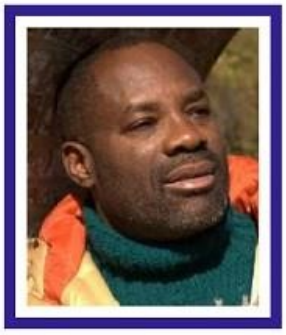
31 Gazing Across Centuries



Philip Emeagwali
info@emeagwali.com 202-203-8724

Philip Emeagwali Lecture 180914-1
Visit http://emeagwali.com for complete transcripts of 100+ lectures.
Video: https://YouTube.com/emeagwali
Podcast: https://SoundCloud.com/emeagwali

31.1.1 Gazing Across the Centuries

The need to calculate
is as old as humanity.
The need to compute

existed because it is central to
human existence.
The Latin equivalence
of the word “computer”
was first used in print
two thousand years ago.
The word “computer”
was first used by the Roman author
Pliny the Elder.
The word “supercomputer”
was first used in 1967.
I believe that our children’s children
will coin a new word
for their supercomputers.
I believe that our children’s children
will invent supercomputers
that are science fiction to us.
The massively parallel processing technology
is the **bridge** that closed the distance
between the first supercomputer
that was invented in **1946**

and the modern supercomputer of **today**.
My quest for the fastest supercomputer
began on the first supercomputer
to be rated at
one million instructions per second.
That supercomputer quest
began in Corvallis, Oregon, United States,
and began on the 20th of June 1974
and began when I was nineteen years old.
That supercomputer quest
ended on the Fourth of July 1989
and ended in Los Alamos, New Mexico,
United States.
At 8:15 in the morning
in Los Alamos (New Mexico, United States)
Tuesday the Fourth of July 1989,
I—**Philip Emeagwali**—made the first
experimental measurement
of the world's fastest computation
ever recorded **across**
an ensemble of the slowest processors

in the world.
That technological invention
made the news headlines
because I invented
how to solve the toughest problems
arising in supercomputing and physics.
Until that invention was made,
that grand challenge problem
had cast its ominous shadow
over the first 43 years
onward of the invention
of the programmable supercomputer that,
in turn, was invented
in 1946.
That invention
of the massively parallel processing
supercomputer
that I made
in Los Alamos (New Mexico, United States)
represents a new way of looking at
both the modern computer

and the fastest supercomputer.
That invention
opened doors
in extreme-scaled, parallel processed
computational physics,
such as physics-based climate modeling
and physics-based
petroleum reservoir simulation.
In the decades of the 1960s through ‘80s,
the question of how to parallel process
the toughest problems
in computational physics
and how to process them **across**
an ensemble of the slowest processors
was the subject of a titanic battle
between the overwhelming **majority**
who believed that all supercomputers
should be powered by a single, isolated,
and powerful processor
and the tiny **minority** who believed that
all supercomputers should be powered by

an ensemble of thousands of
slow processors.
The potential benefits to mankind
of the fastest supercomputer
were highlighted in numerous articles,
such as that in the May 8, 1987 issue
of *The Chronicle of Higher Education*
that was titled:

[quote]
"Some Hail 'Computational Science'
as Biggest Advance Since Newton, Galileo."
[unquote]

Fast forward three years,
the June 27, 1990 issue
of *The Chronicle of Higher Education*
published another article that proclaimed
that I—**Philip Emeagwali**
had made one of the **biggest advances**
in computational science.
That **biggest advancement** was to invent

a new internet
that is a new supercomputer
and a new computer
and to invent them by making
the impossible-to-compute
possible-to-compute.
Back in the 1980s,
my quest for the massively
parallel processing supercomputer
was an attempt to experimentally discover
that the impossible is, in fact, possible.
To the supercomputer scientist
of the Fourth of July 1989 and earlier,
to invent the massively parallel processing
supercomputer
was to invent
how to massively parallel process
the toughest problems
arising in extreme-scale
computational physics
and to figure out how to process them
across
an ensemble of 65,536

commodity-off-the-shelf processors.
My Fourth of July 1989 invention
of a new internet
that is a new supercomputer
that is the precursor
of the modern, parallel processing
supercomputer
is my signature discovery.
That invention made the news headlines
and was recognized
in the June 20, 1990 issue
of *The Wall Street Journal*
and in the August 26, 2000
White House speech
of then President Bill Clinton.
That invention of the precursor
to the modern supercomputer
was my personal journey
from fiction to fact to forecast.
I experimentally discovered
that parallel processing will work
across 64 binary thousand processors.
My invention

was unexpected and for that reason
it was at first rejected as [quote unquote]
“a terrible mistake.”
My invention
of the parallel processing supercomputer
was scorned because,
in 1989 and earlier,
no supercomputer scientist believed that
an ensemble
of all the slowest processors in the world
could be harnessed
to compute faster than
the singular fastest
vector processing supercomputer
in the world.
The contribution that I made to physics
is this:
I invented
how to reduce **time-to-solution**
to increase productivity
and to radically reduce **time-to-market**
of products.
That invention

was praised by the industry
as a giant leap forward.
Before my invention
of the massively parallel processing
supercomputer
that occurred on the Fourth of July 1989,
the most extreme-scaled
computational physics codes
were only executed
on only one supercomputer.
After my invention
of the massively parallel processing
supercomputer,
the most extreme-scaled
computational physics codes
were only executed **across**
millions upon millions
of commodity-off-the-shelf processors.
The invention that I made
of how to reduce **time-to-solution**
and how to reduce that time
from 180 years
to just one day

opened the door
to the modern parallel processing
supercomputer.
That invention
inspired the use of
parallel processing technology
in extreme-scale computational physics
and its use to reduce the **time-to-solution**
from thirty thousand years
to just one day.
That invention
increased our understanding of our universe.
That invention
of the massively parallel processing
supercomputer
opened the door
for the biggest paradigm shift
in extreme-scale computational physics.
The invention
of how to make computers faster
is at the core essence of the computer
and is the only recurring decimal
in the history of the development

of the computer.
"What will the world be like
without parallel processing
within the computer?"
A world without the
parallel processing computer
is a world
in which ninety-nine
of the one hundred processors
inside your computer
is turned off and you're computing at
only one percent of your computer capacity
and perhaps, achieving only one percent
productivity level.
A world without the massively
parallel processing supercomputer
is a world
in which fewer discoveries are made,
is a world
in which innovation is slowed down,
is a world
in which human progress is slowed down,
and is a world

in which the computer of tomorrow
cannot be invented today
thus making it impossible
for us to create the future.
A new supercomputer
without parallel processing
is reduced to the stature
of an ordinary computer.
The fastest supercomputer costs the budget
of a small nation
and it is purchased because
the fastest supercomputer
gives meaning to life,
and because the fastest supercomputer
makes the world a better place,
and because the fastest supercomputer
makes humanity more knowledgeable,
and because the fastest supercomputer
of today
will become the computer of tomorrow.
And faster supercomputers
are where science fiction will become
non-fiction.

The fastest supercomputer
is where humanity's future takes shape.
On the Fourth of July 1989,
I—**Philip Emeagwali**—
experimentally discovered
speeds in extreme-scale
computational physics
that were previously considered impossible
to record **across**
an ensemble of the slowest processors.
Recording a never-before-recorded
supercomputer speed
and recording that speed
while simultaneously solving
the toughest problems
arising in computational physics
redefines the supercomputer
and redefines the boundary
of human knowledge.
Recording the fastest computation
—and recording it
in the parallel processing manner
that was considered impossible—

is the most **objective**
and the most **measurable** contribution
to the development of the computer
as well as a contribution
to extreme-scale computational physics.
Fire is man's first invention,
or rather man's first discovery.
The computer is the greatest invention since fire was discovered.
The modern supercomputer is the greatest invention in modern physics.
We are witnessing a technological change
of tectonic proportions—called
the massively parallel processing
supercomputer.
My motivation for parallel processing **across**
my new global network of
65,536 tightly-coupled processors
was to gain a deeper and surer
understanding of the internet
as a planetary supercomputer-hopeful.
We have changed

the way we think about the computer,
and changed from computing
with only one processor
to supercomputing **across**
millions upon millions of processors.
We will change the way we look at
the internet,
and change from a global network
of computers
to a planetary-sized supercomputer.
That planetary-sized supercomputer
will be the 22nd century's crystal ball
that our children's children
will use to gaze **across** the centuries
and gaze into the Year Million
of our post-human descendants.

I'm **Philip** **Emeagwali**.
at emeagwali.com.
Thank you.