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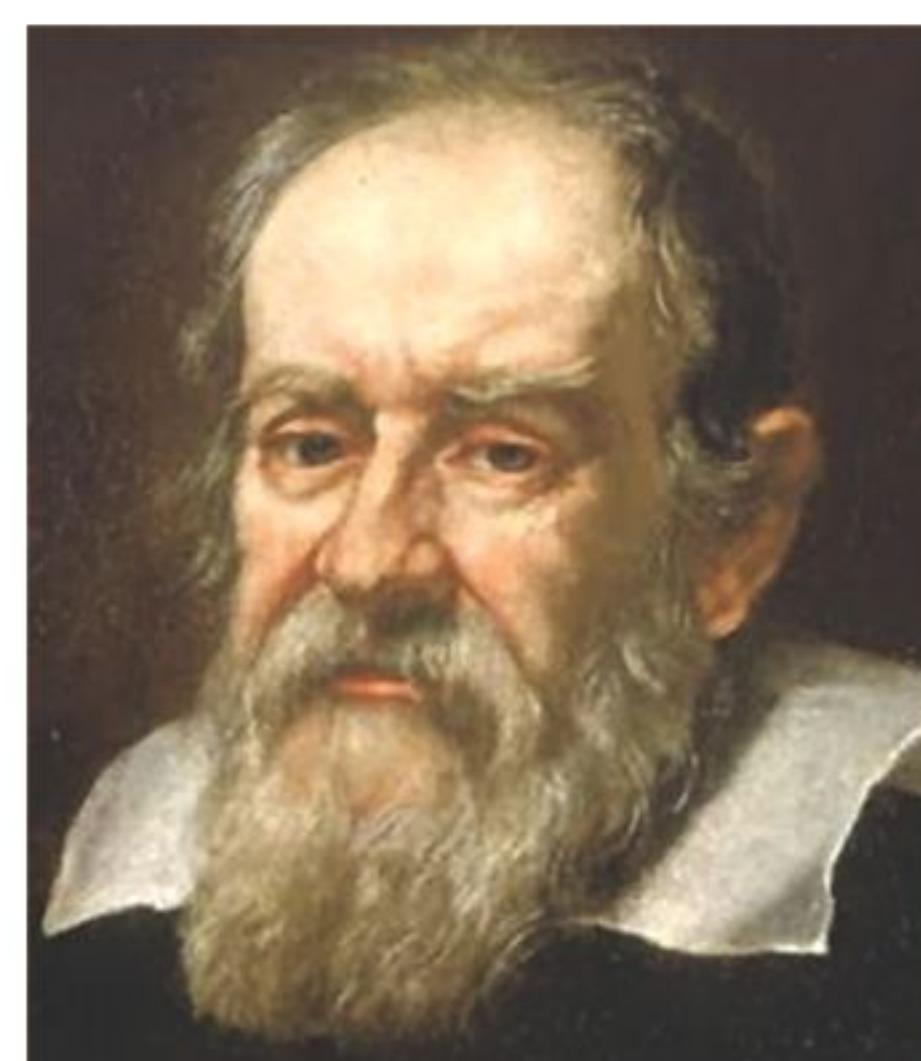
Crimes of Galileo!

QUAMRUL HAIDER, Ph.D.

In the early 17th century, the great Italian astronomer Galileo Galilei (1564-1642) had to face the wrath of the Catholic Church for his endorsement of Copernicus' heliocentric model of the cosmos. The church believed that the model was contrary to the teachings of the Holy Scriptures and branded it as heresy. It hit at the very core of the church's belief in the geocentric cosmos of Aristotle.

In 1616, officials of the Roman Inquisition, which is an institution in the Catholic Church responsible for eradication of heresies, warned Galileo to stop preaching the Copernican model as truth. At the same time, his book *On the Revolution of Celestial Spheres* was placed on the list of Index of Forbidden Books. Galileo, however, was steadfast in his belief and tried to enlighten the church about scientific truth as opposed to "revealed" truth. It was an exercise in vain and it eventually led to his downfall.

In 1623 Cardinal Maffeo Barberini, a friend of Galileo and a patron of the arts and sciences, was elected pope and assumed the name Urban VIII. Believing that a friend was at the helm of the church, Galileo mustered courage and wrote the *Dialogue on the Two Chief World Systems*. Though he claimed *Dialogue* was neutral, it was in fact a veiled polemic in favor of the Copernican model. He had to face the Inquisition again in 1633. This time he was charged with "vehement suspicion of heresy." After a short but swift deliberation, a guilty verdict was pronounced. Out of compassion for an



"Facts which at first seem improbable will, even on scant explanation, drop the cloak which has hidden them and stand forth in naked and simple beauty."

Galileo Galilei

old friend, the pope spared Galileo the fate of Giordano Bruno, a contemporary scholastic philosopher and Copernican astronomer, who was burned at the stake. Instead he was condemned to a life under house arrest in Florence where he died as a blind man in 1642.

Did the two trials of Galileo diminish his stature as a scientist and thinker? If we confine ourselves to the few decades following the trials, the answer is yes. In 1758, the church regretted for not accepting the truth in science, and lifted the ban on most of Galileo's works supporting Copernican theory. In the 20th century several popes acknowledged the great work of Galileo. In October 1992, Pope John Paul II took the extraordinary step to revoke the condemnation, saying that "the denunciation was a tragic error," but

fell short of admitting the mistake of the church. In 2008, Pope Benedict XVI, who condones heresy, admitted "understanding of the laws of nature could stimulate appreciation of God's work."

After three and a half century, how are Galileo and Urban VIII remembered? Galileo is called the "father of modern observational astronomy." Urban VIII is known as an authoritarian pope, a champion of nepotism. Galileo is admired for his unflinching devotion to seek the truth. The pope is known for his efforts to establish the Barberini Dynasty he crowned his nephew as the Prince of Palestrina. There is an epigram about Urban VIII: What the barbarians did not do the Barberini's did. Among other things, Galileo has a space probe named after him; Urban has nothing of importance named after him.

Galileo's bust adorns the halls of hallowed institutions all over the world; Urban's bust erected after his death was destroyed by angry crowd.

The greatness of a person never goes unrecognized. Stephen Hawking in his book *A Brief History of Time* described Galileo as "perhaps more than any other single person who is responsible for the birth of modern science." Albert Einstein considered him the father of modern physics. Even Pope Pius XII described him as one of the "most audacious heroes of research."

The church may have silenced Galileo's voice, but it could not crush his conviction that science is independent of religion. He did not budge an iota from the credo, which in his own words is: "In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual." He also lamented, "It vexes me when they would constrain science by the authority of the Scriptures, and yet do not consider themselves bound to answer reason and experiment."

While under house arrest, he completed his other major work on the science of motion which was published in 1634 as *Mathematical Discourses and Demonstrations Concerning Two New Sciences*. It was a precursor to Sir Isaac Newton's laws of motion which unlocked the secrets of nature and revealed the mysteries of the Universe.

The writer is a Professor in the Department of Physics and Engineering Physics, Fordham University, New York.



MARS STRUCK

Why we're mad for Mars

A N excited comment by a NASA scientist set off a bout of feverish online speculation last week about what new discoveries might be coming from the surface of Mars.

John Grotzinger, the principal investigator for NASA's Mars Curiosity rover mission, told an NPR reporter that the rover's soil sampler analysis had turned up something exciting.

"This data is gonna be one for the history books," he said. "It's looking really good."

Populate Mars!

The comments kicked off immediate online speculation on what the finding could be, but NASA immediately began to manage expectations, with a spokesperson telling CBS News that the discovery was "nothing earthshaking."

But try as it might, NASA likely can't tamp down enthusiasm about the Red Planet. Earth's neighbor has long fascinated the public for its potential to have a history of life, or even to one day support a future human colony.

The lure of Mars

Until the first spacecraft flybys of Mars in the 1960s, scientists believed the planet might have liquid water and sustain life. That possibility was enough to fascinate the public, Bob Crossley, author of "Imagining Mars: A Literary History" (Wesleyan, 2011), told LiveScience in August.

"Somewhere deep in my own psyche, and maybe for other people as well, there is a desire for another world," said Crossley, an emeritus professor of English at the University of Massachusetts.

Source: Live Science



This panorama is a mosaic of images taken by the Mast Camera (Mastcam) on NASA's Mars rover Curiosity.

LONG PURSUIT

The Higgs discovery

A Higgs hunter's perspective

DR. LASHKAR KASHIF



Proton-proton collisions as measured by the European Organisation for Nuclear Research (CERN) in its search for the Higgs boson particle.

Now I think back on all the work that has gone in. I decided to be a particle physicist all those years ago in high school, standing beside the ping-pong table in Scholastica. Later, in my second year at Harvard, I dubbed myself a Higgs Hunter and resolved to be part of the Higgs discovery, if the boson exists at all. Since I completed my PhD, I have been working on the WW channel, which is the most sensitive Higgs decay mode in the low mass range. That is only my personal story; extremely hard work by hundreds of people over years has gone into the making of this morning. Notwithstanding, I am proud of the moment, proud of representing my country here at the pinnacle of science, of knowledge and of human achievement.

The next phase is to measure the properties of this particle: couplings, spin, parity. Is this really the Standard Model Higgs boson, or something more exotic? The latter possibility is definitely the more exciting one. So there is much work to be done. But for now, I am off to Melbourne to attend the International Conference for High-Energy Physics, a few days of relative leisure away from CERN.

Dr. Kashif did his undergraduate studies at Yale University, received a PhD in Physics from Harvard University, and is now a postdoctoral researcher with CERN/University of Wisconsin-Madison. He is based at CERN in Geneva, Switzerland.

FLUKY BRAINS

Intellect by chance!

S CIENTISTS have discovered for the first time how humans -- and other mammals -- have evolved to have intelligence.

Researchers have identified the moment in history when the genes that enabled us to think and reason evolved.

This point 500 million years ago provided our ability to learn complex skills, analyse situations and have flexibility in the way in which we think.

Professor Seth Grant, of the University of Edinburgh, who led the research, said: "One of the greatest scientific problems is to explain how intelligence and complex behaviours arose during evolution."

The research, which is detailed in two papers in *Nature Neuroscience*, also shows a direct link between the evolution of behaviour and the origins of brain diseases.

Scientists believe that the same genes that improved our mental capacity are also responsible for a number of brain disorders.

"This ground breaking work has implications for how we understand the emergence of psychiatric disorders and will offer new avenues for the development of new treatments," said John Williams, Head of Neuroscience and Mental Health at the Wellcome Trust, one of the study funders.

The study shows that intelligence in humans developed as the result of an increase in the number of brain genes in our evolutionary ancestors.

The researchers suggest that a simple invertebrate animal living in the sea 500 million years ago experienced a 'genetic accident', which resulted in extra copies of these genes being made.

Source: Science Daily



Scientists have discovered for the first time how humans -- and other mammals -- have evolved to have intelligence.

STONY ENIGMA

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DID YOU KNOW?

Stonehenge timeline revamped

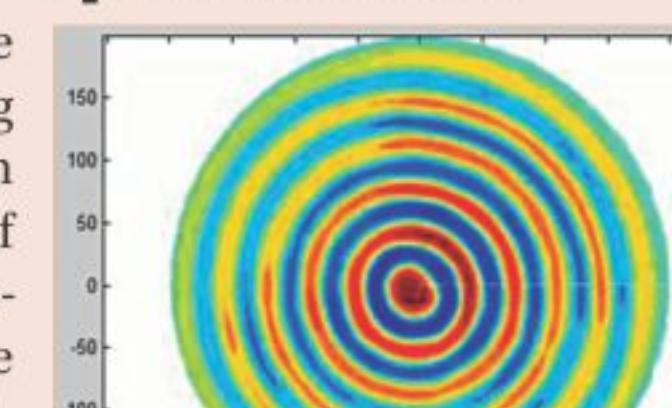


A new timeline of Stonehenge's construction reveals that the massive megaliths came first, while the smaller bluestone oval came later.

Source: Live Science

What is Spin Wave?

Spin waves are propagating disturbances in the ordering of magnetic materials. These low-lying collective excitations occur in magnetic lattices with continuous symmetry. From the equivalent quasiparticle point of view, spin waves are known as magnons.



which are boson modes of the spin lattice that correspond roughly to the phonon excitations of the nuclear lattice. As temperature is increased, the thermal excitation of spin waves reduces a ferromagnet's spontaneous magnetization.