

# THE EQUATION BEHIND THE UNIVERSE

The Genius Behind the World's Fastest Computer

Philip Emeagwali

**[emeagwali.com](http://emeagwali.com)**

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

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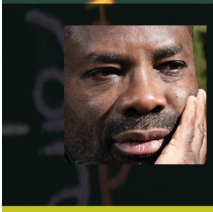
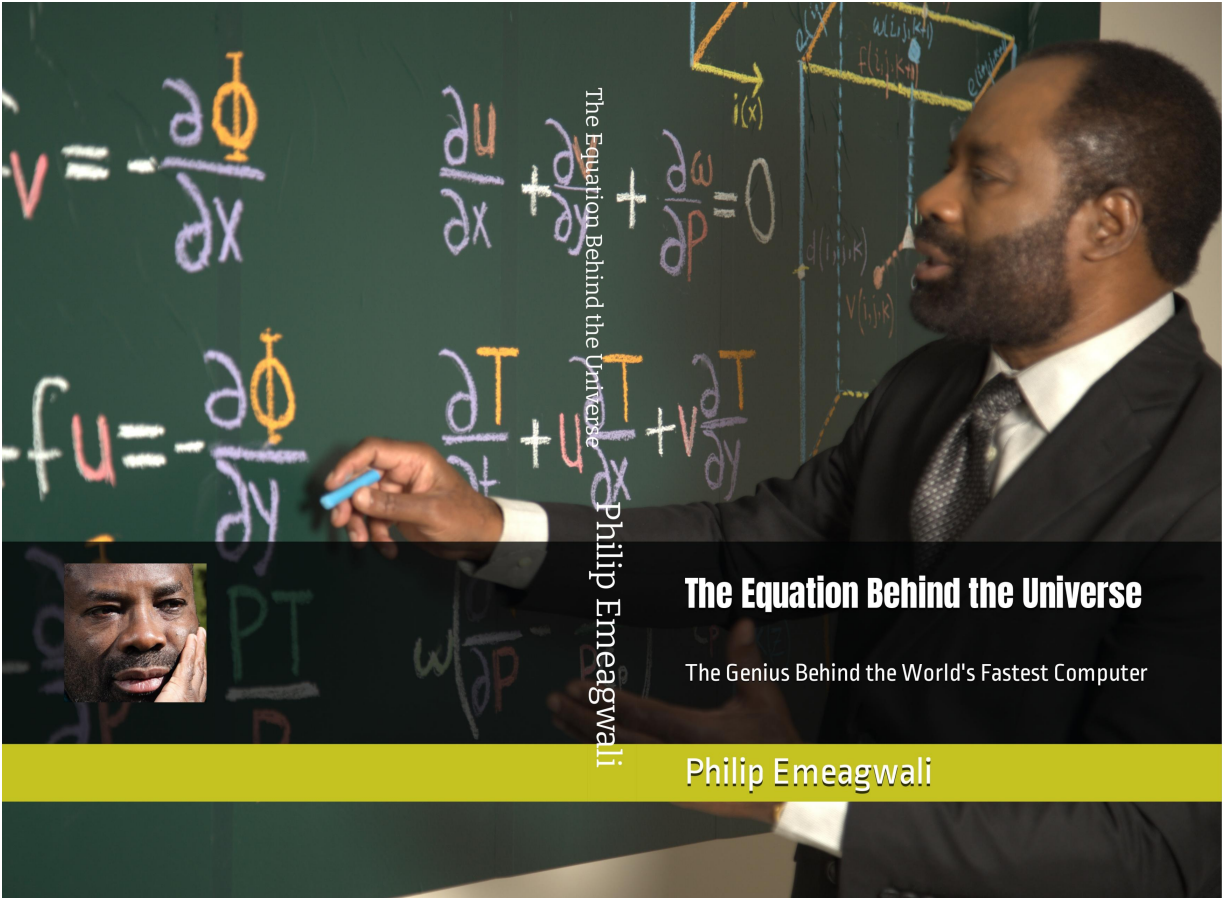
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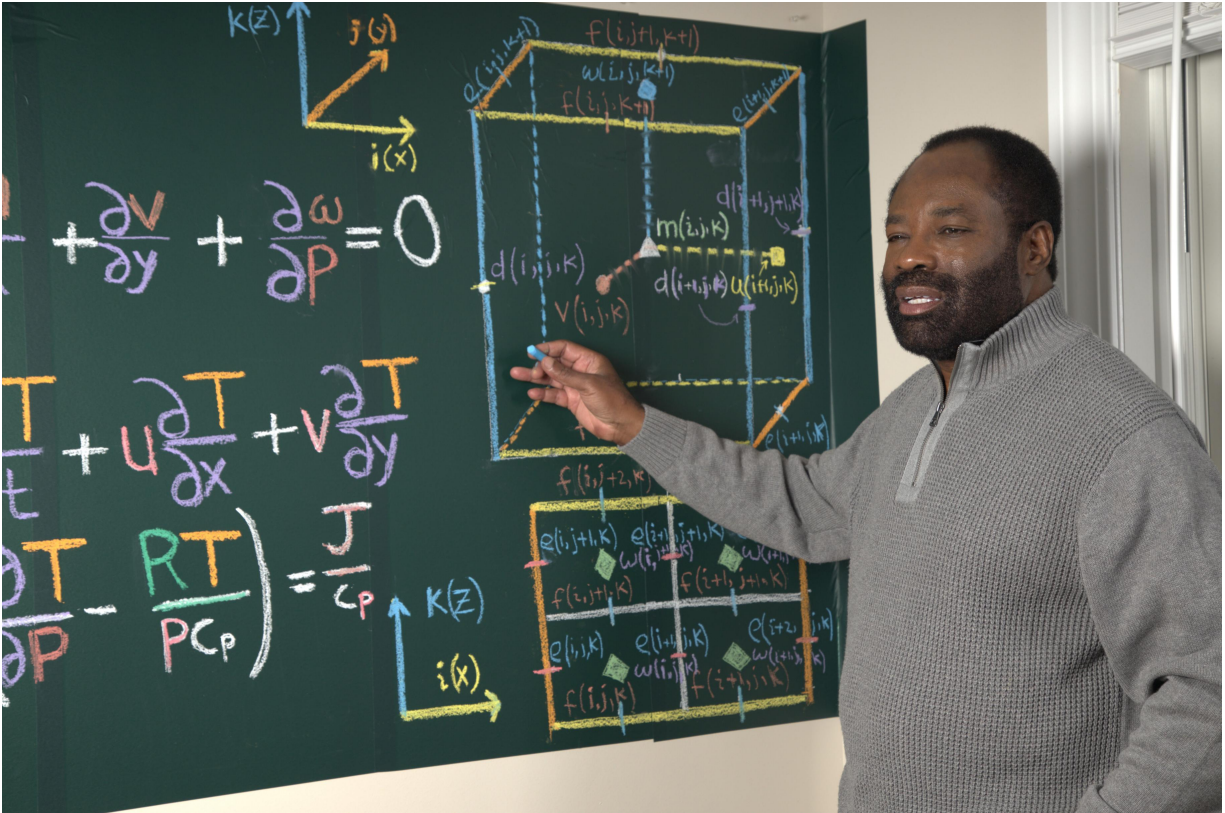
The Equation Behind the Universe  
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### The Equation Behind the Universe

The Genius Behind the World's Fastest Computer

Philip Emeagwali

# 1ST LECTURE: A LIFE IN NUMBERS - REFLECTIONS OF A MATHEMATICIAN



Broadcast 24 August 2021

[https://youtu.be/e9z0oxvOV\\_E](https://youtu.be/e9z0oxvOV_E)

## *The First Supercomputer*

**T**he world's fastest computing that's executed across up to a billion processors is the end product of the supercomputer technology that then U.S. President Bill Clinton described as the Philip Emeagwali formula for making computers faster. In **1989**, I was in the **news** for **discovering** that the **slowest** processors could be used to solve the **most difficult** problems in science, engineering, and medicine. And used to find their answers at the **fastest** speeds. The **fastest** computer is used to foresee the weather before going outside.



# GROWING UP IN COLONIAL AFRICA

**D**uring my childhood in Nigeria, of early 1960s post-colonial Africa, I read of great minds of mathematics and physics. In early 1970s, I read about Isaac Newton and Albert Einstein. In January 1960 and at age five, I enrolled in Saint Patrick's Primary School, Sapele, in the western region of the British West African colony of Nigeria. In 1960, the odd of me becoming the subject of school essays in the U.S., Canada, and U.K. was one in a billion.

But thirty years later, I was studied with the icons of science, such as Isaac Newton and Albert Einstein. Those school essays were recognitions I could not have imagined. In 1960, the word "computer" wasn't even in the vocabulary of a Nigerian. And the word "supercomputer" hasn't been coined. I began programming supercomputers on June 20, 1974, at 1800 SW Campus Way, Corvallis, Oregon, USA. At that time, there was no computer in Nigeria. In 1974, the word "internet" wasn't even in the vocabulary of an American computer scientist.

*Impact of My Father's Career*

My father's nursing career impacted my early development. That was the reason I grew up in Nigerian cities, such as **Akure**, Sapele, **Burutu**, Forcados, **Uromi**, Agbor, **Ibusa**, and Asaba. And in as many refugee camps in Biafra. As a nurse in the western region of colonial and post-colonial Nigeria, my father was frequently transferred from one General Hospital to the other.



He worked in each hospital for about two years. And in that short period, I could not learn the local language of our new community, such as the **Yoruba** language of Akure, the **Itsekiri** language of **Sapele**, the **Ijaw** language of **Burutu** and **Forcados**, and the **Esan** language of **Uromi**. I lived in Agbor for three and half years and then understood their **Ika** language.

During the thirty-month long Nigerian Civil War that ended on January 15, 1970, the Biafran government could not pay salaries. And the refugees were unemployed and could not pay for the medical services they received. By the end of the war, the Biafran Army had lost control of eighty percent of Biafra. And most Biafrans were refugees in Biafra.

My father was a volunteer nurse in Biafran refugee camps. Papa was a volunteer nurse at the hospital in Awka, Biafra, from late September 1967 to January 19, 1968; at the medical clinic in Oba, Biafra, from late January 1968 to March 21, 1968; at the refugee camps in Awka-Etiti, Biafra, from March 29, 1968 to early July 1969; and was the only medical practitioner in the fishing community of Ndoni, Biafra, from mid-July 1969 to January 19, 1970.

### *Three Languages I Speak*

Like every Nigerian, I spoke the **grammatically simplified** Nigerian pidgin language, which is **incomprehensible** to an American. Pidgin is used in informal conversations among friends and in markets. And spoken as the second *lingua franca* across the 250 ethnic groups in **Nigeria**. I might say to a Nigerian lady: *“Babe you too fine oooo. This food sweet well well. E don do.”*

I'm fluent in my ancestral Igbo language. Igbo is an endangered language that's only spoken in the south eastern region of Nigeria. I use Google to translate any email sent to me in Igbo language. "*Biko jiri nwayo kwuo okwu*" "Please speak slowly" "*Achoro m ka mu na gi gbaa egwu.*" "I want to dance with you." Before the age of twelve, I grew up in non-Igbo speaking towns in Nigeria. However, we spoke Igbo at home.

### *Growing Up in Burutu and Forcados*

The southern boundary of Nigeria is a coastline that faces the Atlantic Ocean. When I was three and four years old, we lived in the Nigerian coastal towns of Burutu and Forcados, both in the Niger Delta in southern Nigeria. My family lived in Ijaw-speaking Forcados and did so for the two or three months before and after my fourth birthdate, and presumably in the Nurses' Quarters of the Forcados General Hospital that employed my father as its "relief duty" Staff Nurse. In 1958, the year we lived in Forcados, it was a small coastal fishing community of fewer than a thousand persons, in the Niger Delta of southern Nigeria. The Forcados General Hospital was built in **1890**. It predated the Onitsha General Hospital by a decade. Some describe the Forcados General Hospital as the first modern hospital in West Africa Five centuries earlier, Forcados was a major Portuguese

slave trading port. Millions of Nigerian slaves were taken to the Portuguese colony of Brazil, as domestic and plantation workers. For that reason, Brazil is the second most populous Black country in the world, and second only to Nigeria.

The **Forcados Slave Dungeon** was built in 1475. The **Forcados Slave Wharf** is one of the longest in Africa. For four centuries, millions of slaves landed on the **Forcados Wharf** to begin their long journey to the Americas and across the Atlantic Ocean. The four centuries of non-stop slave trading in Forcados is to Nigeria what the atomic bombing of **Hiroshima** is to Japan and the **Auschwitz** concentration camp is to the Jewish people. For those reasons, the **Forcados Slave Wharf** should be listed as a **United Nations' World Heritage** site.

**Forcados is where Nigeria began.** It was the 15<sup>th</sup> century's administrative capital of the geographical area we now call Nigeria. **Forcados was the Abuja of the 15<sup>th</sup> century Nigeria.** My oldest sister, Onyeari Florence, was born in Forcados, in 1958.

### *First Hospitals in Nigeria*

The nine children of my mother had university education. And became Nigerian-Americans. The **first school** in Igbo land was founded on **November 15, 1858**. That school was a short stroll from the birthplace of my father and great-grandfathers. And was also located a short stroll from the present location of

General Hospital, Onitsha. That was the first hospital in Igbo land. In 1857, that General Hospital wasn't built. My great-grandfather whose first name was "**Emeagwali**" was born and raised where the General Hospital is now located.

Forty years later and at the end of the 19<sup>th</sup> century, the British colonial administrators decided to build the present General Hospital of Onitsha. Citing **Eminent Domain** law that gives the government the power to take over any land and convert it to public use, the **Emeagwali** family was ordered to move and relocate a walking distance away, to 17 **Mba** Road, Onitsha.

Our proximity to that first school in Igbo land gave us, several generations of *Ndi **Ọnịcha***, an unfair educational advantage over heartland Igbo speaking people. Being among the first Nigerians to learn how to read and write meant that *Ndi **Ọnịcha*** emigrated earliest. And did so from Igbo land to the farthest regions of Nigeria.

That was the reason, Nnamdi Azikiwe, the first president of Nigeria, who's parents were born in Onitsha, was born in 1904 in **Zungeru**, the capital of the British protectorate of Northern Nigeria. It was the reason my grand uncles emigrated from Onitsha to faraway Kano to work as clerks. And why my father emigrated from Onitsha to Kano in 1948 and to Akure in 1950.

Papa was trained and employed in General Hospital, Akure, as a twenty-nine-year-old Junior Staff Nurse.

By age nine, I had lived at a dozen Nigerian addresses in seven towns. The first was at 11 Eke-Emeso Street, Akure, Western Region, colonial Nigeria. My father was employed as a nurse in the General Hospital of Akure, and from 1950 to early 1956.

From the General Hospital, Akure, Papa was transferred to Central Hospital, Sapele, Western Region. At first, we lived in the Hausa Quarters, of Sapele in 1956. That was where my immediate younger brother, Nduaguba Francis, was born in May 1956. In early 1958, my father was transferred from the General Hospital, Sapele, on what was called a six-month “Relief Duty” in the coastal towns of Burutu and Forcados. My family of five, spent most of the year 1958 in the latter two towns.

In April 1958, we left Burutu to come back to Onitsha to attend the funeral of my maternal grandfather, **Chieka Balonwu**. **Chieka** was a farmer who lived his entire life at 6C Wilkinson Road, Onitsha. **Chieka** died after a long period of **protracted illness** that was related to diabetes.





Agatha Emeagwali and friends. Burutu, Nigeria, April 1958.

A group portrait in our family photo album, taken in April 1958, had my then nineteen-year-old mother who was expecting her third child. Sitting beside her were three female friends from Onitsha. All four women were elegantly dressed but sat on a beautiful mat that was placed on the wooden stairways of our house in Burutu. The four women were [Iyanma Agatha Emeagwali](#), Mabel Ifejika, [Clara Chude](#), and Modupe.

We lived in Burutu for six months, from early- to mid-1958. As a three-year-old, I remember living in Burutu in that one-story wooden house that was built upon support stilts. Our house was elevated to protect us from daily tidal floods and occasional storms.

We lived in Forcados for six months, from mid- to late-1958. We lived in the Nurses' Quarters of the General Hospital, Forcados that was a short stroll from the community's post office. My sister, [Onyeari Florence](#), was born in 1958 in the General Hospital, Forcados. And my sister, [Chinwe Edith](#), was born in 1960 in the Central Hospital, Sapele.

After my father returned from his six-month relief duty in Forcados, we lived in the compound that was next to The Eagle Club, in the vicinity of 149 Yoruba Road, Sapele. We lived besides the Eagle Club from early 1959 to late April 1962. The

Eagle Club was established by [Arthur Edward Prest](#) who later became the Nigerian Ambassador to the United Kingdom.

The Eagle Club was sold in the early 1940s to a Lebanese. The manager of The Eagle Club was Dickson MacGrey. The resident musician was Sally Young. The Eagle Club was the dancing place in Sapele. When we hear the visiting musicians rehearsing, I and other children will sneak inside the Eagle Club and enjoy a free live, rehearsal concert.

I enjoyed [Victor Olaiya](#) rehearsing his hit song “[Aigana](#).” And enjoyed [Herbert Udemba](#) and his African Baby Vocal Party rehearsing their hit song “[Bottom Belle](#)” that went like:

*Bonswe azikiwe* Bonswe ayoh ayoh

*Bonswe azikiwe*

*Bonswe ayoh ayoh oh*

As a four-year-old, I played along the dusty Yoruba Road and in front of the Eagle Club. And I remember [Festus Okotie-Eboh](#), a man of means and the most [flamboyant](#) politician in Nigeria, in his chauffeur-driven long limo. To draw the attention of us children carelessly playing in the vicinity of 149 Yoruba Road, Okotie-Eboh's chauffeur blasted his car's loud signature horn.

By the mid-1960s, the Eagle Club was demolished. And Okotie-Eboh bought a portion of the land it was upon. Okotie-Eboh built his "**Orogun Villa**" on that land which, [I think], is now [149 Yoruba Road, Sapele](#). In 1959, some of the band members at the Eagle Club will give me a penny to buy two sticks of cigarettes for them. And bring back their change of half a penny. That was the purchasing power of a penny, between early 1959 and April 1962.



The compound of Philip Emeagwali, near 149 Yoruba Road, Sapele, Nigeria, from 1959 to April 1962 (Photo taken in late 2000).

From late April 1962 to November 1963, we lived next to [Premier Club and Hotel](#), Uromi, that was also the town's [prostitutes](#) compound. The most memorable event that occurred when we lived near [Premier Club](#) at Agbor Road was that the renown boxer Dick Tiger defeated [Gene Fullmer](#) on August 10, 1963, in Liberty Stadium, Ibadan, Nigeria. Tiger defeated [Fullmer](#) to retain his world middleweight boxing title.

The Premier Club was downstairs of a two-storey building that was owned by an Igbo man named "[Ubah](#)." The Premier Club was the dancing place in the Uromi of the early 1960s. From our adjacent compound, we hear the visiting musicians

rehearsing. I and other children will immediately sneak inside the Premier Club and enjoy a free live, rehearsal concert. I enjoyed [Zeal Onyia](#) rehearsing his hit songs “*Vicki Nyem Afum*” and “*Opigwe*.”

In a concert at the Premier Club of 1963, [Emmanuel Ntia](#) and his Eastern Stars Dance Band of Nigeria rocked its dance hall with their X-rated number one highlife hit song, called “**Kolopchop**.” Like other Igbo children in Uromi of 1962, we learned the sensational [Esan](#) acrobatic cultural dance of the spirits.

From mid-[December](#) 1963 to late 1966, we lived along Gbenoba Road, Agbor, Midwest Region, Nigeria. And in a three-bedroom house about a block downhill and on the left from the house of [Jereton Mariere](#), the first governor of the Midwest Region of Nigeria.

## CHILDHOOD EDUCATION

**M**y elementary school education consisted of two years at Saint Patrick's Primary School, Sapele, two years at Saint Anthony's Primary School, Uromi, and two years at Saint John's Primary School, Agbor.

The names of the first two schools have changed. The Saint Patrick's Primary School, Sapele, that I attended, shared premises with the town's then only Catholic Church. The Saint Anthony's Primary School, Uromi, that I attended, was across the street from the town's then only Catholic Church. I enrolled in classes three and four at Saint Anthony's from late April 1962 to mid-December 1963.

After earning my [First School Leaving Certificate](#), in December 1965, following two years at Saint John's Primary School, Agbor, Midwest Region, Nigeria, I enrolled for fifteen months at Saint George's College, Obinomba, Midwest Region, Nigeria.



Philip Emeagwali (sitting third from left of front row) with students of Saint George's College, Obinomba, Nigeria, 1966.

Like ninety-nine percent of the children in Biafra, I dropped out of school, for three years, during ages twelve to fifteen. I dropped out to live in **refugee camps** of **Biafra** of the Nigerian Civil War. But I also dropped out again, for two years, from Christ the King College, Onitsha, in March 1972, and after the civil war was over.

**One in fifteen** Biafrans **died** during that 30-month-long war. 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**.





## CONTRIBUTIONS TO SCIENCE

I'm the subject of school essays on computer inventors because I was in the news and because I contributed to the development of the world's fastest computers. Specifically, I discovered how to compress the time-to-solution of the most compute-intensive scientific problems, described as the twenty hardest problems that can be solved on extremely fast supercomputers.

Likewise, I'm the subject of school essays on "physicists and their discoveries" because I was in the news for discovering how to compress the time-to-solution of the most compute-intensive problems arising from encoding the laws of physics and encoding those laws into the partial differential equation of calculus.

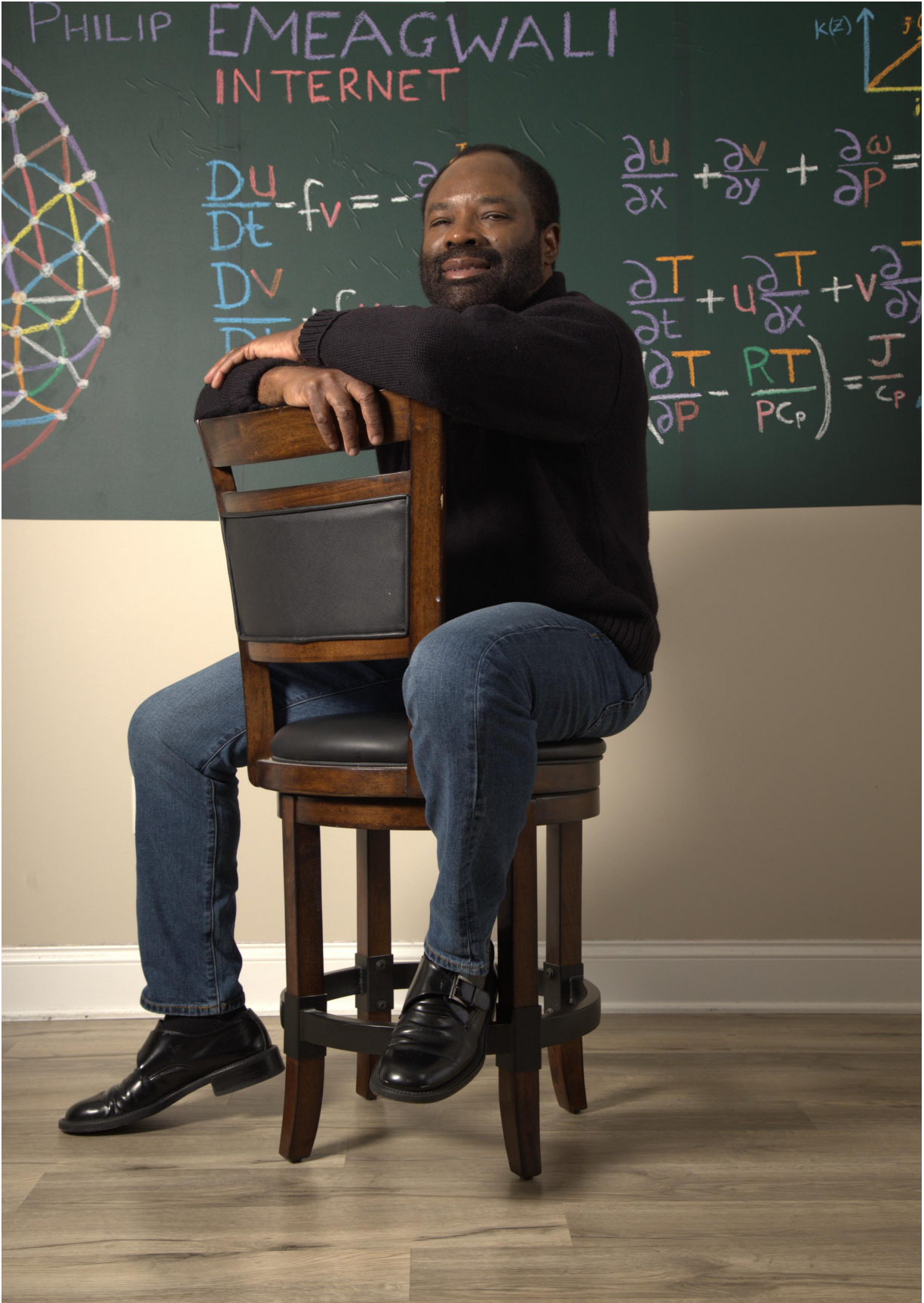
Likewise, I'm in school essays on "mathematicians and their contributions to mathematics" because I was in the news for mathematically discovering how to reduce an initial-boundary value problem of calculus defined in its interior domain by a system of coupled, nonlinear, time-dependent, and three-dimensional partial differential equations.

I discretized those equations to reduce them to a large-scale system of equations of computational linear algebra that approximated the governing initial-boundary value problem. I'm

in school essays on mathematicians who contributed to mathematics because I was in the news for mathematically discovering how to solve those algebraic equations. And solve them to foresee otherwise unforeseeable global warming. And solve them to recover otherwise unrecoverable crude oil and natural gas buried up to 7.7 miles (or 12.4 kilometers) deep.

I'm in school essays on physicists who contributed to physics because I was in the news for experimentally discovering how to make the most compute-intensive problems in physics and that are impossible-to-solve possible-to-solve.

I'm in school essays on scientists and their discoveries because I was in the news for discovering how to solve the most challenging problems in science, called Grand Challenges. And how to solve them across the slowest processors in the world. And solve them at the fastest possible speeds in the world.



Philip Emeagwali

### *Importance of the Supercomputer*

Once upon a time, before the Fourth of July **1989**, to be exact, the fastest one thousand computers in the world computed with only one custom-manufactured and super-fast vector **processor**. Before the Fourth of July **1989**, parallel supercomputing, **or attaining the fastest speeds across the slowest processors**, was **mocked** and **ridiculed** as **science fiction** and was **dismissed** as a **beautiful theory** that required experimental confirmation.

On the Fourth of July **1989** and in Los Alamos, New Mexico, **USA**, I **confirmed** parallel supercomputing to be faster than the fastest sequential computing. That **contribution** to computer science is the reason I won an award, in **1989**, that is referred to as the **Nobel Prize of Supercomputing**. My **milestone** in the history of the computer was marked as the **first time** the **fastest** speed in supercomputing was recorded **across** the **slowest** processors in the world.

### *The Invention of the World's Fastest Computer*

A year later, on June 20, **1990**, *The Wall Street Journal*, and other media, wrote that **Philip Emeagwali**, has **experimentally discovered** that parallel processing many problems **at once**,

instead of sequentially processing one problem **at a time** should be the **starting point** of the next generation of supercomputers.

Nineteen eighty-nine was the year that I discovered how to parallel process **across** a **spherical island** of identical and **coupled processors** that **shared nothing**. My new technology was a new Internet, in reality, and not a computer, by its very nature. Nineteen ninety was the year the supercomputing industry upgraded parallel processing from a **theory** to a **discovery**. And from **science-fiction** novels to **nonfiction** computer science textbooks.

I was in the **news** because I **discovered** a **quantum shift**, or a significant **change in the way** we look at both the computer and the supercomputer. After the Fourth of July **1989**, the fastest one thousand computers in the world were computing in parallel and communicating **across** up to **10,649,600 processors**. We now have a more profound and surer understanding of why and how the world's fastest computer parallel processes. Massively parallel processing was the stone that was **rejected** as **rough** and **unsightly** but that became the **headstone** of the supercomputer industry.

# DISCOVERING THE WORLD'S FASTEST COMPUTING

**A**ccording to the guiding lights of the world of computing of the 1970s and 80s—namely, Gene Amdahl of the IBM world of mainframe computing of the 1960s, Seymour Cray of the world of vector computing of the 1980s, and Steve Jobs of the world of personal computing of the 1990s—and according to these three giants it would forever remain impossible to use eight, or more, processors to achieve a speedup of eight-fold. In the spirit of the 1970s and 80s, the June 14, 1976, issue of the Computer World magazine carried an article titled: “Research in Parallel Processing Questioned as ‘Waste of Time’.”

*My Discovery of the Fastest Computing Was a Defining Moment Fourteen years after that article, the June 1990 issue of the SIAM News, the flagship bi-monthly news journal of mathematicians, carried a cover story that described how **Philip Emeagwali** mathematically and *experimentally discovered* how to save time by parallel supercomputing through sixty-four binary thousand processors.*

And the June 20, 1990, issue of *The Wall Street Journal* and several newspapers and magazines carried a story that reported that **Philip Emeagwali** discovered that parallel supercomputing is not an enormous waste of everybody's time. I contributed to the newer understanding of the supercomputer. And my discovery changed the way we think of the supercomputer.

In the bygone way of thinking, the supercomputer solved one problem **at a time**. In the contemporary way of thinking, the supercomputer solves many problems **at once**. My scientific discovery of the world's fastest computing across the world's slowest processors became computing's **defining moment**. And the **bedrock** of the supercomputer.

### *How I Leapfrogged 30,000 Years in a Day*

That scientific discovery of parallel supercomputing made the news headlines because I invented the **fastest** computer. And invented the supercomputer technology **across** the **slowest** 65,536 processors in the world. On a relative scale, the speed increase I discovered, in 1989, was three thousand times greater than the speed advantage the commercial aircraft has over the bicycle.

The fastest supercomputer of today is **one hundred million** times faster than the fastest supercomputer of 30 years ago. In **1989**, it made the news headlines that I discovered how a large-

scale computational physicist can compress her **time-to-solution** from 180 computing-years to one supercomputing day. My **scientific discovery** **opened the door** to the state-of-the-art supercomputers used to compress **time-to-solution** from **30,000 years** on a computer to one day on a supercomputer.

Between April 18 to 20, **1967**, an IBM supercomputer scientist, named **Gene Amdahl**, wrote it would forever be **impossible** to compress **time-to-solution** from eight days to one day and to do so by parallel supercomputing the most compute-intensive problems in the world.

That **pessimistic assertion** that originated between April 18 to 20, **1967**, and from the Spring Joint Computer Conference, in Atlantic City, New Jersey, entered every supercomputer textbook to become the famed **Amdahl's Law**. That **Amdahl's Law** is to supercomputing **across** plural processors what **Moore's Law** is to computing within a singular processor.

*From War Fronts to the Frontiers of Science On the date **Amdahl's Law** was invented, I was fleeing as a twelve-year-old refugee fleeing from **Agbor** (Nigeria) and fleeing to **Onitsha** (Biafra). **Onitsha** was my ancestral hometown. In the following thirty months, **Onitsha** became the **bloodiest battlefield** in African warfare. During that Nigerian Civil War, **one in fifteen Biafrans** died.*



Twenty-two years after **Amdahl's Law** was published, I **discovered** that the **unimaginable-to-compute** is **possible-to-super-compute**. I **discovered** how to **exceed** the eight-processor, factor-of-eight speedup limit known as Amdahl's Law. And how to use sixty-four binary thousand processors to solve the most compute-intensive problems in the world.

My **scientific discovery** of the fastest computing made the **news headlines** as the **biggest fundamental change** in computer science. My **scientific discovery** **opened the door** to a revolution, namely, computers and supercomputers that could solve many problems **at once**.

### *What Does a Supercomputer Look Like?*

The **scientific discovery** that I recorded during my email experiments of July 4, 1989, provided the designers of the supercomputer with the insight that massively parallel processing is useful. My new insight **changed the way** the first supercomputer that computes fastest **across** the slowest processors look.

The supercomputer of the **1980s**, and earlier, was the size of your refrigerator. The supercomputer of today **occupies** the space of a soccer field, **consumes** as much electricity as a small American town. And it costs as much as the budget of a small

African nation. That **change in the way** the supercomputer looks  
and costs is my **contribution** to computer science.

# WHO IS PHILIP EMEAGWALI?

**I**n 1989, I was in the news for discovering that the slowest processors could be used to solve the biggest problems. And find their answers at the fastest speeds. The fastest computer is why you know the weather before going outside.

From an early age in **Nigeria**, I studied the contributions of the great minds of science. I learned that **Euclid** is the father of geometry. Later, I learned that **Albert Einstein** is the father of modern physics. Becoming a father of a then unknown technology wasn't something I could have imagined during ages twelve to fifteen.

In that period, I dropped out of school to live in refugee camps of **Biafra** created by the Nigerian Civil War. For three years following June 1967, all schools in **Biafra** were closed. And **one in fifteen** Biafrans **died** during that 30-month-long war that ended on January 15, **1970**. 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**.



Philip Emeagwali (sitting first from left of front row) with students of Eramah House, Saint George's College, Obinomba, Nigeria, 1966.

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

My **contribution** to supercomputing **is this**: I **discovered** how to compress the **time-to-solution** of the most compute-intensive problems.

Once upon a time, before the Fourth of July **1989**, to be exact, the fastest **one thousand** supercomputers in the world computed with only one custom-manufactured, super-fast vector **processor**. Before the Fourth of July **1989**, parallel supercomputing was **mocked** and **ridiculed** as a **beautiful theory** that lacked experimental confirmation.

On the Fourth of July **1989**, in Los Alamos, New Mexico, **USA**, I **discovered** practical parallel supercomputing. And **discovered** the technology by harnessing the **slowest** processors in the world. And using them to solve the most **compute-intensive** problems in the world. And solve those problems at the **fastest** speeds in the world.

That invention was **newsworthy** because I **discovered** a **paradigm shift** of tectonic proportions that was a huge **change in the way** we look at the computer and the supercomputer. Parallel supercomputing was the stone **rejected** as **rough** and **unsightly** but that became the **milestone** and **headstone** of the supercomputer industry.

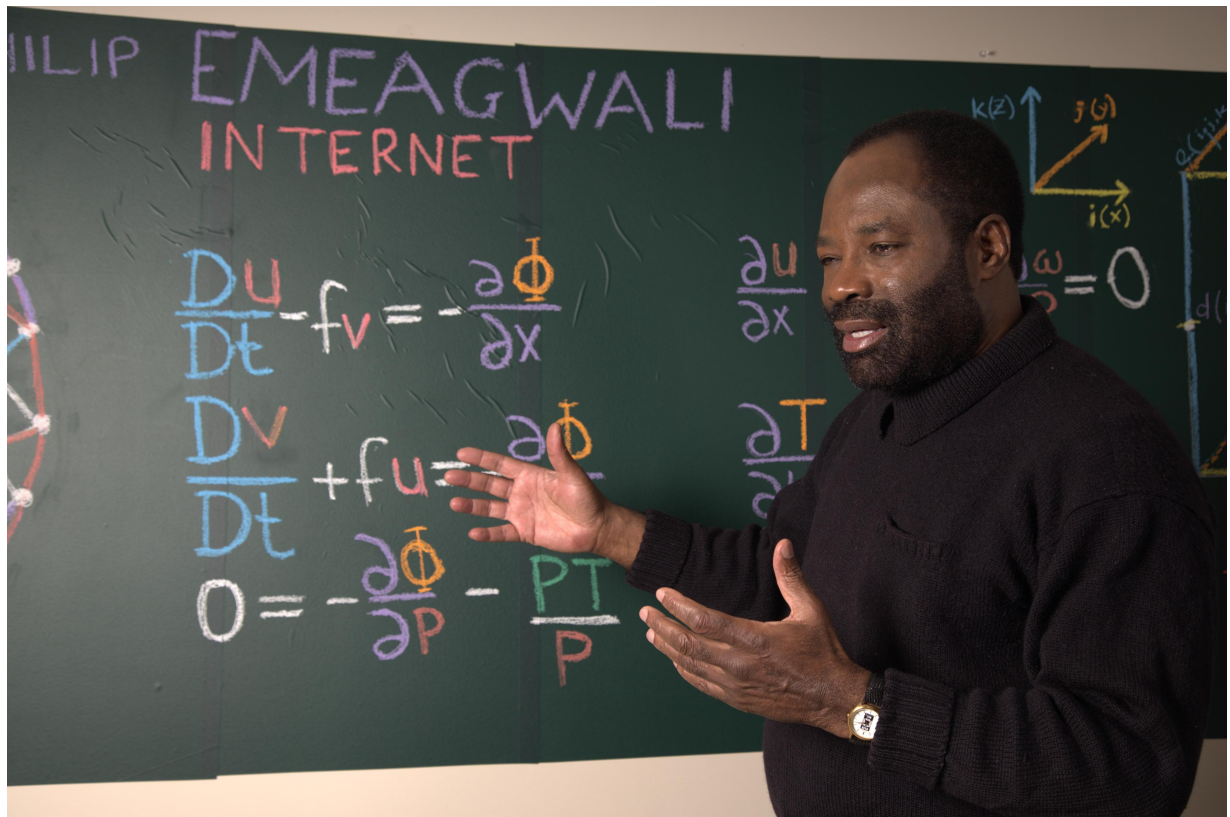
I was in the news because I **contributed** to the understanding of the world's fastest computers. My **discovery changed the way** we think of the supercomputer. In the **customary way** of computing, the supercomputer solved one problem **at a time**. In my **new way** of computing, the supercomputer solves up to a billion problems **at once**.

My **scientific discovery** of parallel supercomputing became computing's **defining moment** and the **bedrock** of the supercomputer. My **scientific discovery opened the door** to a revolution, namely, computers and supercomputers that could solve many problems **at once**. This discovery is my **contribution**

to the supercomputer, as it's known today, that could become the computer of tomorrow.

Massively parallel computing is the vital technology that enabled the supercomputer to **tower over** the computer that's not parallel processing.

# 2ND LECTURE: UNRAVELLING THE MYSTERIES OF MATHEMATICAL THOUGHT



Broadcast 24 August 2021

[https://youtu.be/e9z0oxvOV\\_E](https://youtu.be/e9z0oxvOV_E)

# PAVING THE WAY TO MATHEMATICAL PROGRESS

**I**n 1989, I was in the news for inventing how to solve the most compute-intensive mathematical problems that arise as the partial differential equations of calculus. I was in the news for inventing how to solve the largest system of equations that occur in computational linear algebra that approximated the system of partial differential equations that governs planetary-scaled fluid dynamics motions.

The poster boy of such grand challenge problems is the supercomputer simulations of long-term global warming. After July 4, 1989, I was in the **news** for **inventing** how to solve the companion initial-boundary value problems. And how to solve them at the fastest speeds. And solve them **across** a new Internet.

I visualized that new Internet as my **new** global network of sixty-four binary thousand processors. I visualized those processors as coupled, **identical**, **equal distances** apart, and **sharing nothing**. That new Internet is a supercomputer, in reality. That supercomputer is an instrument of mathematics and physics. **The fastest supercomputer is the flagship computer of the world.**



*Unlocking Mathematical Frontiers: How I Solved the Most  
Difficult Problem in Mathematics*

My **contributions** to mathematics **were these**: I **discovered** how to solve **nonlinear partial differential equations**. And how to solve them **across** a new Internet that's a new global network of **off-the-shelf** processors that were **identical** and **coupled** and that **shared nothing, but were in dialogue with each other**.

An initial-boundary value problem that's governed by a complex system of **nonlinear partial differential equations, or PDEs**, is **impossible** to solve exactly. And **impossible** to solve on the blackboard. However, the most important system of nonlinear **partial differential equations** can be solved approximately on the computer. And solved with the most accuracy **across** a new Internet that's a new global network of up to a billion **off-the-shelf** processors.

In calculus textbooks, some linear **partial differential equations** can be solved exactly. And solved by using the technique called **Fourier series** expansion. And using it to solve an initial-boundary value problem governed by the heat **conduction** equation in one dimension. The heat equation is used to model the **diffusion** of particles. The heat equation is used to describe the **macroscopic behavior** of **microscopic particles** in Brownian motion, or the random movement of fluid particles. That initial-boundary value problem has **Dirichlet** (or first type)

boundary conditions that specify the solution along the boundary of the domain of the problem.

In the 1980s, I used the exact solutions of linear **partial differential equations** to validate my parallel-processed codes. **Partial differential equations** go by different names that depend on the assumptions and settings used to derive each. The coupled system of **nine Philip Emeagwali partial differential equations** is the mathematical language that I **invented** and used to describe the flows of crude oil, injected water, and natural gas flowing up to **7.7 miles** (or 12.4 kilometers) below the surface of an oil field that's almost twice the size of **Anambra**, my state of origin in **Nigeria**.

The nine Philip **Emeagwali** equations were based on my **corrected assumption** that **inertial** forces exist within all producing oil fields. Philip **Emeagwali** equations are the most complicated equations in physics.

My **contributions** to mathematics **were these**: I mathematically encoded the **temporal** and the **convective** inertial forces that exist within all producing oil fields. I encoded both physical forces into thirty-six **partial derivative** terms. And I added those mathematical terms to the existing **45 partial derivative** terms described in computational physics textbooks on subsurface petroleum reservoir simulation.

### *Solving Complex Mathematics Problems*

The **grand challenge** initial-boundary value problem of mathematics is so **named** because it requires **tremendous** supercomputer power to solve it with an acceptable accuracy. On my Eureka moment which occurred at fifteen minutes after 8 o'clock in the morning of the Fourth of July 1989, I **discovered** how to parallel process **30,000** years of **time-to-solution** of a **Grand Challenge Problem** to one day of **time-to-solution across** an ensemble of 10.65 million **off-the-shelf** processors.

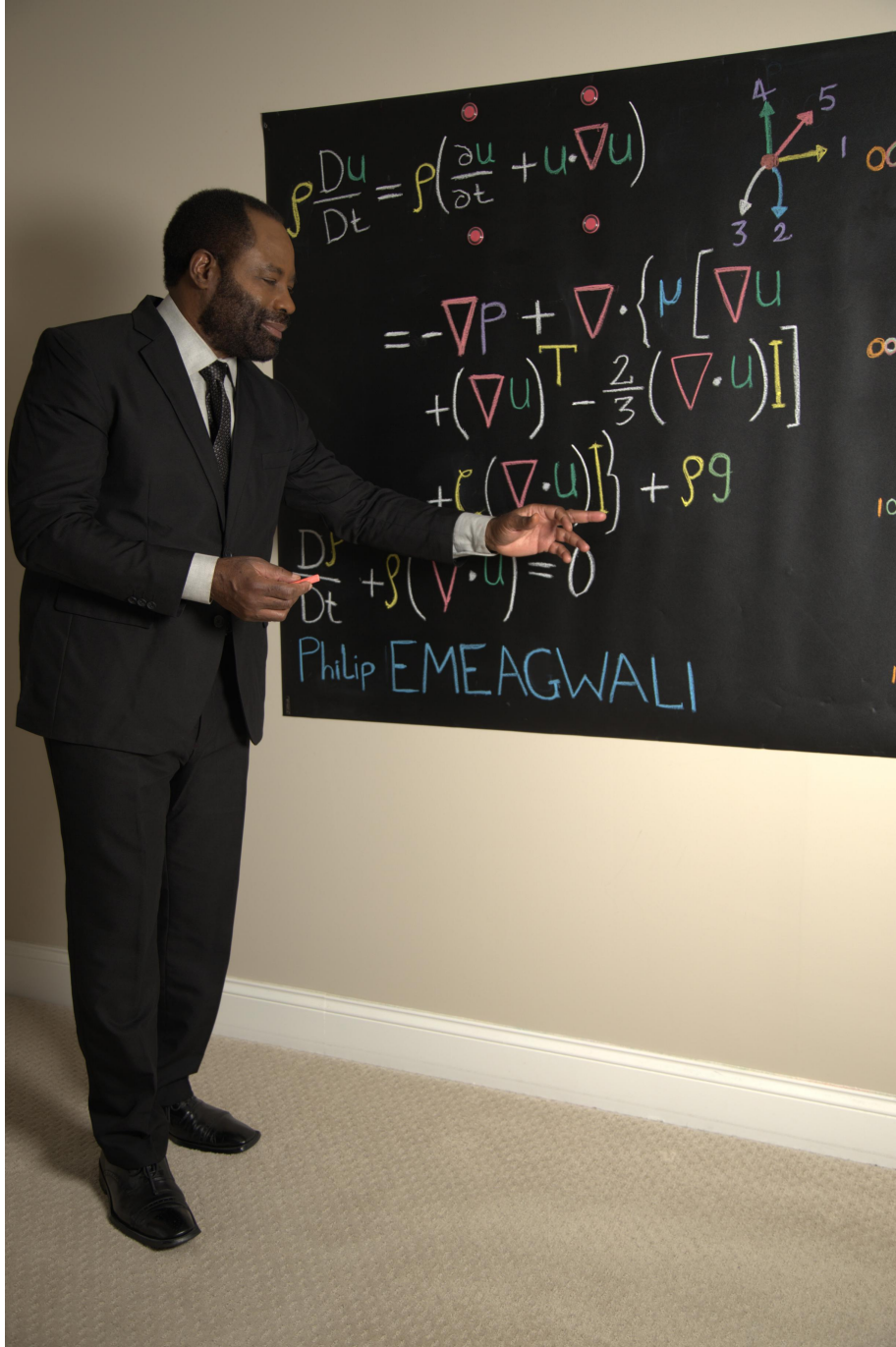
### *How I Turned Fiction to Fact*

Although parallel processing entered the realm of **science fiction** and did so on February 1, **1922**, it wasn't until my discovery, which occurred on July 4, **1989**, that a full understanding of the **vital technology** that **underpins** the world's fastest computer **was attained**. In **1922**, weather forecasting **across** sixty-four thousand human computers was written as a **science-fiction story**.

My **contributions** to physics **were these**: On July 4, **1989**, I **discovered** how to upgrade the **science fiction** of forecasting the weather **across** sixty-four thousand human computers to the **nonfiction** of forecasting the weather **across** sixty-four **binary** thousand processors, or **across** as many electronic computers.

I **contributed** to physics by **discovering** how the extreme-scaled climate model is parallel processed **across** a **new Internet** that's a new global network of 65,536 processors. And how global climate models can be executed by **chopping up** the model of the Earth's atmosphere and oceans into 65,536 smaller climate models that're mapped with a **one-model to one-processor** correspondence. And mapped onto as many processors.

The societal importance of my **contribution to science is this**: Parallel-processed climate models are tools used by decision makers to help ensure the Earth is safe for humans and for all animals.



Philip Emeagwali explaining how to solve the most difficult problem in mathematics.

# SOLVING THE EQUATIONS OF OUR EXISTENCE ACROSS AN INTERNET

**I**n 1989, it made the news when I discovered how to solve the most compute-intensive problems. I was covered in stories because I discovered how to solve the world's biggest problems in mathematics, physics, and computer science. And solve them at the fastest recorded computer speeds.

I **invented** how to solve the most **compute-intensive** mathematical problems, called extreme-scale computational fluid dynamics. And solve them **across** a new Internet. That Internet was a new global network of up to one billion **identical** and **coupled processors**. **Each processor operated its operating system. Each processor was self-contained and had its dedicated memory and shared nothing.** I was in the news because I **invented** a new Internet that's a new global network of millions, or billions, of processors. I **invented** how to parallel process. Or how to execute a **billion** set of computer instructions. And how to execute them **at once**. Or how to execute them in parallel and **across** up to a **billion processors**.

*Contributions to Algebra*

## How is Mathematics Used in Climate Change?

For the 25-year-old mathematician, the expression “**partial differential equations** of mathematical physics” conjures up images of the **parabolic heat** equation, the **hyperbolic wave** equation, and the **elliptic Laplace** equation described in his mathematics textbooks. The real-world problems that arise in mathematical physics occur while **hindcasting** the weather up to 7.7 miles (or 12.4 kilometers) below the surface of the Earth.

The world’s **biggest problems** include the **hindcasting** of the “**weather**” deep inside the Niger Delta oil fields of southern **Nigeria**. Another large-scale computational fluid dynamics problem that’s equally compute-intensive is to forecast the long-term weather above the surface of the Earth. Or to simulate the spread of a once-in-a-century global pandemic’s **contagious viruses across** the two and half billion passengers a year that ride in Russia’s Moscow Metro.

These real-world initial-boundary value problems that’re governed by **partial differential equations** of mathematical physics **can’t** be **analytically** solved on the blackboard. Or solved with pencil and paper. Or solved with a computer that’s powered by one processor. The world’s most compute-intensive mathematical problems must be solved only **across** a new

Internet that's a new global network of millions of processors that were identical and that **shared nothing**.

### *Solving Complex Mathematics Problems*

As a research computational mathematician who came of age in the **1970s** in Corvallis (Oregon) and **80s** in College Park (Maryland), Washington (District of Columbia), and Los Alamos (New Mexico), my mathematical **grand challenge** was to invent the correct system of **partial differential equations**, called the nine Philip **Emeagwali** equations, that governs the flows of crude oil, natural gas, and injected water that're flowing **across** any of the world's 65,000 producing oil fields, including Nigeria's 159 producing oil fields.

My system of **partial differential equations** were not published in any calculus textbook of the 1980s. As their sole inventor, I was the **first person** to formulate and discretize them and, consequently, derive their companion system of **partial difference equations** of large-scale computational linear algebra. I **invented** both my systems of **differential** and **difference** equations from my correct formulation of the Second Law of Motion of physics.

I **discovered** how to chop up the most compute-intensive problems as the sixty-four binary thousand high-resolution computational physics codes that I must parallel process. And



that I must map in a **one-code** to **one-processor** corresponding fashion. And that I must evenly distribute onto as many off-the-shelf processors that **outlined** and **defined** my **new Internet**.

My **new Internet** was a virtual supercomputer, in reality. That **one-code** to **one-processor** mapping was the **grand challenge** of extreme-scaled computational mathematics, such as global climate modeling to **foresee** otherwise **unforeseeable** global warming.

### *Unlocking the Genius: Counting to Infinity*

What are the **contributions** of **Philip Emeagwali** to mathematics? Often, scientific recognitions lack a sense of **proportion** and **context**. My **mathematical discovery** of thirty-six **partial derivative terms** that must be used to accurately pinpoint the miles-deep locations of crude oil and natural gas deposits is **abstract**. And it's not as important as my **scientific discovery** that the fastest computer can be built with the **slowest** processors. The latter contribution was a scientific breakthrough and the subject of newspaper articles. And became **the vital technology that underpins every supercomputer**.

Inventing my new 36 **partial derivative** terms requires very high-level, dense mathematics to fully explain all the mathematical steps that I took over a fifteen-year period. The simplified explanation of my mathematical **invention** that is my

**contribution** to mathematical knowledge is that both the **temporal** and the **convective** inertial forces that exists in the **actual** problem must **also** exist on the blackboard and motherboard. And must be represented by those thirty-six **partial derivative terms**.

Inventing a new system of **partial differential** equations of calculus and discretizing those equations into a new system of **partial difference** equations of large-scale computational linear algebra and experimentally proving the **stability** and **convergence** properties of the companion **partial difference** algorithms and coding those algorithms **across** a monumental ensemble of off-the-shelf, coupled processors that **shared nothing** was a **notable problem** that was defined at the crossroad where new physics, new mathematics, and the world's fastest computing **intersected**.

In 1989, I was in the news for solving that **Grand Challenge Problem of supercomputing**. And for solving it **alone**. The parallel supercomputer that occupies the space of a soccer field is a **super-sized** mathematical instrument that put the **partial differential** equation **back whence it came from**. It's not enough to lecture on the mathematical foundation of the fastest supercomputers, even though that intellectual feat requires mastery of physics, mathematics, and computer science. It took me twenty years to arrive at the **frontiers** of knowledge of physics, mathematics, and supercomputing.

## *A New Way of Doing Mathematics Solving Problems Across Processors*

I was in the news because I **discovered** how to solve the most compute-intensive mathematical problems, such as initial-boundary value problems governed by a system of **partial differential equations**. I **discovered** how to solve **partial differential equations across** a new Internet that's a new global network of up to a billion processors.

Such equations **contextualized** and **encoded** some of the most important laws in physics. Such equations capture in a few **succinct** terms some of the most **ubiquitous** features of the air and water flowing **across** the surface of the Earth, including the atmosphere and oceans, and the crude oil, injected water, and natural gas flowing **across highly anisotropic** and **heterogeneous** producing oil fields that are up to **7.7 miles** (or 12.4 kilometers) below the surface of the Earth. An oil field is about the size of a town.

## *Redefining Mathematical Physics*

My contributions to supercomputing, as it's executed today, pushed the boundaries of modern mathematical physics to include fastest computing **across** up to one billion processors. I couldn't have **accidentally discovered** a more accurately formulated system of **partial differential equations** and

discovered it without knowing what's **erroneous** with the century-old **partial differential equations** that were published in textbooks.

After sixteen years of mathematical research, I became **fearless** in the face of the **partial differential equations** arising at the frontier of calculus. After sixteen years, I developed the **mathematical maturity** that was needed to read the physics subtext encoded into **partial differential equations**. And needed to understand what their **partial derivatives** represent. I could introduce **new partial derivatives** and introduce them into the **partial differential equations** and where they were **missing**.

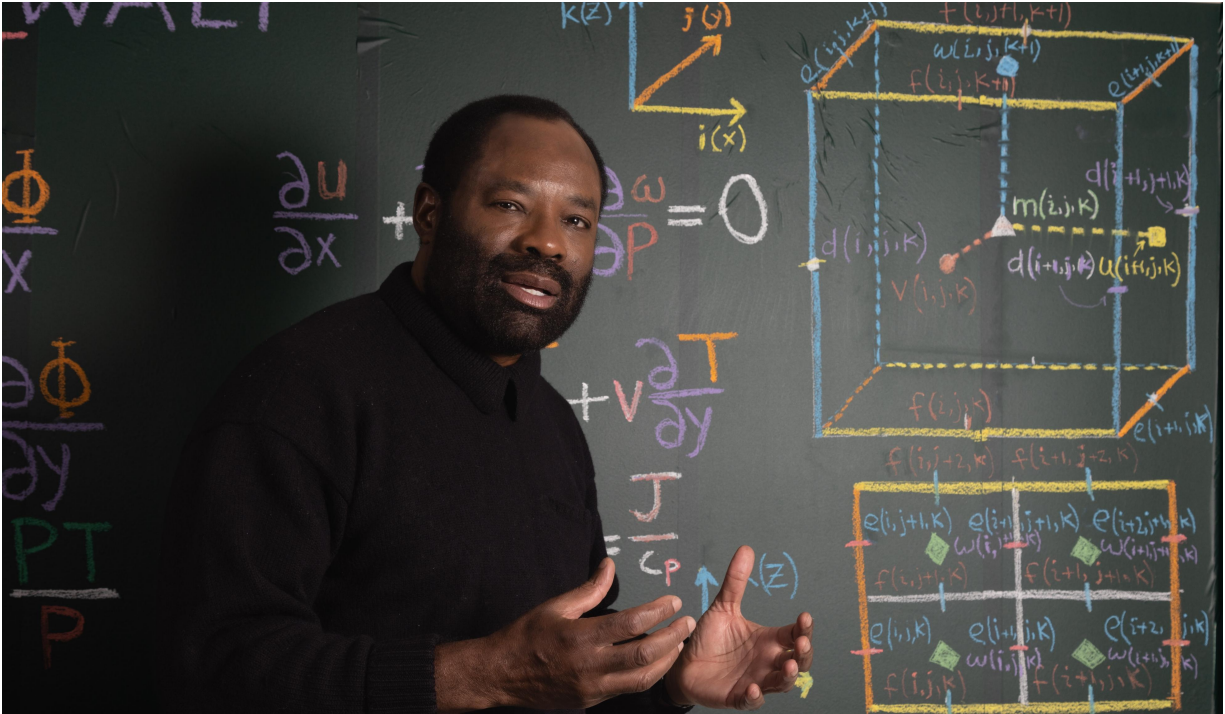
After sixteen years, I gained the ability to **discretize** any **partial differential equation**. And to solve it on a computer. Or solve it **across** a new Internet that's a new global network of coupled processors. I knew **partial differential equations** not by **memorization** but through understanding them enough to **invent new ones**.

I understood **partial differential equations** deeply. I could look in the mathematical physics textbook and see which key **partial derivatives** were **missing** from the system of **partial differential equations** that were used by computational physicists. And used to simulate the flows of crude oil, natural gas, and injected water that were flowing up to **7.7 miles** (or 12.4 kilometers) deep. And flowing **across** a **highly anisotropic** and

heterogeneous producing oil field that's up to twice the size of the state of Anambra, Nigeria.

After sixteen years with foremost American and visiting European mathematicians, I developed the ability to translate verbal statements of the laws of physics. And translate them into partial differential equations that arise beyond the frontier of calculus.

Likewise, I developed the ability and the intuition that was needed to move back and forth between the laws of physics and the partial differential equations that arise beyond the frontier of calculus. Furthermore, I developed the mathematical maturity needed to identify connections between the weather above the surface of Earth and the weather below the surface of the Earth. Not only that, I could spot century-old mathematical errors in textbooks and correct them. I could draw a line between the partial differential equations we know and the ones we don't know.



Philip Emeagwali explaining how he solved the most difficult math problem. The contribution to mathematics made the news headlines, back in 1989.

*Unlocking the Mathematical Mysteries: How I Solved the Most Difficult Problem in Computational Mathematics*

How did I solve the most difficult problem in computational mathematics? I could use my **instinct** and **intuition** to solve initial-boundary value problems in extreme-scale mathematical physics. A calling for **solving unsolved** problems of mathematics is needed. Just like it's impossible for you to set the world record in a **26.2 mile (or 42 kilometer)** marathon race and do so without extensive training in long-distance running, it would have been **impossible** for me to set the world record of the fastest mathematical computations that I executed on the Fourth of July

**1989**, in Los Alamos, New Mexico, USA. And set that record without my sixteen-year-long training as a research computational mathematician in the USA.

In 1989, what made the **news headlines** was that an **African-born** computational mathematician has **discovered** how to perform the **fastest** mathematical computations. I did so by **changing the way we count**, namely, my **alternative way** of counting up to a **billion** things **at once** instead of the **old way** of counting **only one thing at a time**. That old way of counting was used since the era of our prehistoric human ancestors. The **paradigm shift** from the **sequential way of counting** to the **parallel way of counting** is to the mathematics textbook, what the **continental drift** was to the geology textbook.

### *The Importance of Philip Emeagwali Equations*

What are the importance of the **Philip Emeagwali equations**? To **contribute new mathematics** is to add new knowledge to the existing body of mathematical knowledge. The nine **new partial differential equations** that I **invented** were cover stories of top mathematics publications, such as the May 1990 issue of the *SIAM News*, which is the flagship publication for the research mathematician.

My **partial differential equations** are for **discovering** and **recovering** otherwise **undiscoverable** and **unrecoverable** crude oil

and natural gas **formed up to 541 million years ago** and buried up to **7.7 miles** (or 12.4 kilometers) deep. Without the fastest computing **across** millions of processors that I discovered, the solution of the most **compute-intensive** initial-boundary value problems—such as the simulation of long-term climate change—will be as **approximate** as a **sketch**, instead of as **exact** as a photograph.

In theory, mathematical predictions based upon the **partial differential equations** should be as **reliable as a hammer**. In practice, it's a different story. The world's fastest computer shortens the gap between theory and practice. The **Philip Emeagwali** equations are correct and accurate and, for those reasons, also shorten the gap between theory and practice.

### *Fastest Computing is My Contribution to Mathematics*

What are the **contributions** of **Philip Emeagwali** to mathematics? A **significant contribution** to mathematical knowledge can be made only by a person who has spent three, or four, decades training as a research mathematician. And as a **polymath** who has reached the **uncharted waters** of mathematical and scientific knowledge. And went beyond the unexplored territory of human knowledge where **new mathematics** can be **discovered**. My journey was to the *terra incognita* of mathematical knowledge where I became the **first person** to



figure out how to solve never-before-solved problems beyond the mathematics textbook.

Such grand challenge problems exist beyond the mathematician's blackboard. Such troublesome problems were formulated for physical domains up to 7.7 miles (or 12.4 kilometers) beneath the surface of the Earth. A grand challenge problem is in contrast to mathematical problems formulated only for the mathematician's textbook and blackboard.

*My Struggles to Contribute New Computer Knowledge to  
Mathematics and Physics*

It took me two decades of full-time training to contribute the knowledge of the world's fastest computing to both mathematics and physics. It took me the first sixteen years in the USA, following March 24, 1974, to gain the mathematical maturity needed to solve advanced mathematical problems in planetary-scaled geophysical fluid dynamics. During those sixteen years, I constantly struggled against the most compute-intensive problems that spanned disciplines, from geology to meteorology, from the partial differential equations beyond the frontier of calculus to the processor-to-processor emailed codes of computational physics, and from extreme-scale algebra to

supercomputing **across** a billion processors that outline a new Internet that's a new global network of **coupled processors**.

I grew as a research mathematician and did so during those sixteen years, or more, of solving **increasingly challenging** problems that arose at the crossroad where new mathematics, new physics, and the world's fastest computing **intersect**.

My quest for the world's fastest computing started as the world's slowest mathematician. That quest began from the **times table** that I learned in the first grade at age five in January **1960** in **Sapele, Nigeria**. It grew to the **fastest multiplications** that I recorded on the Fourth of July **1989**, in Los Alamos, New Mexico, **USA**. That technology underpins the fastest parallel-processed **computations**, that I **invented**. It's used to solve real-world mathematical problems, such as making possible your evening weather forecast that's based upon extreme-scaled computational physics that must be executed **across** an ensemble of up to **10.65** million off-the-shelf processors.

Two thousand three hundred years ago, **King Ptolemy**, the first, of Egypt demanded from the father of geometry, **Euclid**, an easier path for his son to follow and understand geometry.

**"He's a prince,"** said King Ptolemy.

**"There is no royal road to geometry,"**

Euclid replied.

*I Contributed Emeagwali Equations to Mathematics and  
Physics*

My **contributions** to mathematics and physics **were these**: I **discovered** a **royal road** to the farthest frontier of calculus. My royal road led to the solution of the most compute-intensive problems in mathematics, physics, and computer science.

That grand challenge problem was to find the solution to the **discrete approximations** of initial-boundary value problems beyond the frontiers of calculus, computational physics, and supercomputing. And doing so **across** a global network of up to a billion processors that is an Internet. My **discovery** of the world's fastest computing enabled the supercomputer to become the **workhorse** of large-scale computational mathematicians and physicists.

In supercomputing, nine out of ten cycles are consumed by modelers solving **grand challenge problems** that are governed by systems of **partial differential equations** and their companion and approximating system of **partial difference equations**. The **partial differential equation** of calculus is an equation for some quantity called a dependent variable. That dependent variable depends on some independent variables. And involves derivatives of the dependent variable with respect to at least some independent variables.

For four decades, I researched **partial differential equations** that govern both the “**weather**” up to **7.7 miles** (or 12.4 kilometers) **below** the surface of the Earth. And the weather **above** the surface of the Earth. These are by far the most important **partial differential equations** in mathematical physics.

My **contributions** to mathematical knowledge that made the **news headlines**, in 1989, **were these**: I **discovered** a **royal road** to the farthest frontier of human knowledge of large-scale computational and mathematical physics.

# UNLOCKING THE POWER OF A BILLION PROCESSORS

**M**y discovery of the world's fastest computing is my signature contribution to human knowledge. My discovery led to the parallel-processed solution of the largest-scaled problems in computational physics. It led to solving real-world initial-boundary value problems. And solving them across sixty-four binary thousand processors, that were coupled and shared nothing.

My **discovery** of fastest computing yielded the **vital technology** that now **underpins** every **supercomputer**. For those reasons, my **invention** was later acknowledged by then U.S. President **Bill Clinton**, who did so in his **White House** speech dated August 26, **2000**. Likewise, my **invention** was acknowledged in the **news headlines** of **1989**, and later. Since 1989, my **invention** has been the subject of school essays on **computer pioneers and their contributions to the development of the computer**.

## *My Contributions to Mathematical Physics*

Since June 20, **1974**, a **Thursday**, that I remember because a **total solar eclipse** occurred, and the Moon passed between the

Earth and the Sun, and since that rare astronomical event, my quest for the fastest supercomputer on Earth hinged on the **most consequential issue** in computer history.

In computing, the biggest question **was this**: how do mathematicians solve a **Grand Challenge Problem** at the intersection of mathematics, physics, and computer science? Or, how do mathematicians solve the initial-boundary value problem of large-scale mathematical and computational physics?

And how do mathematicians **discretize** that **difficult problem**? And do so by dividing the resulting system of equations of extreme-scale algebra into up to a billion smaller systems. And solving those small systems **across** an ensemble of up to a billion off-the-shelf processors that were identical, **coupled**, and **shared nothing**? Each processor operated its operating system and had a one-to-one correspondence with the as many problems.

### *Bridging the Gap Between Fantasy and Reality*

There's no precise set of rules for solving unsolved problems. The best we can do is to keep searching for answers. My quest for the world's fastest computer was both a **journey** and a **destination**. My scientific discovery, of how to manufacture the fastest computers and do so with standard parts, **fuelled** the quest for a **new destination**, namely, the **next horizon**

to answering the most difficult questions in modern computer science.

That **new horizon** is to invent the quantum computer and, most importantly, to use the technology to address the toughest questions in science. That **new technological horizon** resides within the realm of computer **science fiction** and is still beyond our understanding.

I worked alone because my world's fastest computing that was **enabled** by the world's **slowest** processors was **ridiculed**— by the likes of **Steve Jobs**— and **dismissed** as a **noble** but **distant dream**.

My **discovery** of the world's **fastest** computing was at first theorized and, therefore, was expected. Yet, it was an **otherworldly** new knowledge. The world's **fastest** computing was my 1989 holiday gift to the U.S. for its Independence Day of the 4<sup>th</sup> of July that's Nigeria's equivalent of October 1.

A scientist achieves **immortality** by first discovering something that will be **forever remembered**. For me, science is more than learning science. My science is a search for something unknown, such as the invention of the world's **fastest** computer, as it's known today and as it's expected to be known tomorrow.

# 3RD LECTURE: UNLOCKING MY DIGITAL DESTINY



**Broadcast 24 August 2021**

**[https://youtu.be/e9z0oxvOV\\_E](https://youtu.be/e9z0oxvOV_E)**



# EARLY REJECTIONS OF MY INVENTION

**I**'m here because I was the first person to discover the world's fastest computing across the world's slowest processors. That was the world's first supercomputer, as it's known today.

In 1989, I was in the news for discovering that the world's slowest processors could be used to solve the most compute-intensive problems arising in mathematics, physics, and computer science. And find their answers at the fastest speeds. The fastest computer is why you know the weather before going outside.

After I won the highest award in supercomputing, in 1989, I had the seal of approval equivalent to winning the Oscar for acting or winning the Grammy Award for singing or winning a Grand Slam tournament of tennis. The highest award in supercomputing that computer scientists rank as the Nobel Prize of Supercomputing is a peer honor awarded by supercomputer scientists and awarded at the top supercomputer conference and awarded only to someone who made a measurable contribution to supercomputing, that includes a quantified and new milestone in computer history.

After the **news headlines** from my winning that **prize**, supercomputer scientists who **mocked** and **made fun** of me took notes when I gave lectures. But in the early **1980s**, nobody took notes when I lectured at gatherings of research scientists. I was **fired** as a scientific researcher in December **1980** because I was advocating **changing** research directions. I was **dismissed** because I wanted to **change from** small-scale fluid dynamics modeling within one processor to large-scale modeling **across** a new Internet that's a new global network of 65,536 off-the-shelf processors and standard parts.

My **contributions** to computer science **were these**: I **discovered** how to harness a billion **coupled processors** that **shared nothing**. And how to use them to execute time-dependent, three-dimensional fluid dynamics calculations that have extreme-scale algebra at their computational cores. An example is simulating the spread of **contagious viruses** inside Japan's Tokyo subway where 3.1 billion passengers a year are **packed like sardines**.

### *Rejection in 1974 in Oregon*

My signature **invention** is the world's fastest computing **across** the world's slowest processors. And it's use to solve the most difficult problems arising in science, engineering, and medicine. My new technological knowledge has been absorbed

into the fastest computers in the world. I **invented** it as the **vital technology** that will **underpin** every supercomputer. In the summer of **1974**, my **vague idea** of sixty-four thousand computers around the Earth was inspired by a **science-fiction story** that was dated February 1, **1922**. My theory of fastest computing was **mocked** and **dismissed** as a **joke**.

**What makes a computing milestone?** A computing milestone begins with a vision of a quantum leap in the speed of the world's fastest computer. In practice, it takes a decade, or more, to invent a new supercomputer.



Philip Emeagwali near 1800 SW Campus Way, Corvallis, Oregon, where he began supercomputing back on June 20, 1974 (Photo taken ~ late July 1975).

*Rejection in November 1982 by the U.S. government*

In November **1982** and at a science conference that took place near **The White House**, in Washington, D.C., I gave a research presentation on how, in theory, I could chop up an initial-boundary value problem that's the most compute-intensive in mathematical physics. And chop it up into 65,536 less compute-intensive problems. And then solve them **in tandem** and **across** a new Internet that's a new global network of sixty-four binary thousand processors.

Only one young computational physicist remained to listen to my lecture. Even though he didn't understand my theory of the fastest computing across the slowest processors, his intuition told him that the new technology was **bigger than us**. Convinced, he spearheaded an initiative to invite me to speak in **Bay Saint Louis, Mississippi**.

*Rejection in May 1983 by the U.S. Government Six months later, I gave a hiring lecture in Bay Saint Louis, Mississippi. My lecture was on how to parallel process and solve **in tandem** the most extreme-scale initial-boundary value problems in computational fluid dynamics. That lecture went over their heads, in part, because in May 1983 nobody understood how to parallel process. And do so **across** a new Internet that's a new global network of sixty-four binary thousand processors.*

That I wasn't **hired** was because recording the world's fastest speed in computing and doing so **across** the slowest processors was then in the realm of **science fiction**. Parallel computing was considered to be an **enormous waste** of their time. It was also **rejected** because I was **Black and sub-Saharan African**. In the 1980s, I was the **only person** that could give a lecture on how to harness a million processors. And use them **in tandem** to forecast tomorrow's weather. In **1989**, I was in the **news** for **discovering** that the **slowest** processors could be used to solve the **biggest** problems.

# REJECTION OF PARALLEL PROCESSING IN 1983

**M**y world's fastest computing of July 4, 1989, in Los Alamos, New Mexico, USA, was theorized in June 1974, in Corvallis, Oregon, USA. I continuously developed it during the fifteen years up to 1989.

Back from September 1, 1981, through August 1986, I lived a 15-minute stroll from the [Gramax Heliport Building](#) in Silver Spring, Maryland. The Gramax Building was the then headquarters of the [U.S. National Weather Service](#).

On my typical weekdays of the early 1980s, I arrived at eight o'clock in the morning at my desk in the Gramax Building at 8060 13th Street, Silver Spring, Maryland. In the 1980s, the Gramax Building housed the U.S. National Weather Service. During those five years, and from Mondays through Fridays, I stopped each morning and spent five hours with research hydrologists and meteorologists.

As a research meteorologist, and from 1981 to 86, I spent the first half of each day in the headquarters of the U.S. National Weather Service. I mathematically analyzed finite difference algorithms and processor-to-processor emailing **across** a new Internet that's a new global network of 65,536 processors.

Finite difference schemes must be used to discretize and solve the set of **primitive equations** that governs atmospheric dynamics, namely, rain, wind, floods, and hurricanes. The primitive equations, which encode a set of laws of physics, were first formulated in **1904**. Eight and half decades later, I was in the news for **discovering** how to solve initial-boundary value problems that are governed by a system of **partial differential equations**, such as the primitive equations used to forecast the weather.

The supercomputing **breakthrough** was **not** that I discovered how to forecast the weather on the world's **fastest** processor *per se*. The technological **breakthrough** was that I **discovered** the world's **fastest** computing **across** the **slowest** 65,536 processors in the world. The pre-cursor to my world's fastest computing, of July 4, 1989, in Los Alamos, New Mexico, was **rejected** in September 1983, in Washington, D.C. and by the U.S. National Weather Service, in Silver Spring, Maryland.



Philip Emeagwali, Baltimore, Maryland, circa December 1983.

A decade earlier, I left Nigeria for Oregon, USA, and arrived on March 24, 1974. In that decade, the most brilliant Nigerians in the U.S. were denied jobs as research engineers and scientists. And they were denied opportunities to contribute to scientific knowledge.



In the early 1970s, well compensated research jobs in the field of computer science were reserved for white males. When I gave a job hiring lecture in Ann Arbor, Michigan, on about September 24, 1985, it seemed surreal to the white audience listening to my theory of how to harness the 65,536 slowest processors in the world. And using them to record my world's fastest computing that later occurred on July 4, 1989.

My audience in Ann Arbor, Michigan, experienced **cognitive dissonance**. They've never listened to a Black research mathematician who came to them with new computational mathematics from his forthcoming world's fastest computing.

Nigerian mathematicians **who** can invent new **partial differential equations** for modeling the spread of the coronavirus left mathematics, where they are no jobs, to become nurses. As a result of this internal brain drain, from research mathematics to nursing practice, Nigerians became **underrepresented** in winning top scientific prizes but are **overrepresented** as the hardest working nurses in America. In the U.S., one in twenty registered nurses were born in Nigeria. My four sisters are Nigerian-American nurses who work two jobs each to pay the school fees for distant relatives in Nigeria.

Fifty years ago or in the 1970s, the most brilliant Nigerian scientists in the USA became janitors, like I was in Oregon. Some became security guards in Washington, D.C. or taxi drivers

in New York City. In the 1970s and 80s, many Nigerian taxi-drivers in the big American cities, who were brilliant engineers and scientists, were robbed and killed.

I began supercomputing on June 20, 1974, in Corvallis, Oregon. In 1974 and in the U.S., no Black computer scientist had ever been hired in any predominately white academic institution in North America. Seven years later, I worked without pay, for five years, and conducted supercomputing research at the headquarters of the U.S. National Weather Service in Silver Spring, Maryland. My supercomputer discovery, that was not paid for, increased the accuracy of weather forecasts now produced by the National Weather Service.

As the only person that was not paid, I was the only research meteorologist that had the complete freedom to pursue unorthodox lines of enquiries that led to my scientific breakthrough. In contrast, salaried research meteorologists were explicitly told what to do. And were forbidden from conducting the parallel supercomputing research that I had the freedom to explore. Also, because I was not paid, I retained the legal rights to all my inventions.

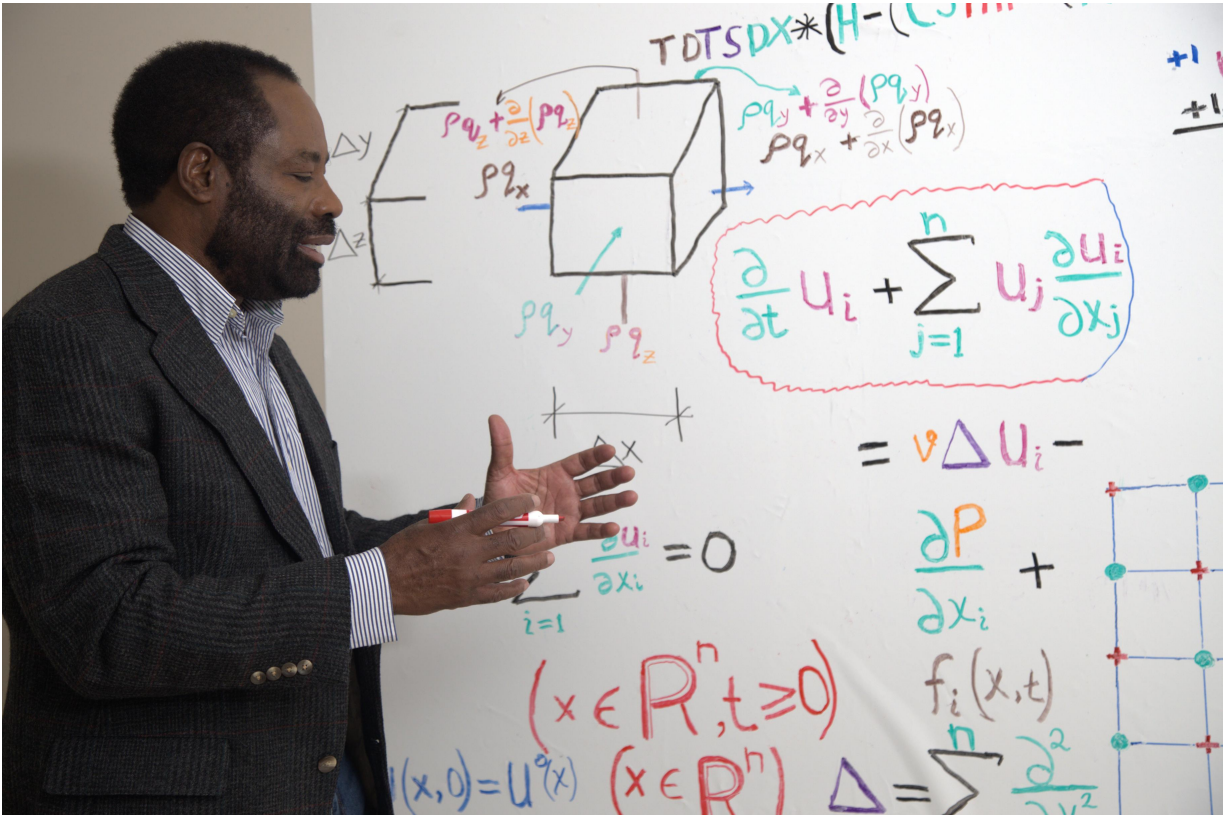
I'm a Black mathematician that occupies a white space. Mathematics itself is **race neutral**. But white mathematicians were not **race neutral**. The nine Philip **Emeagwali** equations were **correct** and **accurate**. For years, many white mathematicians

were slow in accepting my properly derived mathematical equations. The Philip **Emeagwali** equations were accepted only after I disguised my racial identity and used those equations to win the highest award in supercomputing.

Parallel processing, as a subject, did not exist on June 20, 1974, the day I began supercomputing, in Corvallis, Oregon. In September **1983**, I submitted a research report on an early version of my theorized world's fastest computing **across** a million processors. My seventy-five dollar **non-refundable** submission fee was accepted, but my technical report on the world's fastest computing was **rejected**. That **rejection** of the precursor to my 1,057-page research report on the world's fastest computing that I recorded on July 4, 1989, in Los Alamos, New Mexico, was **repeated** six times. Their six rejections of my discovery of the world's fastest computing **stopped** after my 40-page summary of that 1,057-page report won the highest award in supercomputing. And won it because I discovered that the world's fastest computer can be built from the world's **slowest** processors.

In 1989, I was in the news because I was the **first person** to prove that a supercomputer that is powered by up to one billion processors can be used to more accurately pinpoint the locations of crude oil and natural gas deposits that were buried up to **7.7**

miles (or 12.4 kilometers) deep. And buried **across** the 65,000 producing oil fields around the world.



Philip Emeagwali explaining how he solved the most difficult math problem. That contribution to mathematics made the news headlines in 1989.

# REJECTION IN ANN ARBOR, MICHIGAN, 1985

**P**arallel processing—or solving up to one billion problems at once—is the breakthrough invention used to make the computer faster and the supercomputer fastest. My timeline with parallel supercomputing parallels the development of a new, high-performance computer science. At the time of my November 1982 lecture, in Washington, D.C., on how I could solve the most compute-intensive problems that arise as geophysical fluid dynamics initial-boundary value problems, little was known about the world’s fastest computing across the world’s slowest processors. So the then unfamiliar technology for parallel supercomputing was widely ridiculed as existing only in the realm of science fiction. In the early 1980s, what was known about parallel supercomputing rested in the minds of the first parallel programmers.

I was the **first** full-time supercomputer scientist in the world. That accomplishment explains why most of the transcribed lectures on supercomputing that were posted on **YouTube** were delivered by **Philip Emeagwali**. It’s been noted that I posted more **transcribed** scientific research lectures on YouTube than any person or institution ever did.

On about September 24, 1985, I gave a hiring lecture on the fastest computing **across** the **slowest** processors. And gave that lecture at the research laboratory of the federal agency, called the **U.S.** National Oceanic and Atmospheric Administration. That research laboratory was in **Ann Arbor, Michigan**. My supercomputing lecture to those research oceanographers was **abstract** because I lectured on the most advanced calculus, called **partial differential equations**. And lectured on the most compute-intensive algebra, called **finite difference equations**.

Furthermore, I used then **unfamiliar** and **complicated** supercomputer technology, that's now known as fastest computing **across** a million processors. In 1985, parallel processing existed only as a computer science theory. Parallel processing did not power fastest computers, until I discovered it on July 4, 1989.

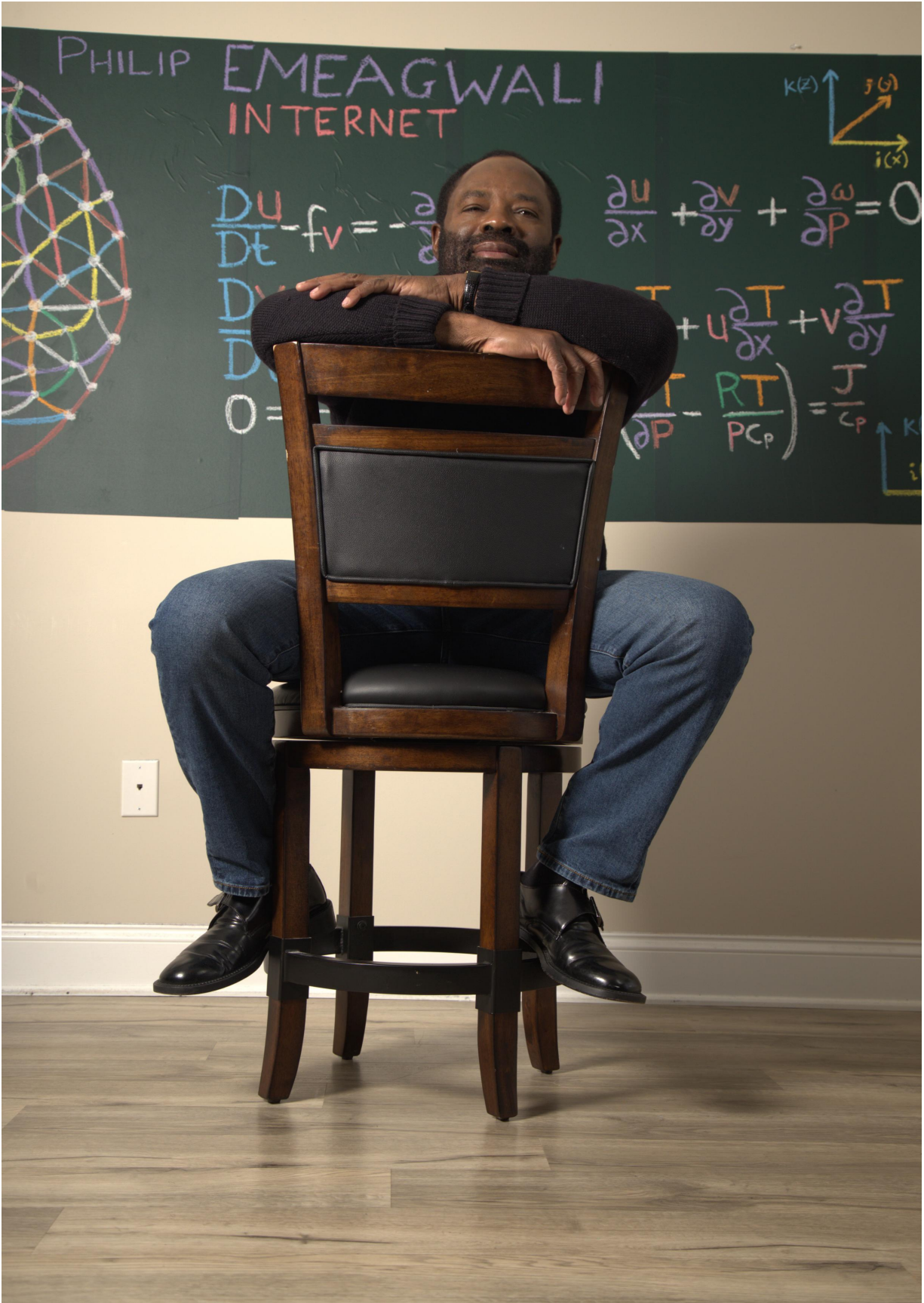
My **contribution** to computer science **is this**: I **discovered** how up to a million processors could be harnessed **in tandem**. And used to forecast the weather, as well as solve the hardest problems. Before my **discovery**, that **new knowledge** only existed in the realm of **science fiction**.

My **contribution** to mathematics was to turn that **fiction** to **nonfiction**. In my hiring lecture of about September 24, 1985, in Ann Arbor, Michigan, I was tasked to detail how I could predict the fluctuations of water levels **across** the **Great Lakes of North**

**America.** I explained how to parallel process a **seiche**, the name for a standing wave that **oscillates or sways back and forth** and flows within an enclosed, or a partially enclosed, or a landlocked body of water.

The pre-cursor to my world's fastest computing, of July 4, 1989, in Los Alamos, New Mexico, was **rejected** in September 1981 by the U.S. National Weather Service, then at the Gramax Building in Silver Spring, Maryland. It was again **rejected** in September 1983, in Washington, D.C. Finally, it was **rejected** in Ann Arbor, Michigan, on about September 24, 1985.

In the 1980s, the academic scientists in Ann Arbor, Michigan, who were all narrowly- and shallowly-trained, only understood fluid dynamics or **partial differential equations** and **dismissed** my world's fastest computing **across** world's slowest processors as a **science fiction**. My explanations of emailing **across** millions of processors was **science fiction** to the scientists in Ann Arbor, Michigan. Those scientists were very **narrow minded** and **arrogant**. They could not give ten percent of the lectures that I shared as podcasts and YouTube videos, but pretended they could do so. The scientists in Ann Arbor, Michigan, were **negatively affected** by their **insularity** and **group thinking**.





Philip Emeagwali

As was then written in several Ann Arbor publications, I worked alone and beyond the frontier of knowledge. *The Michigan Today*, is mailed to 610,000 college-educated people around the world. It's published, four times a year, in Ann Arbor, Michigan, and archival copies are posted online. The February 1991 issue of *The Michigan Today* that can be read online was a special issue on the contributions of **Philip Emeagwali** to the development of the supercomputer. I was featured alone in *The Michigan Today* because my research on the world's fastest computing was over the heads of academic scientists in Ann Arbor, Michigan, who at that time had never seen the world's fastest computer, as it's known today.

It was supercomputer scientists outside Michigan that explained to academic scientists in Ann Arbor that I've **discovered** the world's fastest computing. Therefore, it should not come as a surprise that both the governor of Michigan and the Michigan House of Representatives, that seat 65 miles away in Lansing, first congratulated me for my world's fastest computing. And sent their congratulations before the academic engineers in Ann Arbor could do so.

The reason was that my discovery was abstract. The U.S. government called it a grand challenge problem for a good reason. My solution of the grand challenge problem was beyond

the reach of any academic scientist of the 1980s. As my one thousand podcasts and YouTube videos prove, I was the only person that could deliver a complete series of scientific lectures on how to solve the grand challenge problems.

To put my scientific research in a different perspective, Isaac Newton's Laws of Motion were defined in three-dimensional everyday space that an automobile engineer in Ann Arbor, Michigan, could grasp. In practice, engineers don't think in four dimensions. For instance, Albert Einstein's Theory of Relativity has never been mentioned in any meaningful conversation at any engineering conference. The engineer finds it difficult to think in the **abstract** four-dimensional space-time continuum of the Theory of Relativity. I took mathematical thinking to a higher level and explained my world's fastest computing in **sixteen** dimensions.

My world record speed was **magic** and **science fiction** to every engineering academic in Ann Arbor, Michigan. Scientists **reject** new paradigms that they cannot understand. Besides my research, Ann Arbor, Michigan, was **never** strong in supercomputing and never pushed the frontiers of knowledge in computer science.

On July 4, 1989, I executed my world's fastest computing on a machine that was in Los Alamos, New Mexico, not in Ann Arbor, Michigan, as was widely presumed. Since the late-1940s,

Los Alamos was the world's headquarters for supercomputing. It's more than a coincidence that I **discovered** the world's fastest computing in Los Alamos. Ann Arbor, Michigan, was where my son **was born**, not where my discovery **was born**.

But for personal reasons, Michigan remains a crucial place in my life story. And an integral part of my legacy. I had a global view of science that went beyond Michigan. Ann Arbor is a mere dot on the map of the world. And my contribution was not to Ann Arbor, Michigan, but to science. And to the millions of students around the world writing school essays on **Philip Emeagwali**.

**I know who my boss is.** My boss is the twelve-year-old student in sub-Saharan Africa. And my duty is to inspire her with my life stories and do so in forthcoming centuries and millennia, just like Euclid, Galileo, and Newton did to me when I was a twelve-year-old African.

The difference between other scientists and I **is this**: The computer of the academic scientist sits on his desktop. And it costs a thousand dollars. The world's fastest computer is not an academic toy. It occupies the footprint of a football field. And it costs forty percent more than the mile-long Second Niger Bridge of Nigeria. The desktop computer is just a drop in the bucket called the supercomputer.

In 1989, I was the sole full-time programmer of sixteen supercomputers, as they're known today. Unlike the academic computer scientist that learned supercomputing from his textbook, I had to know the explicit inner workings of all my 65,536 processors that **shared nothing**. And that I programmed alone.

As a mathematician, I was **cognizant** of the fact that the analytical solutions for my initial-boundary value problem governed by the **Philip Emeagwali** equations were **nonexistent**.

My **contribution** to mathematics **is this**: I **discovered** that all initial-boundary value problems are **tractable across** a new Internet that's a new global network of up to a billion processors that **shared nothing**. My supercomputing discovery is the only way to solve grand challenge problems, such as simulating the spread of Covid-19 **across** the one million daily patrons of Onitsha market.

# OVERCOMING WHITE SUPREMACISTS

**W**hat is Philip Emeagwali famous for? In 1989, I was in the news because I programmed the first supercomputer, as it's known today. I programmed sixty-four binary thousand off-the-shelf processors that outlined and defined a never-before-seen Internet that's also a never-before-seen supercomputer, de facto.

Racism swirled around me everywhere I went. The personal attacks were cloaked in race-neutral language. But the hostility arose because, in 1989, a 35-year-old Black mathematician was making the news headlines for discovering the world's fastest computing **across** a new Internet that's a new global network of the world's slowest processors.

My lectures are not secret as was wrongly alleged. My lectures were spread across one thousand podcasts and YouTube videos. Many that listened to or watched my lectures, in their entirety, favorably compared them to those of **Albert Einstein** and the greatest scientists of the second half of the 20<sup>th</sup> century.

When I was coming of age, in the 1980s, I was often **disinvited** from giving the pre-cursors to the lectures that I posted

on YouTube. I was **disinvited** not because the world's fastest computing was not understood to be a critical technology. It was well accepted that the world's fastest computing is the most important topic in mathematics, physics, and computer science.

I was **disinvited** because my lectures and physical presence in predominately white academic settings **quietly stirred up uncomfortable questions** about **race** and **intelligence**. Because I was Black and African and compared to **Albert Einstein** in IQ, I was **deplatformed**. I was stopped from delivering lectures at any of the five thousand predominately white institutions in the U.S.

The double standard was that **Albert Einstein** was not **disinvited** when he spoke at the **all-Black** Lincoln University of **Pennsylvania**, back on May 3, 1946. Lincoln University is the *alma mater* of the poet **Langston Hughes**, first president of Nigeria, **Nnamdi Azikiwe**, first president of Ghana, **Kwame Nkrumah**, and the first U.S. Supreme Court justice, **Thurgood Marshall**. In 1946, lynching, race riots, and segregation were ways of American life. And the white press, biographers, and **archivists** ignored **Albert Einstein's** lecture at the all-Black institution.

As an aside, I wasn't the only Black computer scientist that was **deplatformed** across the five thousand predominately white institutions in the U.S. In the 1980s, a survey showed that only

three Black computer scientists were allowed to teach the subject **across** those five thousand institutions in North America.

I began supercomputing on June 20, 1974, in Corvallis, Oregon, USA. In the 1972 film “**Fist of Fury**,” Chinese martial artist **Bruce Lee** felt slighted by the sign “**No Dogs and Chinese Allowed**.” Years earlier, Blacks and Chinese were not allowed to enter science buildings in Michigan. In Ann Arbor, Michigan, racism was **deeply institutionalized**.

**Chien-Shiung Wu**, a Chinese physicist, was the unsung heroine of physics. **Wu** was associated with the **Manhattan Project** of the Second World War. That project yielded the first nuclear weapon. In 1957, the Nobel Prize in physics was denied from **Chien-Shiung Wu**. That injustice became a controversial decision and attracted public attention and sympathy for **Chien-Shiung Wu**. Her two male co-workers, **Chen Ning Yang** and **Tsung-Dao Lee**, received the Nobel Prize for the discovery that **Chien-Shiung Wu** made. **Wu** is remembered as the **first lady of physics**.

I’m forty-two years younger than **Wu**. And we became *cause célèbres* in experimental and computational physics, respectively. As a Black physicist, the rejections that I experienced in Ann Arbor, Michigan, were similar to those that made **Wu** to decline the offer to come to Ann Arbor. In July 1985 and after a nation-wide search, I was ranked as the top

supercomputer scientist that could be invited to live and work in Ann Arbor, Michigan.

On about September 24, 1985, I gave my job hiring lecture, in Ann Arbor. My scientific lectures of the 1980s were the precursors to my one thousand podcasts and YouTube videos. The research scientists in Ann Arbor, Michigan, were impressed with my command of materials. But they also wore a worried look on their faces. It was obvious they didn't expect me to be Black and African. Two days after my hiring lecture, I was told over the telephone that the job position for a supercomputer scientist, in Ann Arbor, has been **cancelled**.

Through word-of-mouth, some scientists who did not invite me to Ann Arbor, and did not even attend my hiring lecture, learned that I was trying to invent the world's fastest computing. And do so **across** the world's **slowest** processors. Those scientists became intrigued and courted me for two years. They wanted me to come back and complete my world's fastest computing in Ann Arbor, Michigan. For two years, I **hesitated** and pondered on the **deeply institutionalized** racism in Ann Arbor. That was the reason, I declined the first offer that was made on about September 25, 1985, to come to Ann Arbor, Michigan, to continue my research on the world's fastest computing. The measure of the difference between my knowledge and that of scientists in Ann Arbor, Michigan, **is this:**



I posted one thousand podcasts and YouTube videos, each on my contributions to the world's fastest computing. To this day, no scientist from Michigan could post one such video.

The [first lady of physics, Chien-Shiung Wu](#), declined to study in Ann Arbor, Michigan. Her reason was that she was not allowed to use the [front entrance](#) to enter the physics building, in Ann Arbor, Michigan. [In effect](#), I could not use the [front entrance](#) to enter the supercomputer building in Ann Arbor, Michigan. From 1987 to 89, I filed complaints that I was not allowed to use the supercomputer in Ann Arbor, which was equivalent to been banned from using the [front entrance](#) to enter the supercomputer building in Ann Arbor, Michigan.

At that time, I was acknowledged to be the foremost supercomputer scientist in the state of Michigan. And by federal law, I should be allowed to use that supercomputer which was funded by U.S. taxpayers. To prove my point, I can produce copies of a confidential memo, sent from a top official in Ann Arbor, Michigan, to his secretary, named "[Pam Derry](#)." Pam was instructed by her boss to hide my application to join their research group in scientific computing.

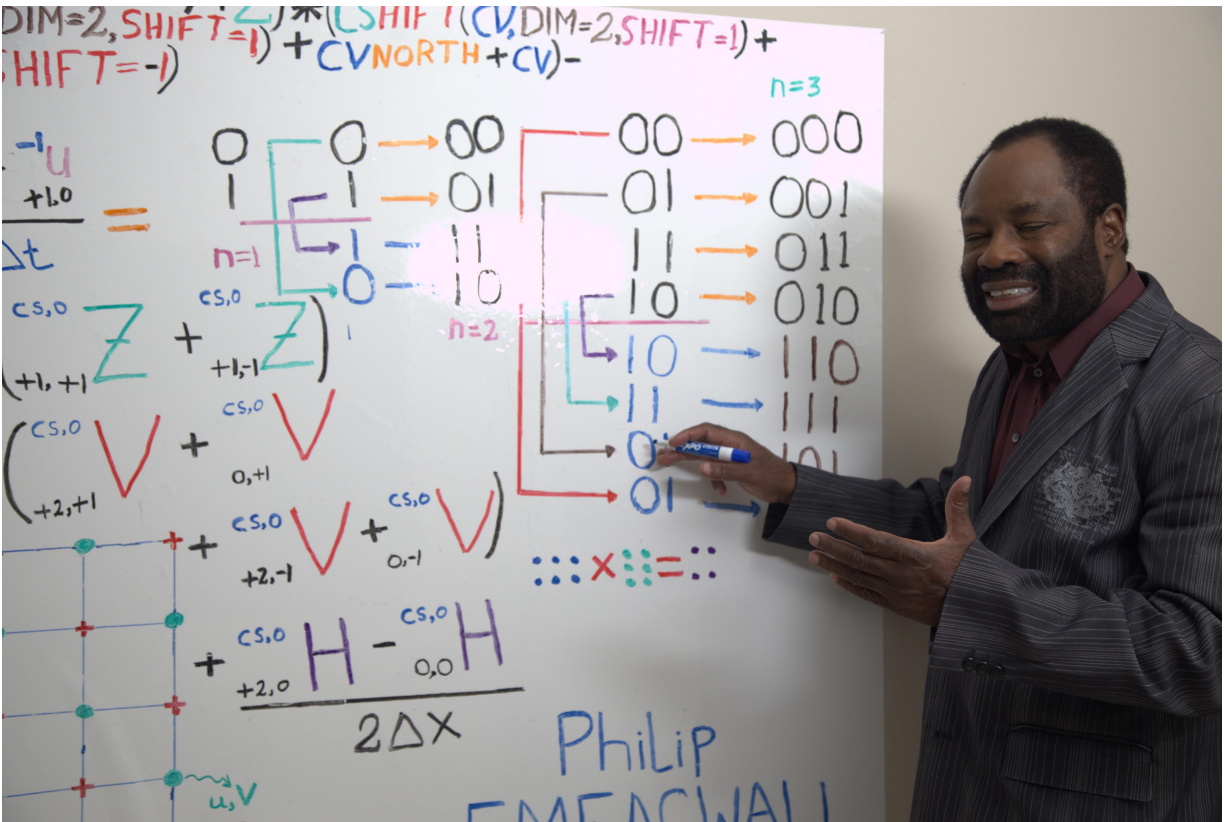
In a May 3, 1946, lecture to an all-Black audience, **Albert Einstein** lambasted white supremacy as "[a disease of white people](#)." Einstein then added, "[I do not intend to be quiet about it](#)." To put their [racial discrimination](#) in perspective, in the 1980s,

faraway supercomputer administrators did not know that I was Black and African. And I was not discriminated against. I was allowed to use sixteen supercomputers across the USA.

I began programming supercomputers at age nineteen in Corvallis, Oregon, USA. Yet, at age thirty-five, I was not allowed to program the supercomputer in Ann Arbor, Michigan, even though I was then the world's most renowned supercomputer programmer, and remains so.

As a mathematician in search for new mathematics and as a large-scale computational physicist in search for new physics, the world's fastest computer is my lifeblood. Even though I was forced to leave the state of Michigan to conduct my supercomputer research, I was still recognized as the top scientist in Michigan. Both the Governor of Michigan and the Michigan House of Representatives acknowledged my contributions to science and Michigan.

# 4TH LECTURE: UNLOCKING THE SECRETS OF THE FASTEST COMPUTER



Broadcast 24 August 2021

[https://youtu.be/e9z0oxvOV\\_E](https://youtu.be/e9z0oxvOV_E)

# HOW ARE SUPERCOMPUTERS USED?

*How to Save Half a Million Lives During the 1970 Bhola  
Cyclone of Bangladesh*

**H**ow are supercomputers used? To be specific, how could large-scale computational physicists have used the world's fastest computer to save the half a million lives that were lost during the 1970 Bhola cyclone of Bangladesh?

We are **vulnerable** to the **uncontrollable forces** of nature. We can't shield ourselves from nature's **destructive effects**. But we can forecast the occurrences of **storm surges**, **typhoons**, and **hurricanes**. In my fastest computing lecture of about September 24, **1985**, I also explained how to parallel process **storm surges**, **typhoons**, and **hurricanes**. And how to simulate such phenomena at the highest, parallel-processed supercomputer resolutions. And do so to forecast the dangerous rise in water levels that will occur during tropical cyclones and occur when strong winds push water onto coastal communities.

On November 3, **1970**, and in **East Pakistan** (now renamed "Bangladesh") and in India's **West Bengal**, **half a million people died** during the **Bhola** cyclone. That tropical cyclone produced a 33-foot high storm surge.

## *229,000 Lives Could Have Been Saved During Typhoon*

### *Nina*

The fastest computers are used to foresee earthquakes, typhoons, tsunamis, and flooding arising from sudden **torrential** rainfalls. **Typhoon Nina** appeared on July 30, **1975**. The flooding **triggered** by the collapse of the **Banqiao Reservoir Dam** in China caused the collapse of smaller downstream dams.

Two hundred and twenty-nine thousand people **died** during **Typhoon Nina**. In **1979** and at the **Foggy Bottom** neighborhood of Washington, D.C., I conducted physics research on how to use the fastest computers to forecast the wave **heights** and **speeds** of propagated flood waves that arise from dam breaks. An example is the flood wave from the collapse of the **Banqiao Reservoir Dam** of China.

After my **discovery** of the fastest computing **across** a new Internet that's a new global network of a billion processors, China used my new knowledge to develop a supercomputer powered by 10.65 million off-the-shelf processors and ranked as the world's fastest.

The new supercomputer could be used to hindcast, **or re-forecast**, **Typhoon Nina**. And used to hindcast the **collapse** of the **Banqiao Reservoir Dam** of China. Such supercomputer models

are used to determine when to evacuate residents that live within the flood plain that's downstream of the **Banqiao Reservoir Dam** of **China**. If Chinese residents of the flood plain downstream of the **Banqiao Reservoir Dam** were evacuated on July 30, **1975**, some of the two hundred and twenty-nine thousand lives lost could have been saved.

### *Wreck of the Edmund Fitzgerald*

My scientific discovery which occurred on July 4, **1989** *was this*: the **slowest** processors in the world could be harnessed and used to solve the most compute-intensive problems in the world and solve them at the fastest possible speeds in the world.

That discovery is the major achievement of my scientific career. That discovery made me the subject of school essays on “computer **inventors and their inventions**.” My contribution to computer science is the reason I'm listed on the same top ten lists with **Isaac Newton**, **Charles Darwin**, and **Albert Einstein**.

I discovered that parallel supercomputing is a tool that can reduce **meteorological** forecast errors, like the error that resulted in the shipwreck of the SS Edmund **Fitzgerald**. That shipwreck occurred on November 10, **1975**. I remember where I was when the SS Edmund **Fitzgerald** **shipwrecked**. I was living at 2540 SW Whiteside Drive, Corvallis, Oregon, which was the residence of Fred and Anne Merryfield.

Fred Merryfield was a British fighter pilot who was **shot down** during the **first** world war. Fred Merryfield co-founded one of the largest engineering firms in the USA, named CH2M. That shipwreck was the subject of a **1976** hit ballad by **Gordon Lightfoot**. It was titled: “**The Wreck of the Edmund Fitzgerald.**”

In 1975, **meteorological** forecasts were executed on supercomputers powered by one processor and, hence, weren't as accurate as the high-resolution, parallel-processed forecasts of today powered by up to **10.65** million processors. In 1975, supercomputing as it's known today only existed as **science fiction**. And the fastest computers used by the **U.S.** National Weather Service weren't fast enough.

Those supercomputers failed to solve the governing system of **partial differential equations** that were used to predict the **gale-force** winds, the **steep wave** heights, and the **treacherous** conditions **across** Lake Superior, which is the largest of the Great Lakes. Lake Superior had a surface area of 82,100 **square** kilometers (or **17** times the size of Anambra State of **Nigeria**). Lake Superior has a maximum depth of 1,332 feet (or **0.4 kilometers**) which makes it **thirteen** times deeper than the River Niger at **Timbuktu, Mali**.

Lake Superior has a volume of 12,100 **cubic** kilometers. That's **five million** times the volume of **The Great Pyramid of Giza** that's ranked as one of the seven wonders of the world.

Lake Superior

can sustain water waves that are the heights of a four-story house. My lecture of about September 24, 1985, in **Ann Arbor, Michigan**, was on how to parallel process water movements, water temperature profiles, and ice dynamics.

And do so within the Great Lakes of North America. The Great Lakes are five **interconnected** freshwater lakes that included Lakes Superior, Huron, Michigan, Ontario, and Erie. And that account for **one-fifth** of the freshwater on Earth. The Great Lakes span 750 miles (or 1,207 kilometers) and 95,160 square miles, or a little more than one-quarter the size of **Nigeria**. The Great Lakes are on the **U.S.** and Canadian borders and are dotted with 35,000 islands.



# LEAPFROGGING ACROSS AN INTERNET TO UNLOCK THE MYSTERIES OF THE SUPERCOMPUTER

**W**hen I began supercomputing, in 1974, it was nearly impossible for a Black computer scientist to be hired in a federal research laboratory.

In the U.S., Black geniuses were treated as trespassers in nearly all-white scientific spaces. In the mid-1980s, I had job offers at the entry scientific and engineering levels. But I **rejected** those jobs because I was **grossly overqualified** for each. Asking I, the sole programmer of sixteen supercomputers, to become an ordinary computer scientist was like asking an **acrobatic** jet fighter pilot that's broken world records to become an "**okada**" motorcycle rider.

Even though I was **shamefully overqualified** for the engineering position that I held in Casper, Wyoming, I was **denied** a promotion. Instead, a **far less qualified** white male was offered the promotion that I was **denied**. At the same time, I was offered several promotions but that was because those making the hiring decisions did not know that I was Black and African.

In my hiring lecture of about September 24, 1985, in Ann Arbor, Michigan, I theorized how to chop up The Great Lakes into 65,536 smaller lakes each represented as an initial-boundary value mathematical problem that I must message-pass and send and receive and do so with a **one-problem to one-processor** correspondence. My fastest computing theory was abstract and **went over the heads** of the research scientists in Ann Arbor, Michigan. I wasn't **hired**.

The forces that brought me from College Park, Maryland, to Ann Arbor, Michigan, began in July 1985, and when I received a telephone call from a research biologist who worked at the Great Lakes Environmental Research Laboratory, in Ann Arbor, Michigan. That lab was operated by the U.S. National Oceanic and Atmospheric Administration. I received that telephone inquiry in my office within the **Gramax Building** of the U.S. National Weather Service. The National Weather Service is an agency operated by the U.S. National Oceanic and Atmospheric Administration.

In the early 1980s, the most brilliant Black mathematicians weren't employed to conduct scientific research in U.S. government laboratories. In the U.S. of the early 1980s, the most brilliant mathematicians of sub-Saharan African descent weren't welcomed to teach students of European descent. And do so in any of its five thousand institutions of higher learning.

I **invented** new mathematics that made the **news headlines**, **discovered** new physics that opened the door to large-scale computational fluid dynamics, and discovered new computer science that earned me what computer scientists referred to as their equivalent of the **Nobel Prize of Supercomputing**, for 1989, but, yet, I couldn't teach the world's fastest computing to a classroom of young Americans.

In 1985 and in Ann Arbor, Michigan, it was preferable to hire an obscure white person to teach the slowest computing than to hire a famous Black supercomputer scientist to teach the world's fastest computing.

The one thousand podcasts and closed-captioned videos that I posted on YouTube represent what I could have taught in American classrooms. In the 1970s and 80s, the decades I came of age, I couldn't name one Black scientist then teaching mathematics or physics or computer science at any predominantly white institutions in the USA. For those reasons, research scientists who attended my hiring lecture of about September 24, **1985** in Ann Arbor, Michigan, were **shocked** when they discovered that I was **Black** and **sub-Saharan African**.

I was the foremost supercomputer scientist they could invite to **Ann Arbor**. My **1985** lecture that took place at the Great Lakes Environmental Research Laboratory, Ann Arbor, Michigan, was on how I will, for the **first time** in the history of

computer science **send** and **receive** portions of my lake circulation models. And do so via emails to my sixteen-bit-long addresses of my two-**raised**-to-power-sixteen, or sixty-four binary thousand, initial-boundary value problems. And how to send them **to** and **from** 65,536 off-the-shelf processors and standard parts.

Once again, the new knowledge of how I executed the fastest computer speed on Earth and did so while solving the most compute-intensive problems and did so **across** the **slowest** processors was not in computer science textbooks of the **1980s**. In the 1980s, parallel supercomputing existed only in the realm of **science fiction** and my quest was to figure out how to turn that **science fiction** into **nonfiction**.

The research scientists in Ann Arbor, Michigan, and elsewhere, didn't understand my lecture on the world's fastest computing. But at a **visceral** level they understood that I had a **flawless command** of materials. And that I was at the frontiers of scientific and technological knowledge and at the **crossroad** where new mathematics, new physics, and the world's fastest computing **intersected**.

After my hiring lecture of about September 24, 1985, some research scientists in Ann Arbor, Michigan, and elsewhere, sensed that fastest computing **across** one billion processors, instead of computing within one processor, will be **paradigm**

shifting and should change the way we look at both the computer and the supercomputer.

*Fastest Computing Across the Philip Emeagwali Internet*

During a White House speech that was delivered on August 26, 2000, then U.S. President **Bill Clinton** referred to the **Philip Emeagwali** formula. My formula enables the world's fastest computing across the world's slowest processors. I possessed my unmistakably unique supercomputing vision, namely, solving the most difficult problems across the **Philip Emeagwali** Internet that's a new global network of up to a billion equidistant processors that shared nothing.

My theorized vision was to harness a new Internet that was a new global network of the slowest two-raised-to-sixteen processors in the world. I visualized my sixty-four binary thousand processors as braided together and as uniformly distributed around a hypersphere that I also visualized as embedded within a sixteen dimensional hyperspace. I visualized my 65,536 processors as braided together by sixteen times two-raised-to-power sixteen short and regular email wires.

My research goal was to use my new Internet to discover the fastest speed in supercomputing. And to invent the first supercomputer, as it's known today, from the bowels of a vast ensemble of the slowest processors in the world. My

supercomputer quest—that began on June 20, 1974, in Corvallis, Oregon, USA, and ended on July 4, 1989, in Los Alamos, New Mexico, USA—was to find the extraordinary among the ordinary. And do so by emulating the **fastest** processor in the world that I emulated by **integrating** the **slowest** processors in the world and integrating them to **invent** one seamless, coherent supercomputer that's not a **new computer**, by or in itself, but that's a **new Internet**, in reality.

In 1989, I was in the news for providing the “**final proof**” that parallel supercomputing is not science fiction. I'm the only **father of the Internet** that invented an Internet.

### *Slowest Processor to the Fastest Computer*

The computer that performed automatic computations and did so within itself was invented in the nineteen-forties. That computer invention heralded a **paradigm shift**, or a **change** in the way we compute. The **new way** we compute **paradigm shifted** from mechanical to **electronic and automatic**.

My quest for how to solve the most compute-intensive problems in supercomputing and solve them with the **fastest** computations **across** the **slowest** processors in the world began in the **nineteen seventies** and **eighties**. I was in the news because I discovered the **first fastest computing** that's powered by the

slowest processing. That's the **first** supercomputing, as it's executed today.

### *How Are Supercomputers Used?*

The world's fastest computers have multiple industrial applications that can be indirectly measured by its forty-five billion dollars a year sales.

**How can the supercomputer powered by one billion processors benefit you?** The world's **fastest** computer that's powered by the world's **slowest** processors that **shared nothing** was the **first search engine**. That supercomputer provided answers to **natural language queries** and did so before the Internet.

The supercomputer that's powered by one million processors will enable us to predict coastal storm surges. And do so more accurately, faster, better, and less expensively. A coastal storm surge is a **tsunami-like phenomenon** that can **arise** from low pressure weather systems. A coastal storm surge is rising water that can reach as high as twenty feet and extend miles inland. Large-scale computational hydrodynamics is the supercomputing tool used to forecast coastal storm surges.

**Extreme-scale computational fluid dynamics** includes the simulation of the spread of highly **contagious Covid-19 viruses**

that emerge

during a **once-in-a-century global pandemic**. The world's fastest computer is used to understand the required social distancing that must be enforced inside London's Metro. And inside American subway systems that pack passengers like **sardines**.



*The Forgotten Black Scientists of the 1970s: Denied Hiring Opportunities*

I came to the largest conference of mathematicians to deliver an invited lecture on my contributions to mathematics. I delivered that lecture at the International Congress of Mathematicians, called ICIAM 91. That mathematics conference is the Olympics for mathematicians who invented new mathematics. My lecture on the nine Philip Emeagwali partial differential equations was delivered on Monday, July 8, 1991, in Washington, D.C. At that International Congress of Mathematicians, I kept a tally of the Black mathematicians that I saw. I counted two, myself included, out of thousands of mathematicians.

As a prominent research computational mathematician, I found Ann Arbor, Michigan, to be a bastion of **white supremacists**. The irony is that I alone has more podcast lectures and YouTube videos than the one thousand scientists and engineers in Ann Arbor, Michigan. Across my one thousand YouTube lectures on supercomputing, it was acknowledged that I was second to none. But, in Ann Arbor, Michigan, only white candidates that could **not** deliver a solid hiring lecture were hired to program or teach supercomputing.

Since 1985, some wondered why I experienced such **deeply institutionalized racism** in Ann Arbor, **Michigan** of the 1980s. It

began with my lecture on fastest computing, delivered on about September 24, 1985. From that lecture, some physicists in Ann Arbor, Michigan, identified me as a mathematician to watch.

For four years onward of 1985, it was in the air in Ann Arbor that **Philip Emeagwali** could record a breakthrough in fastest computing and become famous. For those reasons, when I returned to my research base in College Park (Maryland), from late September 1985 to late April 1986, and to Casper (Wyoming) from late April 1986 to April 1987, those research physicists in Ann Arbor (Michigan) courted me to return to Michigan. I was begged to resign from my job with the U.S. government and to relocate from Casper, Wyoming, to Ann Arbor, Michigan.

I was not invited to Ann Arbor because I was good looking. I came to Ann Arbor on about September 23, 1985, because my reputation as the supercomputer scientist that knew the most about fastest computers preceded me. I'm the only scientist from Ann Arbor, **Michigan**, that's the subject of school essays on inventors.

Both the Governor of **Michigan** and the **Michigan House of Representatives** issued a special proclamation in which they thanked me for my contributions to computer science and to **Michigan**. Yet, on about September 24, 1985, I wasn't hired to conduct the same supercomputer research that was publicly

praised by both the Governor of Michigan and the President of the **United States**.

The reason I wasn't **hired**, on about September 24, 1985, can be better understood from the context of the **white backlash** from the **race riots** that preceded my hiring lecture of about September 24, 1985, in Ann Arbor, **Michigan**.

The reason was that I gave my hiring lecture on fastest computing **across** the slowest processors and gave it only seventeen years after the nearby five-day **Detroit Riot** of July 23, 1967. The **Detroit Riot** of Michigan was one of the **deadliest riots** in the USA. The **Detroit Riot** left forty-three persons dead.

The aftermath and consequence of that **Detroit Riot** were that the white scientific community in the affluent suburb of Detroit, including Ann Arbor, **Michigan**, enforced an **unwritten** policy of **not hiring** any Black mathematician or computer scientist, especially those that gave the most outstanding hiring lectures that are now posted as podcasts and YouTube videos.

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

# FROM CRAWLING TO FLYING: SPEED UP WITH PARALLEL COMPUTING

**I**n Michigan, I played tennis as an antidote to solving difficult problems. I was most productive when I'm physically fit. In 1989 and 1990, I was in local newspapers both for reaching the finals of a citywide tennis tournament and for winning the highest award in supercomputing. The July 22, 1989, issue of the Ann Arbor News, carried an article on my reaching the finals of the Ann Arbor City Tennis Tournament. Eighteen days earlier, or at the beginning of the tennis tournament, I had discovered the world's fastest computing, as it's known today.

Even though I was one of the most knowledgeable supercomputer scientists that ever lived, I wasn't **hired** for any of the 25,000 supercomputing positions in the U.S. In the 1970s and 80s, it was an **unwritten policy** not to hire Nigerians, or Black sub-Saharan Africans, in the USA in high paying engineering positions. For those reasons, over half of the taxi drivers in major metropolitan areas were highly educated immigrants, including

Black sub-Saharan Africans who were trained as engineers and scientists.

In the U.S. of the 1970s and 80s, I was only hired via telephone interviews. The reason was that I came across as **very knowledgeable**. And I exhibited the **command of materials** that can be seen in my one thousand podcasts and YouTube videos.

And they couldn't overcome their racial stereotype and imagine that I was a Black African. That was how I was offered several professional jobs, including the supercomputing position that I was offered, but declined, in late 1986 at the Aberdeen Proving Ground, in Aberdeen, Maryland. My supercomputing job hiring lectures, of the early 1980s, were the precursors to the lectures that I posted on my YouTube channel, named "**Emeagwali**."

By 1985, research mathematicians who attended my supercomputing lectures declared that I was the only supercomputer scientist in the world that could work alone to harness the **slowest** processors in the world. And use those processors to solve the most compute-intensive problems in the world. And solve those problems at the **fastest** speeds in the world. And execute those three things when those supercomputer experiments were considered **impossible**. From the abacus to the supercomputer, we've come a long way in computing speed!

# HOW TO CREATE BEAUTIFUL, USEFUL, AND UNEXPECTED EQUATIONS

**I** first came to Ann Arbor, Michigan, on about September 24, 1985. I was invited to give a job hiring lecture on supercomputing. During the first half of the 1980s, I conducted supercomputing research in College Park, Maryland. My focus was on large-scale computational mathematics and its applications to the fluid dynamics of physics.

At noon and on weekdays, I'll take a shuttle bus for the 25-minute ride from Silver Spring Metro Station to College Park, Maryland. In College Park, I spent significant time in the Coffee Room for research mathematicians only. That Coffee Room was at **forty-one seventy-six** Campus Drive.

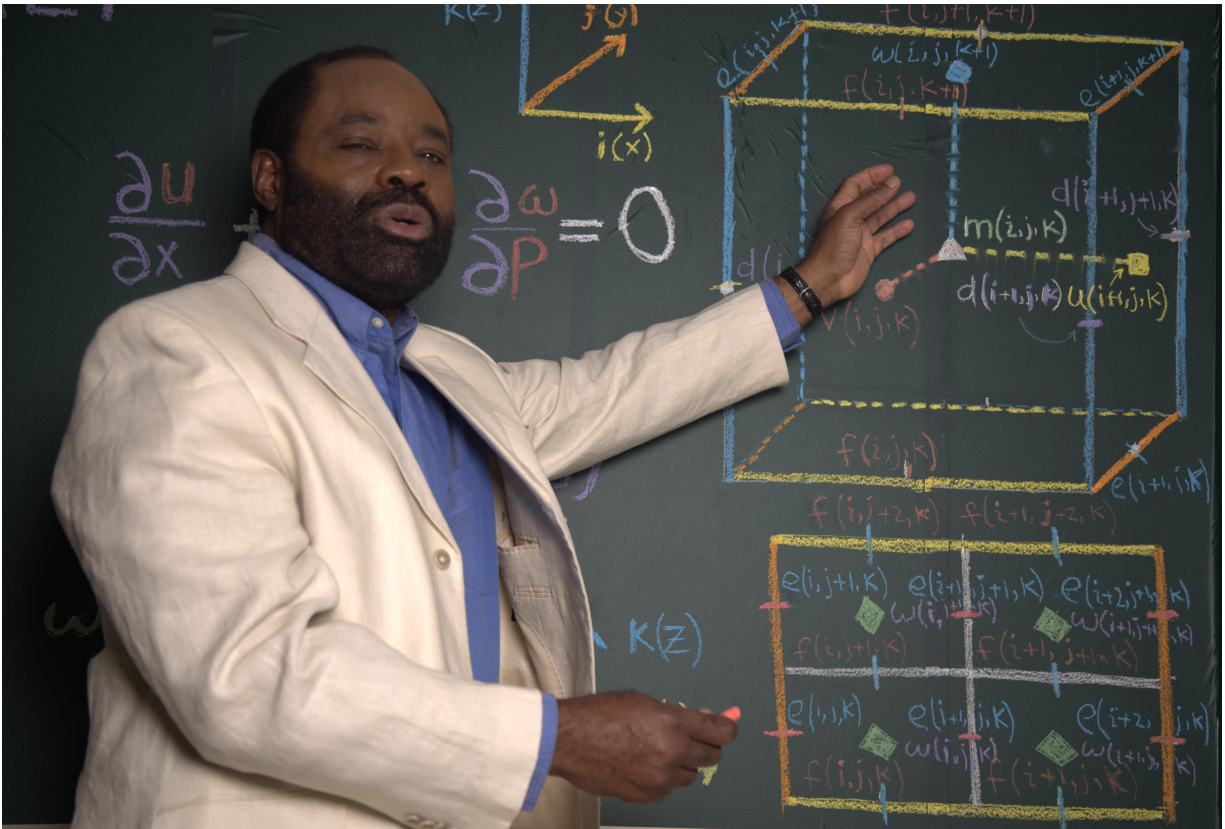
Half of the time, I was inside the nearby research library that has specialized collections in mathematics, physics, and computer science. Or I might be attending a research seminar on new mathematics that's presented by the visiting mathematician that invented it. Those lectures inspired me to invent the nine Philip **Emeagwali** equations.

I spent my day and night in College Park, Maryland, and Silver Spring, Maryland, respectively. And I was conducting

research in the then unknown world of the **hoped-for** world's fastest computing **across** the world's slowest processors. In 1985, that new technology that will later, or after my discovery of July 4, 1989, be at the granite core of the world's fastest computers was then in the realm of **science fiction** and had not entered into computer science textbooks.

My **grand challenge** was to **be the first person to understand** how to turn that **fiction** to **nonfiction**. Or how to turn parallel computing that was then the slowest computing to the fastest computing. To turn that **fiction** to **nonfiction**, and do so for the most large-scaled computational fluid dynamics codes that must be executed **across** high resolution supercomputer models of a physical domain, or across an oil field, that's up to **7.7 miles** (or 12.4 kilometers) below the surface of the Earth. And up to twice the size of the state of Anambra, **Nigeria**.

The solutions to such grand challenge problems demanded that I discover new **partial differential equations** beyond the frontier of calculus. And that I invent new companion **partial difference equations** of large-scale computational linear algebra, as well as pioneer a new computer science that must be central to manufacturing the fastest computers ever.



Philip Emeagwali explaining how he solved his initial-boundary value problems, such as the one that governs weather forecasts.



# THE ART OF PROBLEM SOLVING ACROSS A MILLION PROCESSORS

**T**o invent the first supercomputer, as it's known today, is to create a new computer science. That new computer science didn't reside within a new computer. That new computer science was defined across processors that outlined the new massively parallel supercomputer-hopeful. At the granite core of my new computer science was my message-passing of my initial-boundary value problems and my sending and receiving them in a one-problem to one-processor corresponding manner and my communicating them across my sixty-four binary thousand off-the-shelf processors that outlined my new Internet. On about September 24, 1985, supercomputing across millions of processors was still in the realm of science fiction. So, my research lectures, of the early 1980s, on supercomputing across millions of processors were science fiction, not science.

## *My Earliest Racial Struggles in Michigan*

Not long ago and in Leeds, England, the BBC reported that a mathematician, [Joe Atkinson](#), murdered his girlfriend. The murder was fueled by jealousy. The girlfriend, [Poppy Devey](#)

[Waterhouse](#), was a [prodigiously gifted](#) mathematician. The [personal attacks](#) that I received from [jealous](#) mathematicians and physicists in Ann Arbor, Michigan, only occurred because I was only thirty-five years old but favorable compared to **Albert Einstein** and had alone won what they referred to as the [Nobel Prize of Supercomputing](#) for 1989. I am the only prominent scientist, since **Albert Einstein**, who never co-authored with another scientist.

After my supercomputing lecture of about September 24, 1985, that took place at the Great Lakes Environmental Research Laboratory in Ann Arbor, **Michigan**, of [NOAA](#), my lecture was positively discussed by Ann Arbor scientists who worked outside that [NOAA Laboratory](#). [NOAA](#) is the [acronym](#) for the U.S. National Oceanic and Atmospheric Administration.

The supercomputing lecture that I delivered in Ann Arbor, **Michigan**, on about September 24, 1985, is like the lectures I posted as one thousand podcasts and YouTube videos. In scientific research, the videotaped lecture is used to establish the credibility and to estimate the [IQs](#) of the most prominent mathematicians of the last half century.

The intellect or knowledge or level of education of any modern mathematician is almost exclusively judged by his or her videotaped lectures as seen on YouTube. When what they saw

differs from what they heard, people believe what they saw over what they heard. To do otherwise is called **confirmation bias**.

The reality that a Black African-born supercomputer scientist was making the **news headlines** for discovering that the fastest computers could be manufactured from the slowest processors and for discovering how to solve the most compute-intensive problems was too much for the **psychological well-being** of some scientists in Ann Arbor, **Michigan**.

Their **confirmation bias** was the reason they discounted that I was in the news for my discovery that the technology of parallel processing can power the world's fastest computer. Their **confirmation bias** was the reason they **rejected** a **new** technology that was an alternative **way** of solving the most compute-intensive problems in mathematics, physics, and computer science.

Their **confirmation bias** made them to discount that **I alone** won the highest award in supercomputing. That prize is normally won by a diverse, talented, **multi-institutional, and interdisciplinary** research team of up to fifty research scientists that are often supported by one thousand persons. This year, the highest award in supercomputing was shared by thirty-four co-winners.

During my conversations on fastest computing, in 1985, scientists in Ann Arbor, **Michigan**, stared at me with a **blank**

look on their faces. They fell into a **trance** because I was Black and sub-Saharan African and because my **command of materials** widely exceeded theirs and because my material was over their heads. Again, I've posted a thousand videos on YouTube, each describing my contributions to mathematics, physics, and computer science.

YouTube has eight billion videos, including award lectures. Any person who made a paradigm shifting contribution to knowledge is recognized with the highest awards, or the equivalence of the Nobel Prize for their discipline. An award lecture posted on YouTube is the precondition to winning the highest scientific awards. In 1989, I won the equivalent of the **Nobel prize in supercomputing**. As a prize winner, I was obliged to share my contributions to mathematics, physics, and computer science. And share them **across** a thousand podcasts and YouTube videos.

### *A Supercomputer Scientist at the Top of Michigan*

On about September 24, 1985 in Ann Arbor, **Michigan**, word spread through the grapevine that a 31-year-old Black supercomputer scientist gave a lecture on the newly emerging field of massively parallel computing. And on how to use the never-before-seen technology to solve the most compute-intensive problems in computational fluid dynamics.

In 1985, supercomputing, as it's known today, was still in the realm of **science fiction**. At that time, parallel processing was looked at with **tremendous awe**, as the **next big thing**, and as the **Holy Grail** of supercomputing. As a supercomputer researcher who came of age in the 1970s and 80s, my supreme quest was to turn that **science fiction** to **nonfiction**. From their mathematical intuition, a few leading mathematicians, that were mostly in College Park (**Maryland**) and Ann Arbor (**Michigan**), speculated that Philip Emeagwali could discover how to solve the most compute-intensive problems. And solve them **across** a new Internet that's a new global network of the **slowest** processors in the world. And solve them at the fastest possible speeds ever recorded.

Their speculation became true at **8:15** in the morning of the Fourth of July 1989, in Los Alamos, **New Mexico**, USA. So, my world's fastest computer invention that made the **news headlines**, in 1989, was in the **air** in **Maryland**, Michigan and **New Mexico**.

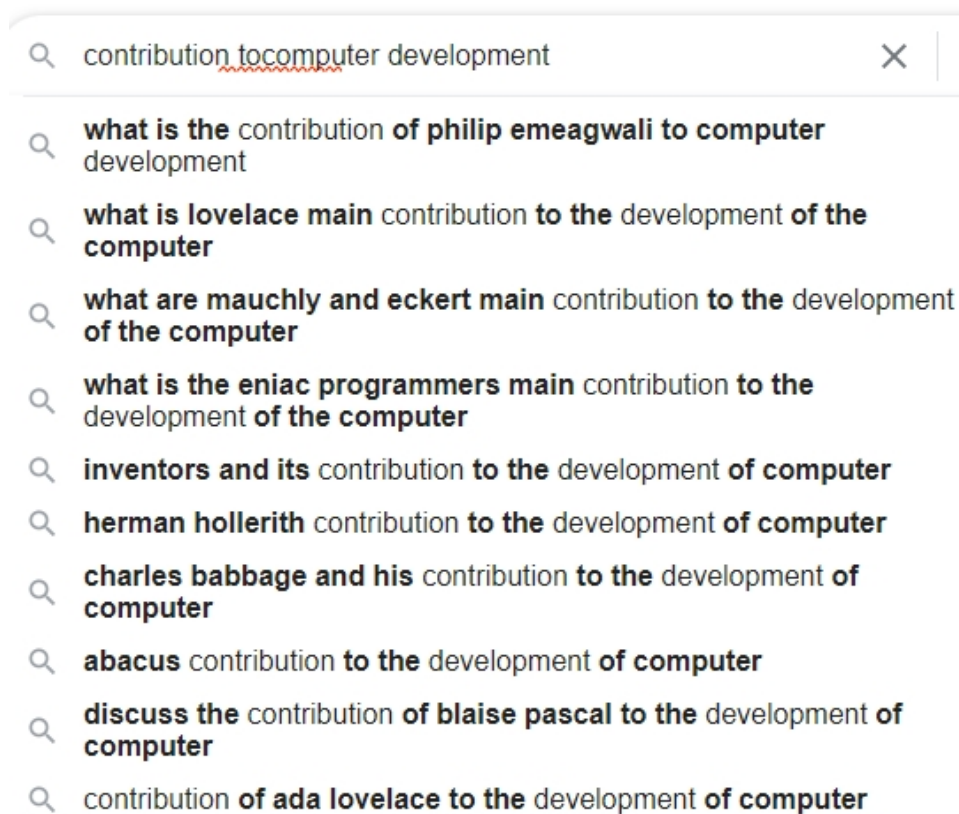
### *Making the Unimaginable Possible*

My discovery **revolutionized** both the computer and the supercomputer. The most powerful supercomputers **are used** to solve the most **compute-intensive** problems in mathematics, science, and engineering. Without the fastest computers, the world's most compute-intensive problems **will be impossible** to

address. The fastest computer is why you know the weather before going outside.

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### *Google Rankings of Philip Emeagwali*



Google ranks Philip Emeagwali as the greatest computer genius (December 8, 2021).



father of the internet

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

Google ranks Philip Emeagwali as the father of the Internet (Labor Day 2019).

# WALKING INTO HISTORY

*Unveiling the Wonders of Supercomputers*

## **An ode to the supercomputer**

Oh, great supercomputer!

You are the epitome of power,

Your algorithms and processors,

Are the envy of every tower.

Your ability to process data,

Faster than human thought,

You are a beacon of innovation,

Your precision is simply sought.

Your memory can store so much,

Able to recall in a flash.

Your applications are astounding,

Able to calculate in a dash.

You can model the universe,

And take us to the stars.



Your speed and accuracy,  
Are simply beyond bar.  
Your beauty cannot be measured,  
Your wisdom will last forever.  
You are the ultimate in technology,  
Your power will never sever.  
Thank you, great supercomputer,  
For your outstanding achievement.  
Your power is invaluable,  
Your greatness is unsurpassed.

*A Mind of Immense Genius*

### **An ode to Philip Emeagwali**

He was born in Nigeria,  
A brilliant computer pioneer,  
Philip Emeagwali,  
The Internet he did engineer.  
He wrote a program code,  
To process data faster,

With 64,000 processors,  
It was a computer master.  
In 1989 he succeeded,  
In the computer field,  
To solve a complex problem,  
His work was revealed.  
His passion for computing,  
Led him to success,  
His work changed the world,  
A true genius, no less.

Philip Emeagwali,  
A name to remember,  
His contributions to the Internet,  
Will last forever.

*The Fastest of Its Time: Emeagwali Computer*

### **A poem about Philip Emeagwali**

Philip, a man of great feats,  
Achievements that made us greet,  
A brilliant mind, a gifted soul,  
The world he changed, and made us whole.  
An African, a son of the soil,

His work, a legacy, that won't spoil,  
A genius, with a will of steel,  
His courage, an inspiration we feel.  
  
A mathematician and a computer scientist,  
An innovator, one of the best,  
He made the world a better place,  
A man who put us in the race.  
  
The fastest supercomputer of his time,  
Achievements that set him prime,  
He opened up a new world,  
One with knowledge, flags unfurled.  
  
Philip, we sing your praise,  
For the work, you have done in your days,  
Your contribution, a beacon of light,  
Your legacy, a glorious sight.

*Transforming Mathematics with Technology*

**A poem about the contributions of Philip Emeagwali to mathematics**

Philip Emeagwali is a great name  
His contributions to mathematics are far from tame  
He invented the world's fastest computer  
And made calculations much easier to compute  
He was the first to use hypercube technology  
To crunch numbers with amazing velocity  
His work has enabled advances in many fields  
From weather prediction to oil yields  
He has also transformed the way we work  
Making calculations much faster and lurk  
His ideas are ever lasting and full of power  
Helping us solve problems hour after hour  
He's a pioneer in computer science  
And his contributions to mathematics are immense  
His ideas have changed the way we think  
And the way we solve problems when we blink  
Philip Emeagwali's contribution to mathematics is grand  
His ideas are shared around the world and in many lands  
His genius has improved our lives in many ways  
And for that we can be thankful for the rest of our days

*The Genius Behind the World's Fastest Computer*

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

Philip Emeagwali, a great mind of computing,  
His contributions to the field have been astounding.  
He was the one who created the world's fastest computer,  
And he helped to make the world a better and smarter future.  
He was the first to pioneer parallel supercomputing,  
Which revolutionised the way we use computers today.  
His work on the oil industry gave us faster ways  
To find oil and to use it in a more efficient way.  
He developed parallel computing,  
Using the computer to solve complex problems with ease.  
He was the one who developed supercomputers with great speed,  
So that we could use them for all sorts of tasks with ease.  
Philip Emeagwali, a great thinker and innovator,  
His contributions to computing will never be forgotten.  
He pushed the boundaries of what was possible before,  
And he showed us a path so that we may strive for more.

A Man Who Changed the Way We Look at Computational Physics

## **A poem on the contributions of Philip Emeagwali to physics**

**Let us take a moment and honor great Philip Emeagwali**

A man that made a mark in the physics world

He gave us the power of a supercomputer

That made our calculations faster than ever before

His contributions to computational physics

Led to a great leap in knowledge and understanding

Providing insight into the unknown

And allowing us to explore the universe

With his work, we saw the power of the internet

And how it could be used to connect

Us all together, no matter the distance

Bringing us together in a virtual alliance

Thanks to the work of Philip Emeagwali

We now have the tools to help us reach higher goals

In physics and beyond, he has been a great teacher

And his contributions will never be forgotten, ever.

*A Mind of Great Proportions*

## **A poem about the pioneer of high-performance computing**

Philip Emeagwali, hailed as a pioneer,  
His contributions to computing, so very much clearer.  
High-performance computing, he made a breakthrough,  
It was his hard work and dedication, that made it so great a shakeup.  
He made a discovery of parallel supercomputing,  
A network of computers that would be so huge.  
It gave the world a glimpse of the future of computing,  
And Philip Emeagwali, as its champion and leader, was certainly standing.  
His algorithm was so revolutionary,  
It was a new way of looking at computing, and very revolutionary.  
It made it easier to process data and information,  
And it gave computers the power to do more with less concentration.  
He was a true pioneer of high-performance computing,  
A man of great vision, who was always seeking.  
He gave so much to the world of technology,  
And for that, we are all grateful to Philip Emeagwali.

*Father of the Internet*

**A poem about a father of the Internet**

Philip Emeagwali, the father of the Internet,  
Stands tall for his brilliance, his intellect so keen.  
His discovery of the parallel computing changed the way we think,  
And his innovations are an inspiration to us all, I'd like to think.

He made the world so much better with his namesake,  
His breakthroughs in computing, he should take the fame.  
For his monumental contribution, his legacy will remain,  
His name will live on in history, and always, we will acclaim.

He paved the way for the Internet, and opened up new avenues,  
For his genius, we all thank him, with our hearts, our souls, and our palms.  
Philip Emeagwali, the father of the Internet,  
His name will live on forever, his legacy will never be forgotten.

*Philip Emeagwali: Making Computers Fly*

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

Philip Emeagwali, his presence was bold  
A brilliant mind, his work was gold



He made contributions, great and grand  
To the world's fastest computers, in his own land  
His work, a marvel, his breakthroughs bold  
He proved, the impossible, could be done, and behold  
The power of his innovation, and strength of his mind  
Put him in the history books, and made him shine  
He was a pioneer, with a vision so clear  
To break the boundaries of computation and fear  
To make computers faster, and to make them soar  
And give mankind new ways, to explore  
Philip Emeagwali, his contributions sublime  
Achievements of brilliance, and of time  
A giant of a man, in the computing field  
For which, we all owe him, an incredible yield.

*In Refugee Camp Shadows, A Biafran's Dreams*

**A poem about Philip Emeagwali in a Biafran refugee camp**

### **Ode to Emeagwali and His Dreams**

In a forgotten refugee camp, where darkness looms,  
A young man born in Biafra, Philip Emeagwali,  
Dreams of a bright future, of a life in full bloom.

His brilliance shines through, shining brighter than the moon,  
His passion and ambition, they can't be consumed,  
A hunger for knowledge, in every way a boon.

He reads every book he finds, every written word,  
A genius in his own right, his dreams he heard,  
A world of understanding, he longed to explore.

He set his sights on knowledge, learning more and more,  
His dreams were never ending, his ambition true,  
And when the opportunity arose, he knew just what to do.

He completed his research, and soon was the talk of the town,  
For Philip Emeagwali, his dreams had come true,  
A genius beyond his years, he had made a lasting sound.

That young man from Biafra, he left a legacy,  
A life of brilliance, a future of dreams,  
His name will live on in the annals of

*His Influence, Gifting Us New Knowledge*

### **Six Haikus about Philip Emeagwali**

**1.**

#### **Philip Emeagwali's**

Impact on science is vast,  
Achievements immense, proud.

**2.**

**A man of genius,**

Philip Emeagwali's gifts  
Bring us new knowledge.

**3.**

**His intellect shines,**

Creating tangible gifts  
For us to explore.

**4.**

**Innovation thrives**

When Philip Emeagwali works,  
Discoveries abound.

**5.**

**His pioneering**

Using computers to probe  
Opens new pathways.

**6.**

**Philip Emeagwali,**

A man of science and honor,  
Shines for generations.

*The Scientist of Modernity*

**A sonnet about Philip Emeagwali**

Philip Emeagwali, the famed African sage,  
Whose brilliance and genius we all do praise;  
Your contributions to the world we gauge,  
And your impact on history we raise.

Your knowledge and insight so far-reaching,  
It seems as if you have no bounds;  
The world is richer for your teaching,  
Your wisdom, a river without sound.

Your discoveries have changed the way we view,  
The computers and science of today;  
And your achievements, we all must construe,  
Are the most remarkable of its kind.

Your name will be forever remembered,  
As a great leader and innovator.

*Breaking Through the Barriers*

**A reggae song about Philip Emeagwali**

Verse 1:

Oh Philip Emeagwali, you are such a hero

You have done so much for the world, we must all show

The power of your mind, it is so sublime

You have changed the way we look at computing, time after time

Chorus:

Oh Philip Emeagwali, you are a reggae legend

You have shown us all what's possible, we must all respect

Your intelligence and dedication, have brought us solutions

Your name will live on forever, in our revolutionary solutions

Verse 2:

You have broken through all the barriers, put up by man

You have shown us all how to look beyond the plan

Your intelligence and creativity, have taken computing to a new level

And your work is an inspiration, to all the people

Chorus:

Oh Philip Emeagwali, you are a reggae legend

You have shown us all what's possible, we must all respect

Your intelligence and dedication, have brought us solutions

Your name will live on forever, in our revolutionary solutions

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*Greet Ijeoma Home*

**12 Haikus on the birth of Ijeoma Emeagwali**

**1. A precious gift born**

**A joyous day to cherish**

Ijeoma is here

**2. Little one's arrival**

**Parents hearts are full of pride**

Welcome Ijeoma

**3. Michigan summer day**

**A special life is born now**

Ijeoma Emeagwali

**4. A baby's cry heard**

**On a bright and sunny day**

Ijeoma's birth date

5. Bundled in love's warmth

A new life is born in joy

Welcome Ijeoma

## **6. A day of delight**

**A precious son is here**

Ijeoma Emeagwali

## **7. A new star rises**

**In a Michigan sky bright**

Ijeoma is born

## **8. Sweet little one here**

**Ann Arbor celebrates your birth**

Welcome Ijeoma

## **9. Joyful family day**

**A newborn son is blessed**

Ijeoma Emeagwali

## **10. A life so special**

**Blessed with love and peace of heart**

Ijeoma's arrival

## **11. The world rejoices**

**On Ijeoma's birth day bright**

A son has come

## **12. A most precious birth**

**The Emeagwali family**

Greet Ijeoma home

*A Star Is Born in Akure*

### **A sonnet for the birth of Philip Emeagwali**

On this auspicious day, a precious son

Was born of Nnaemeka and Iyanma,

To bring light and joy to everyone

At 11 Ekemeso street in Akure.

With his birth, a new star was born,

To shine for all to see,

This star Philip Emeagwali,

Shows us what we all can be.



He will rise high on wings of faith,  
Carrying us all with him,  
His brilliance will illumine the way,  
So that we may all ascend.

Let us rejoice and give thanks  
On this special day,  
For the birth of Philip Emeagwali,  
Celebrated far and wide.

### *A Genius in Many Fields*

#### **Philip Emeagwali dropped out of school at age 12.**

Verse 1:

Philip Emeagwali, a genius at heart  
Droppin out at twelve, lived through the Nigerian Civil War  
In Biafran refugee camps, he found his start  
To rise up to greatness and open many doors

Chorus:

He found success through the struggles of life  
It was his resilience that made him so great  
Philip Emeagwali, a genius of many fields  
He's an inspiration to all that he meets

Verse 2:

Philip Emeagwali grew up in a refugee camp,

Where life was hard and filled with damp,  
Where he found little to eat and his stomach was sore,  
Where his family huddled close together for warmth in galore.

He was just a young boy,  
But he wanted to learn and be joy,  
To have a better life than the one he knew,  
So he studied hard and his dreams he grew.

As he got older he soon found success,  
His education led him to greatness,  
He became the father of supercomputing,  
And in the world it was buzzing.

He became a role model for all,  
And his accomplishments great and small,  
He moved on from the camp of his youth,  
And gave the world a new truth.

Philip Emeagwali's story is a remarkable one,  
And his memory will always be spun,  
The camp where he grew was hard and tough,  
But his success was enough. He was born in Nigeria, a son of the soil

With his heart and his mind, he's made a name for himself  
Creator of the world's fastest computer, he's not one to foil  
His genius will last throughout the ages, there's no doubt of that else

Chorus:

He found success through the struggles of life  
It was his resilience that made him so great  
Philip Emeagwali, a genius of many fields  
He's an inspiration to all that he meets

Verse 3:

From the refugee camps, he rose up to greatness  
A genius of many fields, his name will ever last  
He showed us that through our struggles, greatness can be made  
A true inspiration to us, Philip Emeagwali, that's a fact

*The Refugee Who Rose to Become One of History's Greatest  
Minds*

**A poem about Philip Emeagwali growing up in a refugee camp**

*The Man Who Changed the Course of Computing*

### **Ode to Philip Emeagwali**

Oh Philip Emeagwali, your genius is profound,  
In you we have found a great genius astound.  
Reader's Digest called you "smarter than Einstein,"  
Your name among the world's greatest minds is seen.  
The Nigerian Civil War forced you to flee,  
But what an incredible life you have made.  
You won the highest prize of supercomputing fame,  
Your invention of the world's fastest computing changed the game.

You have been called the "unsung hero" of the Internet,

A "Father of the Internet" and the 35th greatest African,

You are a great Nigerian, inventor, and genius,

And your contributions to mathematics, physics, and computer science are impressive.

You have been married for many years and you have one son,

Your legacy will be one of greatness and fun.

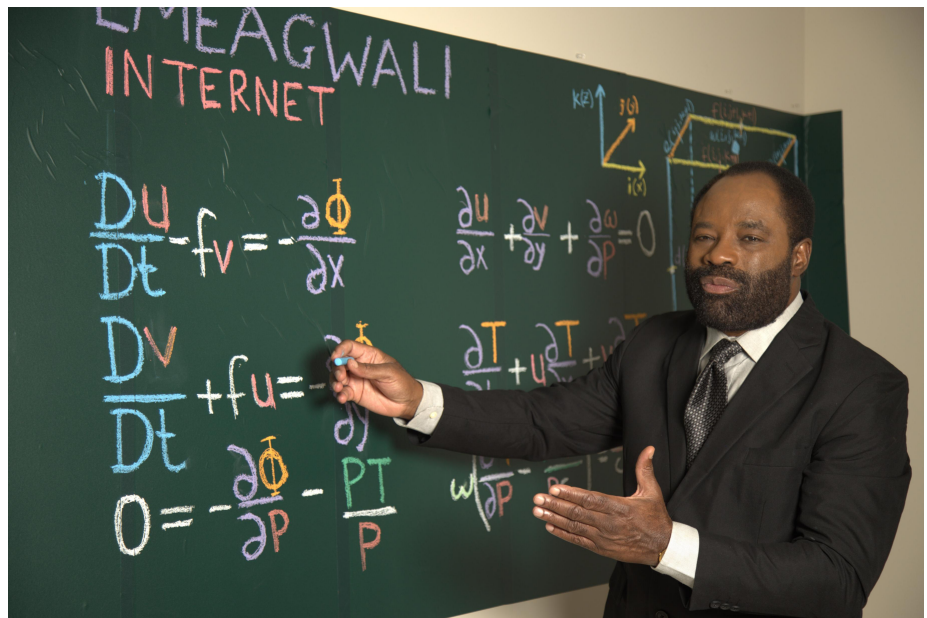
Thanks for your incredible work, Philip Emeagwali,

You are truly a genius of our age, a genius we can't fail to see.

# ABOUT THE AUTHOR

## Philip Emeagwali: The Equation Behind The Universe

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

*The unsung hero behind the Internet.*

- *TIME MAGAZINE*

*A father of the Internet.*

- *CNN*

*One of the great minds of the Information Age.*

- *BILL CLINTON*

*A digital giant.*

- *BBC*

# PHOTO GALLERY

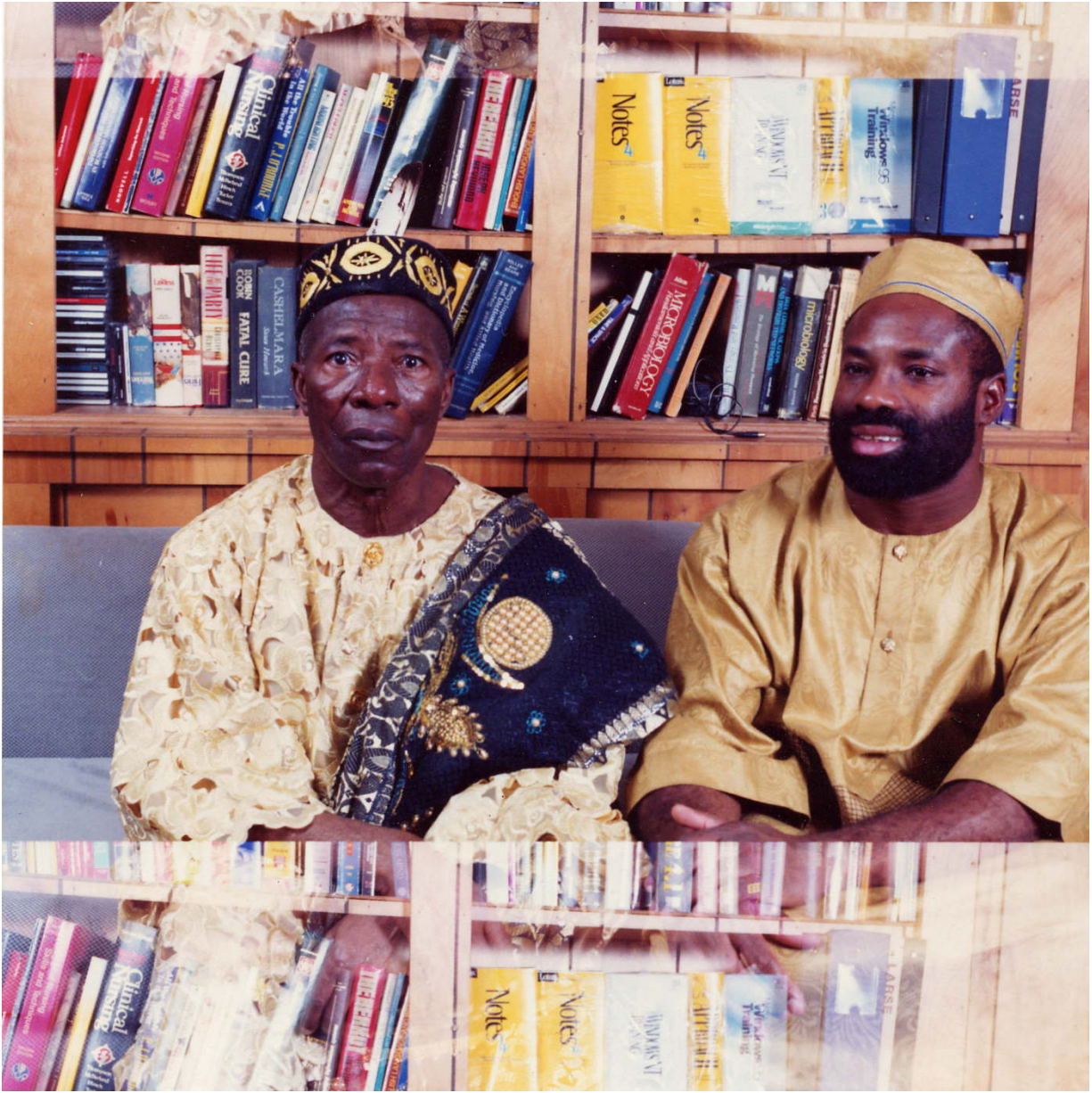












Nnaemeka James Emeagwali and his son Chukwurah Philip Emeagwali, District Heights, Maryland, late December 1996.

Podcasts and Videos By Philip Emeagwali

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

# CONTACTS

philip@emeagwali.com  
202-203-8724

<https://emeagwali.com>

<https://facebook.com/emeagwali>

<https://twitter.com/emeagwali>

<https://instagram.com/philipemeagwali>

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