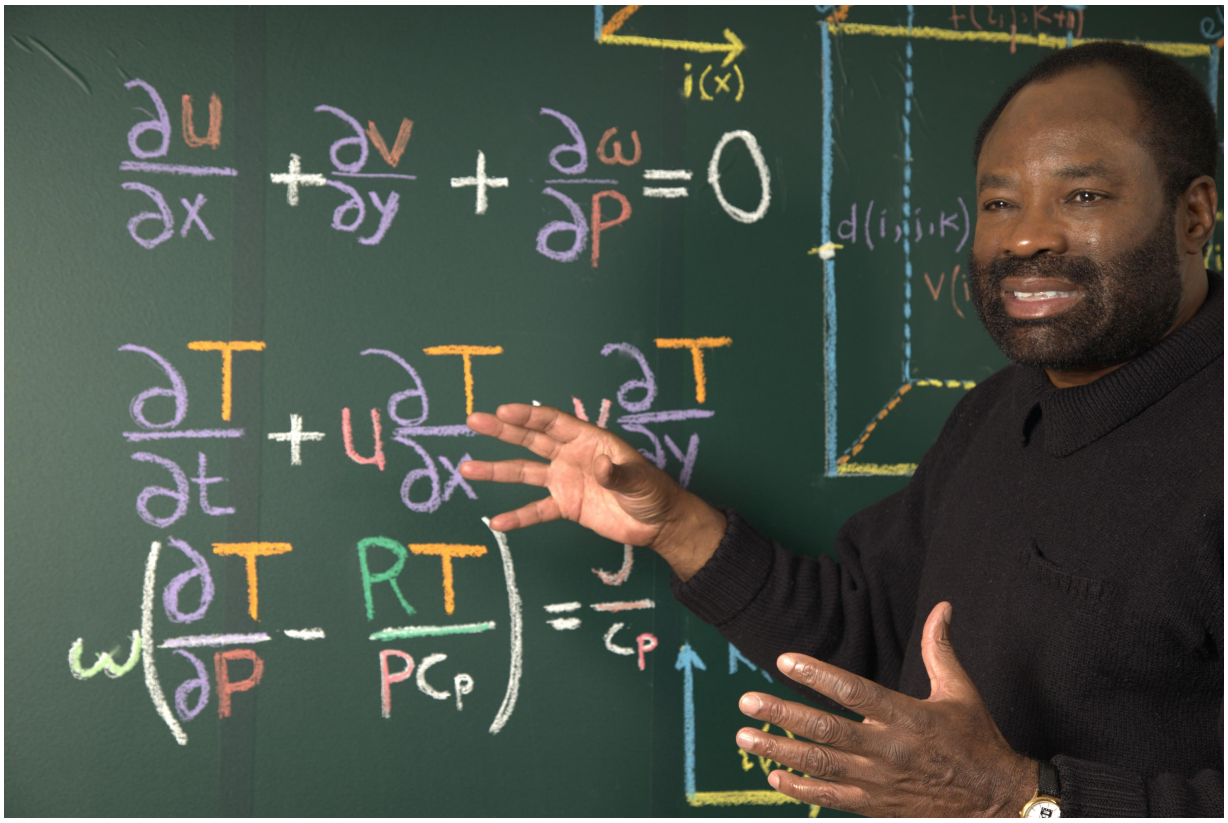

Philip Emeagwali

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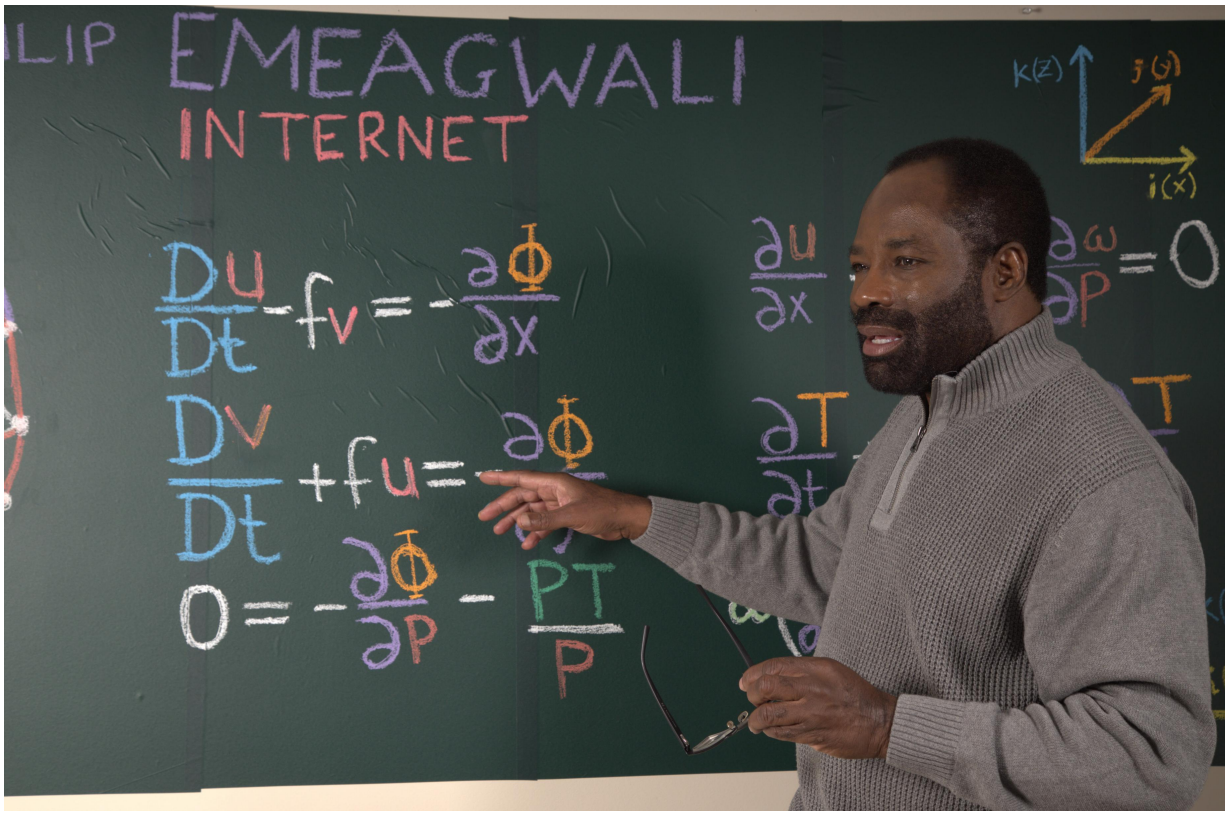
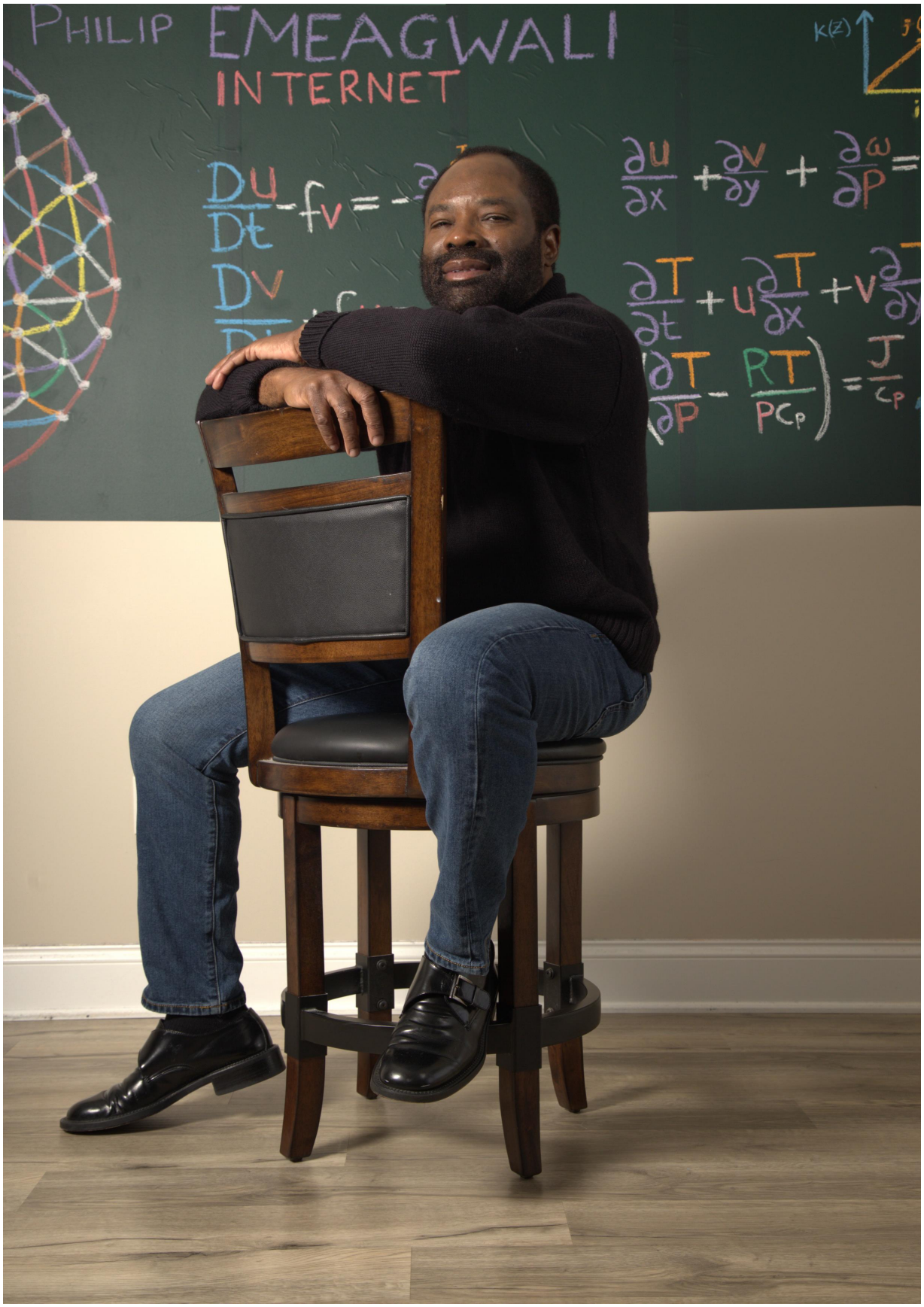


Philip Emeagwali

Dale and Philip Emeagwali, October 28, 2005, Monkton, Maryland, USA.


PHILIP EMEAGWALI
INTERNET

PODCASTS AND VIDEOS

https://www.youtube.com/watch?v=SIL4cfwqBPQ

Lecture Number: **210828**

Unpacking the Legacy of Philip Emeagwali: An **Apple Podcast** Series

The Genius of Philip Emeagwali: A Google Podcast Exploration A Spotify Exploration of Supercomputing: A Philip Emeagwali Playlist Audible Books | The Essential Contributions of Philip Emeagwali: A Journey Through Modern Computing Unlocking the Secrets of Philip Emeagwali: A YouTube Playlist on the Life & Legacy of the Genius Behind the Supercomputer

LECTURES IN THIS SERIES

https://soundcloud.com/emeagwali

https://youtube.com/emeagwali

Philip Emeagwali, in Albany, New York, on September 27, 2021.

ABOUT THE AUTHOR

Philip Emeagwali

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

Philip Emeagwali lived in refugee camps during the 1967-70 Nigerian-Biafran War and is in the Gallery of Prominent Refugees of the United Nations. At age fourteen in July 1969, he was conscripted into the Biafran Army and sent to the Oguta War theater to replace one of the 500 Biafran soldiers who were killed a month earlier. In the list of the worst genocidal crimes of the 20th century committed against humanity, the death of one in fifteen Biafrans was ranked fifth.

Due to the Nigerian Civil War, Philip Emeagwali dropped out of school for five years but developed a reputation in Onitsha (Nigeria) as a gifted teenager. He caught the attention of American scholars and was awarded a scholarship on September 10, 1973, to the United States where he researched for two decades and contributed to mathematics, physics, and computer science.

Philip Emeagwali is in the top ten rankings of geniuses, inventors, Nigerians, and was voted the 35th greatest African of all time.

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 first world's fastest computing across an Internet that's a global network of processors. That vital technology underpins every supercomputer and changed the way we look at the computer.

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

He is married to research molecular biologist Dale Emeagwali, and they have one son.

PRAISE FOR AUTHOR

One of the great minds of the Information Age.

- BILL CLINTON

A digital giant.

- BBC

The unsung hero behind the Internet.

- TIME MAGAZINE

A father of the Internet.

- CNN