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Breakthrough, Vol.15, No.3, February 2012

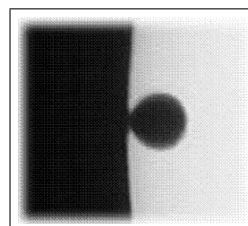
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## Cover Article

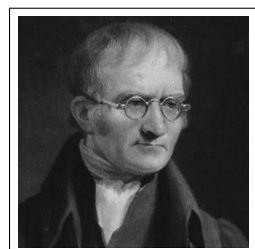
### The Transit of Venus 2012— A Celestial Spectacle

Soumitro Banerjee .....	7
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On the 6th of June, 2012, there will be a spectacular scene in the sky: The planet Venus will be seen passing over the disk of the sun. What is the historical significance of this event? What is the science behind it? How to view the event? From where can it be observed, and when? Prof. Banerjee throws light on these issues.



## General Articles



### Evolution of Chemistry—Part II

K. P. Saji .....	19
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This year is being celebrated as the “International Year of Chemistry.” On this occasion we publish a serialized article on the evolution of chemistry through the ages. In the Part-I, the development of chemistry from the ancient times till Lavoisier was discussed. In the next instalment, the author discusses the “modern” phase of chemistry, starting from Dalton up to the birth of quantum mechanics.

### E-Waste and Its Management: an Emerging Problem

Abhijit Mitra .....	29
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With the ever increasing use of consumer electronic goods by the people, the problem of electronic waste is fast becoming an important problem faced by the society. Dr. Mitra discusses the dimensions of the problem and the possible solutions.

### Galileo's experiment on falling objects

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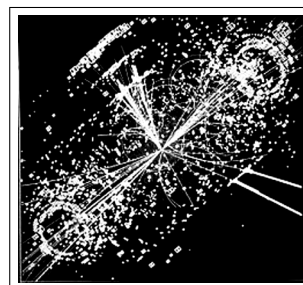
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## Cover Article

### **Discovery of the Higgs Boson — Standard Model Finds Its Missing Piece**

Subhasis Basak ..... 4

On the 4th of July, 2012, the scientists at CERN, Geneva, announced that a new particle of mass 126 MEV resembling the Higgs' boson has been detected in the high-energy proton-proton collisions at the Large Hadron Collider. Dr. Basak discusses the gravity of the discovery in the light of the standard model of particle physics and the concept of the Higgs' boson.



## General Article

### **Hazards of nanoparticles and nanotechnology: Need for a general awareness**

Madhusudan Jana ..... 11

With the spread of various nanotechnologies in the market, it has become necessary to be aware of the potential environmental hazards posed by the new technology. Dr. Jana exposes this problem and the possible measures to counter it.

## Serial Article

### **A Brief History of Science Part-1: The Advent of Agriculture**

Soumitro Banerjee ..... 20

With this article we are starting a series on the history of science. In the first part, Dr. Banerjee discusses the character of the hunting-gathering society and its transition to an agricultural society. The neolithic revolution, shows Dr. Banerjee, created tumultuous changes in the structure of the society, which, in its turn, propelled scientific development.

## Organizational News

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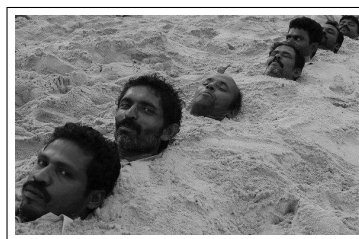
Breakthrough, Vol.16, No.1, January 2013

## Cover Article

### Nuclear Energy — Facts and Fiction

Satish K. G. ....4

The people's movement against nuclear power plants at Koodankulam in Tamil Nadu, Jaitapur in Maharashtra, and Haripur in West Bengal, has again brought the nuclear question to the fore. Is nuclear energy the only way to solve our power problem? Is it really safe? Is it really economical? This article addresses these vital issues.



## Series Article

### History of Modern Chemical Industries

Asoke P. Chattopadhyay .....17

This is the last of the series of articles on the History of Chemistry which started in the International Year of Chemistry. In this instalment Prof. Chattopadhyay recounts how the advancement of chemistry in the modern times reaped real benefits to the society by mass production of the chemicals essential for a modern society.

## Series Article



### A Brief History of Science Part-2: The Upsurge of Greek Intellect

Soumitro Banerjee .....26

This second part of the series on the History of Science deals with the great development of human intellect that occurred in ancient Greece. This period, spanning about 700 years, essentially set the course of enquiry that was followed for millennia. Great men of this period were Thales, Pythagoras, Hippocrates, Democritus, Socrates, Plato, Aristotle, Euclid, Archimedes, Ptolemy, etc.

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Breakthrough, Vol.16, No.2, April 2013

## Cover Articles

### Cell Phone/Tower Radiation Hazards and Solutions

Girish Kumar and Neha Kumar ..... 4

We have become so accustomed to using mobile phones that we do not consider its effects on our body. The authors discuss the current regulations in India, and place it in the context of the experts' recommendations and the practices in other countries.



### Hazards of Electromagnetic Radiation

Madhusudan Jana ..... 11

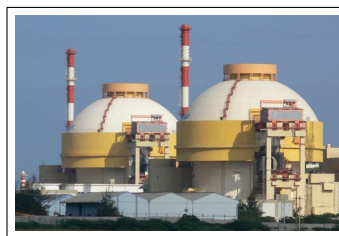
In a modern society, the human body is exposed to many sources of electromagnetic radiation: while watching TV or using computers, in close proximity to high-voltage lines and mobile towers, in diagnostic procedures like x-ray, MRI, etc. The author discusses the possible health effects and ways to minimize them.

## Series Articles

### Nuclear Energy—Facts and Fiction, Part II

Satish K. G. .... 19

In the second part of this article, the author discusses the alternatives to nuclear energy, and shows that sources like solar and wind have much more prospect as clean and economical source of energy.



### A Brief History of Science Part-3: The Dark Age

Soumitro Banerjee ..... 30

This third part of the series on the History of Science deals with the post-Greek period, which saw the advent of feudalism replacing slavery, organized religion, and a decline of the culture of science. The period is generally called the "dark age".

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## Cover Article

### Comet ISON: Our New Guest in the Sky

Dr. Subhasis Basak ..... 5

The comet ISON is heading towards the inner solar system, and will offer a celestial spectacle in November-December this year. This article describes the scientific details of comets in general and comet ISON in particular.



## General Articles

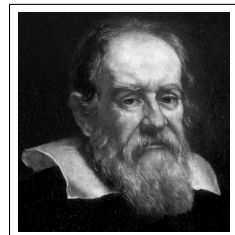
### Cloudbursts and Flash Floods in the Himalayas

A. K. L. Asthana ..... 11

### Global Position of India in Scientific Research Where we were : where we are

A. K. Maiti ..... 22

## Series Article



### A Brief History of Science Part-4: The Renaissance

Soumitro Banerjee ..... 24

In the fourth part of the essay, the great development in human thought known as the scientific renaissance is discussed. Dr. Banerjee outlines the socio-economic basis of the renaissance, and its manifestation in arts and science.

## Students' Section

### The Birth of the Concept of Temperature

K. Sampath ..... 34

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### Story of Atomic Models : A tribute to Niels Bohr on the occasion of centenary of his model

Madhusudan Jana ..... 7

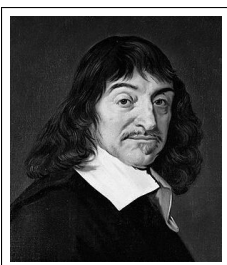
2013 was the 100-year anniversary of Niels Bohr's revolutionary atomic model, which formed the basis for our understanding of atoms and for the quantum revolution. Niels Bohr's model of the atom revolutionized physics when it was published in 1913.

### Niels Bohr — An Eternal Inspiration

Ashwin Kalyan ..... 18



## Series Article



### A Brief History of Science Part-5: Development of the Scientific Method

Soumitro Banerjee ..... 23

After the renaissance, there was a great spurt of scientific activity, the philosophical basis for which was supplied by Galileo, Bacon, and Descartes. In this part of this essay, these major contributions that established the scientific method are discussed.

## General Article

### Mars Orbiter Mission — An Appraisal

Rajani K. S. .... 29

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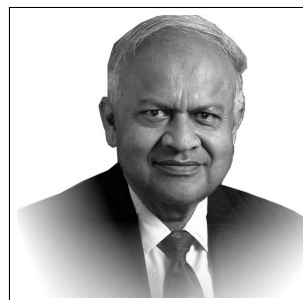
Breakthrough, Vol.17, No.1, July 2014

## General Articles

### Corridors of Cosmology and Prof. Jayant Narlikar

Moncy V. John ..... 4

Dr. John recounts the course of events that led to the conflict between the two main theories of cosmology, namely, the big bang theory and the quasi-steady state theory, and the role played by the leading Indian scientist Prof. Jayant Narlikar.



### How light is created

A. K. Maiti ..... 11

## Series Article



### A Brief History of Science Part-6: The Newtonian Synthesis

Soumitro Banerjee ..... 15

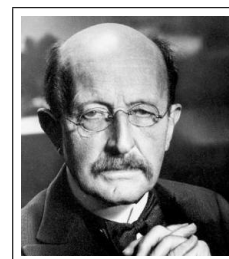
Within a hundred years of the publication of Copernicus' book, the "Age of Reason" took shape in the minds of the learned people of Europe, and a period of rapid advancement of science began. The central figure of this period is Newton. Dr. Banerjee describes how the social conditions shaped the agenda for science of that time, and how the resulting science brought materialism back to the centre stage of intellectual pursuit.

## From the Pages of History

### Scientific Ideas: Their Origin and Effects

Max Planck ..... 24

We reprint this article from the book "The philosophy of physics" by the great physicist Max Planck. From it any student of science will get valuable things to learn about the method of science. Planck also gives important messages for those who plan school science curriculum.



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## Series Article

### **A Brief History of Science**

#### **Part-7: The Heydays of Mechanical Materialism**

Soumitro Banerjee .....	34
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This part of the serial article deals with the developments in the post-Newtonian era, when the intellectual sphere was dominated by Newtonian mechanical materialistic philosophy and empiricism. It shows how the wrong ideas in the understanding of heat, electricity, and chemistry were dispelled laying the strong foundation for the phenomenal development of science in the 19th century.



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## Series Article

### **A Brief History of Science Part-8: The Development of Science in Ancient India**

Soumitro Banerjee .....	9
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In this part of the serial essay, we deal with the rich heritage of science and technology in ancient India by dividing the whole epoch into three parts—the Indus Valley civilization, Vedic age, and post-Vedic period. A few misconceptions that are being systematically propagated are also exposed. We also discuss the reasons of the decline and fall of Indian science after the 1st millennium AD.

## General Articles

### **• Getting on Top of Cancer**

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### **• Phlogiston, Oxygen, and Birth of Modern Chemistry**

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### **• Probiotics — The Bugs Beneficial to Human Health**

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Breakthrough, Vol.18, No.1, August 2015

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## General Articles

### • **Evaluating the claims of ancient Indian achievements in science**

Mayank Vahia ..... 4

Dr. Vahia discusses the attempts by fringe groups to undermine the rich scientific heritage of India by making false claims, and calls for an all-out struggle by the scientific community to expose and defeat these fringe groups. "A battle is not far, and it will be brutal, hard and long" he writes. "It will have to be fought on every forum and every place, from Indian Science Congresses to the newspapers and public forums. But those who care for the soul of India and desire a rational nation to emerge will have to join the battle."

### • **Early History of the Earth** ..... 12

This is the translation of a chapter from the Bengali book "Vivartan Yuge Yuge" (Evolution through Ages), describing how the Earth evolved after being formed from the solar nebula 4.6 billion years back.

## Series Articles

### • **A Brief History of Science** **Part-10: The Revolution in Biology**

Soumitro Banerjee ..... 21

In this part of the serial essay, we discuss the course of events that led to the grand synthesis in biology: Darwin's theory of evolution.

### • **Materialist Philosophy in Ancient India – Part-I**

'Subrata Gouri ..... 32

Contradicting the usual belief that ancient India was a seat of spirituality and idealism, the author shows that there was considerable cultivation of materialist philosophies.

## Organizational News

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Subrata Gouri .....	12
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### • A Brief History of Science, Part-11:

#### Philosophy transcends mechanical materialism and metaphysics

Soumitro Banerjee .....	22
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### • What is wrong with our teaching and research institutions today?

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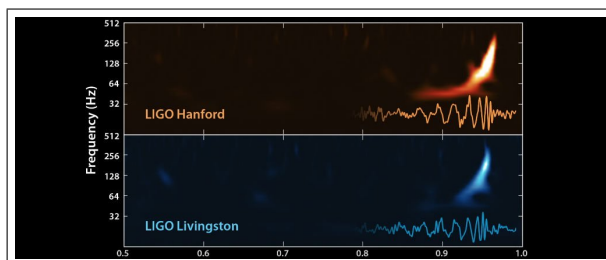
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## Cover article

### Gravitational waves: Einstein's whispers from the cosmos

Nathan K. Johnson-McDaniel,  
Archisman Ghosh,  
Arunava Mukherjee ..... 4



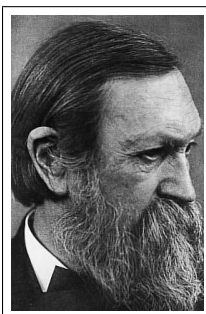
A century after Einstein predicted the possibility of waves in space-time continuum, mankind has been successful in detecting such a wave. It was a remarkable feat in experimental science as it required the detection of change in length less than the diameter of an atomic nucleus. The authors, members of the international team that achieved this feat, describes the discovery.

## General Article

### LED as Present Day Lighting Device

Madhusudan Jana ..... 16

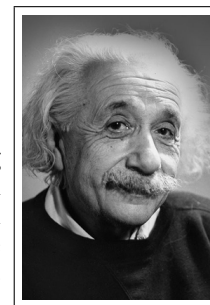
## Series Article



### A Brief History of Science Part-12: The Rise and Fall of Positivism

Soumitro Banerjee .....24

What is the correct way of doing science? In answering this question, and philosophical viewpoint called positivism developed in continuation of the empiricist tradition, which dominated the scientific landscape towards the end of the 19th century. This article discusses this viewpoint, and its impact on the development of science.



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### Genetically Modified Mustard — A Trojan Horse For Introducing GM Food Crops in India

Safique Ul Alam ..... 6

### Water Crisis

Pradip K Datta ..... 17

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### A Brief History of Science

#### Part-13: The development of quantum mechanics

Soumitro Banerjee ..... 23

This installment of the series article discusses one of the most exciting phases in the history of science, when our conception of the micro-world underwent a revolution through the development of quantum mechanics. This development also gave rise to important questions regarding the nature of physical reality and debates regarding its interpretation, which are yet to die down.

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### Analysis of the Real

Sarosh Ali ..... 34

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- Observation of Transit of Mercury, 9 May 2016 ..... 39

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## Cover article

### **The National Education Policy 2016: A Critical Appraisal ..... 4**

The Ministry of Human Resources Development has brought out a 43-page document called “Some Inputs for Draft New Education Policy.” Here we publish our organization’s evaluation of the proposed content of the New Education Policy.

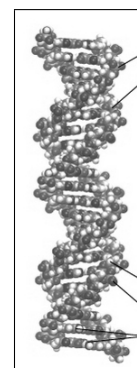
## Series Article

### **A Brief History of Science**

#### **Part-14: Genetics becomes a science**

Soumitro Banerjee ..... 14

One of the major advancements in science in the 20th century was the development of our understanding of the mechanism of heredity. In this installment of the serial article, we discuss the milestones in this discovery. We also touch upon the important confusions and misinterpretations in genetics that are still prevalent in the society today.



## General Article

### **The birth and growth of a Scientific Idea — Science of Motion**

K. Sampath ..... 24

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- Is climate change responsible for decline of Harappan civilisation? 30
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## Commentary

### When Spirituality Masquerades as Science

Saji K P .....4

## Cover article

### Science under Socialism in the USSR ..... 10

This year the world is commemorating the centenary of the November Revolution that occurred in Russia between the 7th and 17th of November 1917 and led to the birth of the world's first socialist state. On this occasion, economists and social scientists all over the world are evaluating the successes of socialism in eradicating social inequality, unemployment, and various social evils. For the scientific community the natural question is, what was the status of science in the socialist society that resulted from the revolution?

## General Articles

### On the Significance of Faraday and Maxwell's works

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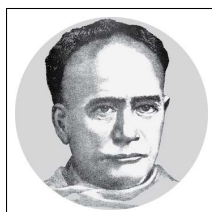
### **March for Science, March for Progress**

Ashish Mahabal .....	9
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On 22 April 2017, scientists all over the world organized *March for Science* in 600 cities, demanding greater support for science and demanding that governmental policies be guided by evidence-based science. Dr. Mahabal, a researcher at CALTECH, describes its perspective and the excitement it generated among the scientists of USA.

## Series Article

### **A Brief History of Science Part-15: Rebirth of Science in India**



Soumitro Banerjee .....	14
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From the 9th century, science in India declined, and after the 11th century practically nothing remained. In the 19th century, when the light of European renaissance entered India, there was a rebirth of science. Spearheaded by Rammohan and Vidyasagar, the Indian renaissance created a storm in science. The concluding part of the series tells the story of that exciting period of Indian science and points to the way ahead.

## General Article

### **Was there a creation for the universe?**

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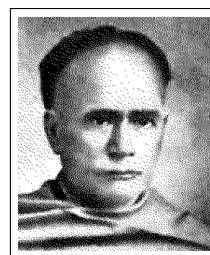
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The 200th birth anniversary of the legendary educationist, humanist and social reformer Ishwar Chandra Vidyasagar is being observed this year. The author discusses his stellar role in initiating a secular and scientific education in the country.



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Climate change is a matter of hot debate, and the relative importance of all the causative factors is not well understood yet. In this article Prof Ghosh argues that astronomical factors can also play an important role in causing global climate change.

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