his December 26th '08 letter to [AboutBlackBoston.com,](AboutBlackBoston.com) ET al.

Beyond the Last Computer

by Philip Emeagwali

He won the 1989 Gordon Bell Prize, the Nobel prize of supercomputing. ---->

"One day, the Internet will become our shared planet-sized supercomputer and individuals will become nodes on the Internet and the Internet, as we know it, will become obsolete and "disappear" into our collective memory."

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I felt the hard, cold steel of a gun against the back of my head. I spun around and saw my assailant's finger shaking on the trigger: "Don't run or I'll shoot you," he said. I was just 14 years old, and death was a stranger to me.

It was 1969, and Nigeria was embroiled in civil war. As a teenage refugee conscripted into the Biafran Army, I was forced at gunpoint to carry weapons to the Oguta front. It was a 24-hour, march through mosquito-infested mangroves flooded by the River Niger.

When the 30-month war ended on January 15, 1970, I was discharged and reunited with my parents. Together with one million returning refugees we walked for three days, avoiding landmines along fetid rainforest footpaths. Eventually, we reached our hometown of Onitsha. It was badly battered by the war.

There my thoughts returned to a love abandoned three years earlier–mathematical physics. This love affair blossomed when I was a refugee in Biafra, –shortly before July 20, 1969–the day man first walked on the moon. While running an errand, I stopped to gaze through a classroom window and saw a physics lecturer writing on a blackboard. It was Newton's Second Law of Motion: "Force equals mass times acceleration, or F=ma."

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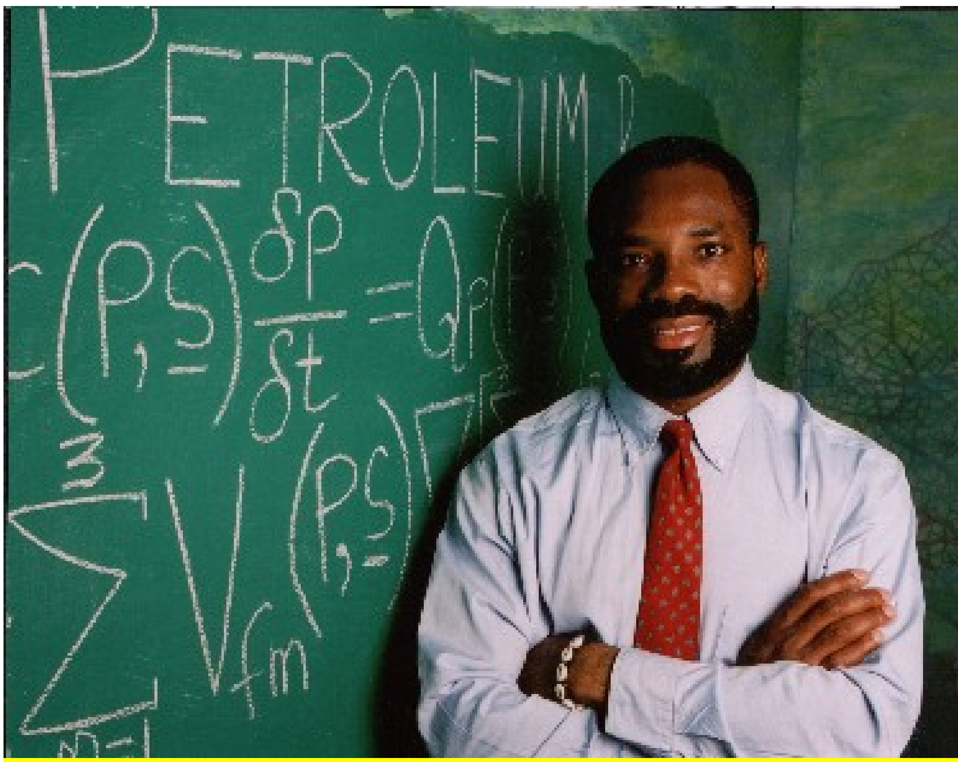
Unaware that I had just been introduced to the most important law in physics, I was, nevertheless, awestruck. Newton's Second Law of Motion is far more important than Einstein's Theory of Relativity. "E equals MC squared" may be sexier on a T-shirt than "F=ma," but Encarta lists the three laws of motion as the third most important scientific discovery of all time.



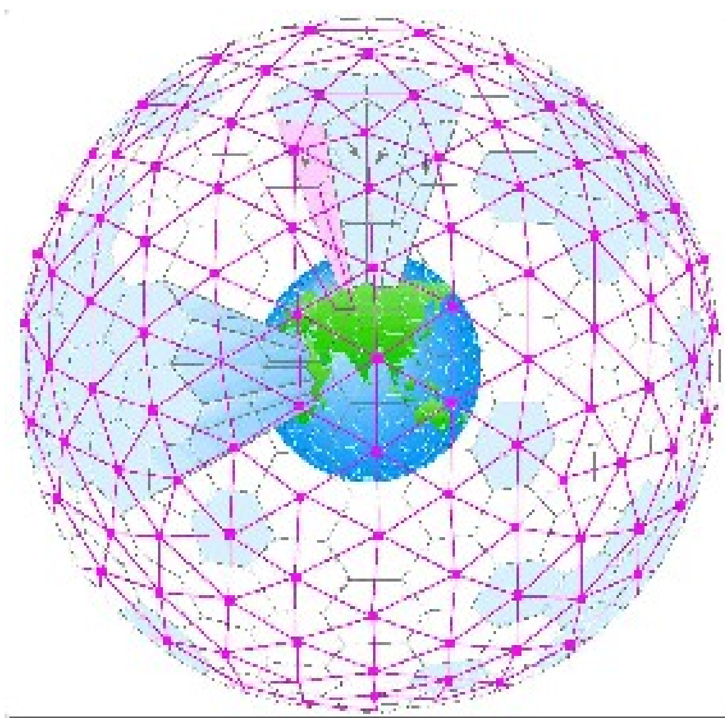
Three hundred and thirty years later, we still do not completely understand F=ma But it is the only formula that is integral to computing's 20 grand challenges and mathematics' seven millennium problems.

I devoted many years devising a solution to one grand challenge. While conventional wisdom suggested it would be almost impossible to harness the power of 65,536 processors my grand challenge was to prove otherwise.

Initially, the challenge seemed deceptively simple; but in reality, there were so many different tiers of complexity that I sometimes forgot why I was programming those 65,536 processors. In hindsight, I did just about everything wrong before I finally got it right. Research is a high-risk game, but, as they say, nothing ventured, nothing gained.

The complexity of the grand challenge renders it as incomprehensible to laypeople as pages of hieroglyphics or Greek symbols. Concisely, the challenge used the Second Law of Motion propagated along a virtual 16-dimensional hypercubic network to be executed by 65,536 processors. These processors are the beginning of the end. I started at the end because the end is devoid of the complex proofs and dense mathematical language that are unfathomable to non-mathematicians.

This grand challenge earned its name: it was a super problem that required one to think in ways that merge the laws of physics, logic, and numbers in 16-dimensional mathematical space, and to solve the problem by attacking it from three perspectives.



Walk with me as I tell a story that will take you from the Second Law of Motion to the blackboard, to the motherboard, to the mother of all motherboards: a one-of-a-kind computer powered by 65,536 processors. Every scientific discovery begins as a thought. The strategy for harnessing these laws of physics, logic, and numbers has to be conceived and thought out before becoming reality.

I visualized the grand challenge problem as a complex game with complex parameters, which I solved using three simple rules. First, I harnessed the power of processors to perform myriad computations. Second, I followed a minimum number of communication pathways to perform a minimum number of communications. Third, I enforced the Second Law of Motion in models of all that flows underneath the Earth.

In all, I had 65,536 processors and over one million pathways. The processors-plus-pathways make a computer a supercomputer, and a planet-sized supercomputer an Internet.

I have been asked: “What gave you the confidence to tackle one of computing’s grand challenges?” My answer – fifteen years of putting into practice the athlete’s five P mantra: Proper Preparation Prevents Poor Performance.

In the 1980s, I was a mathematical physicist logged on 24/7 to a 65,536-brain supercomputer on think.com –the third registered dot com ever. It was an unpaid labor of love. I was tormented by self-doubt, a maniac who pushed his supercomputer to its breaking point.

Each one of us must learn to move outside our comfort zones. We learn with each step we take into the unknown. When I was five, my father discovered that I was slow in mathematics. He decided to teach me to solve 100 math problems in one hour. Thereafter, my ability to do rapid calculations earned me the nickname “Calculus” and set me on the path to become a supercomputer scientist who solved one of the most difficult problems in mathematics.

Crossing the frontiers of knowledge to conquer tomorrow’s grand challenges will demand revolutionary techniques. In my new technique, my 65,536 processors perform computations side by side, linked by 16 wires, each corresponding to the 16 sides of a 16-dimensional hypercube. This is the essence of “higher” mathematics: go beyond calculus and mine infinite dimensional spaces.

My multicolored drawings of the hypercube are a feast for the eye; programming them is a feast for the mind. The hypercubic circuitry of the supercomputer left me breathless. I was awestruck by its 16 unique information pathways coming from each processing node. Has there ever been any technology as gorgeously complicated as the hypercube supercomputer? For me, it was love at first sight. It was hypercubic elegance that engaged me emotionally, imaginatively and computationally.

One day, the Internet will become our shared planet-sized supercomputer and individuals will become nodes on the Internet and the Internet, as we know it, will become obsolete and “disappear” into our collective memory.

By definition, both the supercomputer and the Internet consist of connected nodes working in harmony. In fact, the supercomputer is more about communication than computation. The supercomputer and the Internet link computation and communication into a congruent whole - two complementary sides of a coin.

As the computer evolves into the supercomputer, and the supercomputer evolves into the Internet, and the Internet evolves into humanity, all that will remain will be a HyperBall superbrain - an electronic, organic Web 10,000 miles in diameter encompassing the Earth. The nodes will be people, embedded in an interconnected network of humanity working as one.

If history repeats itself, the supercomputer of today will become the ordinary computer of tomorrow. This core technology could evolve to become iconic, a masterpiece, a legacy, a legend, and a contribution to civilization. Each new “grand challenge” met becomes another beacon guiding humanity forward into the age of information.

Excerpted from a lecture delivered by Philip Emeagwali at the University of the West Indies, Trinidad and Tobago on June 8, 2008. The entire transcript and video are posted at **emeagwali.com.**

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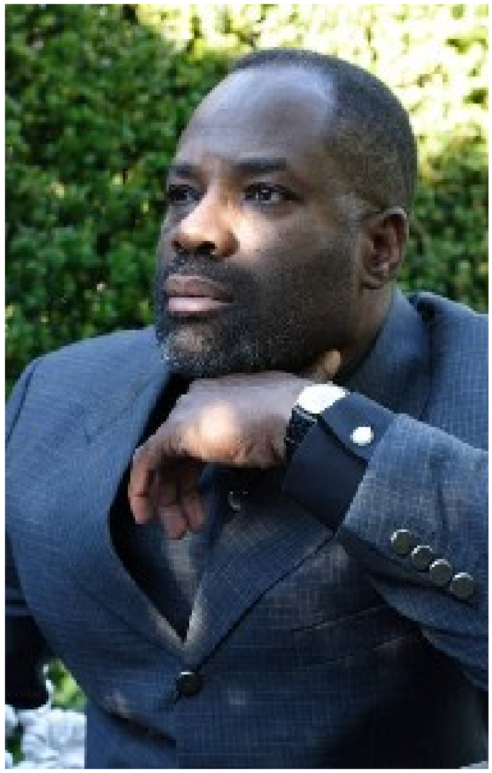
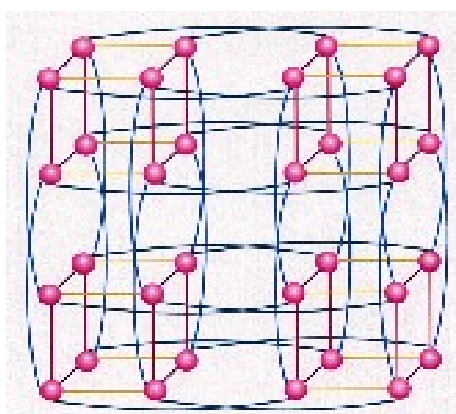
Philip Emeagwali has been called "a father of the Internet" by CNN and TIME , and extolled as "one of the great minds of the Information Age" by former U.S. President Bill Clinton . He won the 1989 Gordon Bell Prize, the Nobel prize of supercomputing.





What is Black History Month? In the US during the new year's second month, Black inventors are amplified for about 28 days.