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VP News

UNESCO Kalinga Prize Winner from Pakistan Visits Vigyan Prasar

Prof. V.S. Ramamurthy presenting a memento to prof. Rervez Hoodbhoy. Dr. V.B. Kamble looks on

Prof. Pervez Amirali Hoodbhoy a nuclear physicist and a science populariser, of the Department of Physics, Quaid-e-Azam University, Islamabad, Pakistan, and a winner of UNESCO Kalinga Prize for the year 2003 for his contributions in the area of science popularisation visited Vigyan Prasar on November 17, 2004. While interacting with members of VP, he briefly described the science

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Inside

VP's Participation in Regional Science Congress organized by Navodaya Vidyalaya Samiti

Vigyan Prasar participated in Regional Science Congress – 2004 and Regional Award giving ceremony on November 16, 2004, organized by Navodaya Vidyalaya Samiti, Jaipur region. Dr. V. B. Kamble, Director, VP, was the chief guest and Dr. S. Mahanti, Scientist 'F', VP, was the Guest of Honour. The function was presided over by Shri H.N.S. Rao, Dy. Director, Navodaya Vidyalaya Samiti, Jaipur region. On this occasion, prizes were given to students, teachers and principals for their successful performance. Dr. Kamble gave presentation on "Aerodynamics of the cricket ball". He demonstrated various underlying scientific principles in bowling, say swing and spin bowing. He underlined the role of science in different games. Dr. Mahanti talked about general aspects of science highlighting the way the scientists work. He emphasized the central role of curiosity in the pursuit of science. On this occasion, Shri Rintu Nath, Sr. Scientific Officer, VP, demonstrated

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From L to R: Shri Mahendra Singh Chaudhry, Principal, JNV, Paota; Shri Mathew, JNVS, New Delhi; Dr. V. B. Kamble, Shri H. N. S. Rao, Dy. Director, NVS, Jaipur;. Dr. S. Mahanti and Shri Trivedi, NVS, Jaipur at the awards presentation ceremony

... think scientifically, act scientifically... think scientifically, act scientifically... think scientifically, act...

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Editor : Dr. V.B. Kamble

The Tragedy Lives On

The Union Carbide built a pesticide factory in Bhopal in 1970s considering that India represented a huge untapped market for its pest control products. However, droughts and floods rarely left any money with the Indian farmers to buy Union Carbide's pesticides. Sales never met the company's expectations. As a result, the plant never reached its full capacity and ceased active production in the early 1980s. However, vast quantities of dangerous chemicals remained. Three tanks continued to hold over 60 tonnes of methyl isocyanate – popularly called MIC. MIC is a particularly reactive and deadly gas, but the safety system was allowed to fall into disrepair. May be, the management thought that since the plant had ceased all production, no threat remained.

On the night of December 2 and 3, 1984, when an employee was flushing a corroded pipe, multiple stopcocks failed and allowed water to flow freely into the largest tank of MIC. It was five past midnight then. This led to an uncontrolled reaction and spewed out a deadly white cloud of MIC, hydrogen cyanide, mono methylamine and other chemicals. Aided by the prevailing winds, the deadly cloud settled over most of Bhopal, and soon thereafter the people began to die. Incidentally, there were six safety systems designed to contain such a leak. But, none of them was operational! As a result, the gas spread throughout the city of Bhopal. Half a million people were exposed to the deadly gas. Some 8,000 died in the first three days alone.

The gigantic and dense poisonous cloud of MIC left thousands of children dead or permanently disabled. Seventy per cent of the children born before the disaster continue to suffer from respiratory diseases and 55 per cent from affected eyesight. After the accident, many pregnant women suffered miscarriages, while others delivered still born or malformed babies. More than half the children exposed to the gas in their mothers' wombs died. Many were born with deformities. Indeed, these children may carry forward the toxic legacy of their parents in the form of genetic disorders. Even today, lakhs of residents of Bhopal continue to be ill with complaints of diseases of the eyes, lungs, kidneys, liver, brain, reproductive and immune systems. The rate of TB among people exposed to the gas is four times higher than the national average. Amongst women exposed to the gas, the problems reported include early menopause – in some cases even in early twenties - and short and painful menstrual cycles. Since the disaster, survivors have been plagued with an epidemic of cancers, menstrual disorders and what one doctor described as "monstrous births."

Neither Union Carbide Corporation, nor Dow Chemicals, which took over Union Carbide Corporation in 2001, took responsibility for the leak. UCC, however, abided by a 1989 Supreme Court ruling asking it to pay compensation of $ 470 million after a long legal battle in the US and India. Union Carbide settled the civil suit by paying victims a lump sum of $ 470 million (about Rs. 705 crore then). The amount was arbitrarily estimated on the basis of 3,000 dead and 1 lakh injured. However, later estimates showed that about 20,000 died and over 570,000 still suffer! Till November 2003, the next–of-kin of Bhopal's dead had received Rs. 57,000 while the injured had been paid Rs. 26,000 each. Disbursement of another unutilised Rs. 1565 crore to the injured 570,000 persons began as recently as November 15 this year. This would entitle on an average Rs. 50,000 per injured person towards compensation – a pittance indeed for a people economically and physically destroyed over two generations!

Twenty years after the incident, Bhopal residents remain at risk of poisoning due to toxic material still stocked around the plant. There are signs that a second tragedy is in the making. New environmental studies indicate that tonnes of toxic material dumped at the old plant has now seeped into the groundwater, affecting a new generation of Bhopal citizens. Tests reveal cancer and brain-damaging and birth-defect causing chemicals and those causing impairment of foetal development. Mercury and lead contamination have even found their way into samples of breast milk. Ground water tests have shown contamination levels hundreds of times higher than World Health Organisation limits.

"This tragedy is living on," says Abdul Jabbar, who runs a seamstress workshop for widows of gas victims. "The groundwater for 3 to 5 kilometers from the site is contaminated, and this comes 20 years after the tragedy struck Bhopal. The state public health agency has conducted two studies proving the water is unfit for drinking, but still people use the hand pumps." Back in 1984, the wind direction carried the methyl isocyanate gas toward the south. But now, the contaminated groundwater is heading north, carrying the poisons to a completely new population – a cruel twist indeed! "Those who are living out

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Editor : **V.B. Kamble**

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John Burdon Sanderson Haldane

The Ideal of a Polymath

❑ Subodh Mahanti
e-mail : mahantisubodh@yahoo.com

"I am a part of nature, and, like other natural objects, from a lightning flash to a mountain range, I shall last out my time and then finish. This prospect does not worry me, because some of my work will not die when I do so."

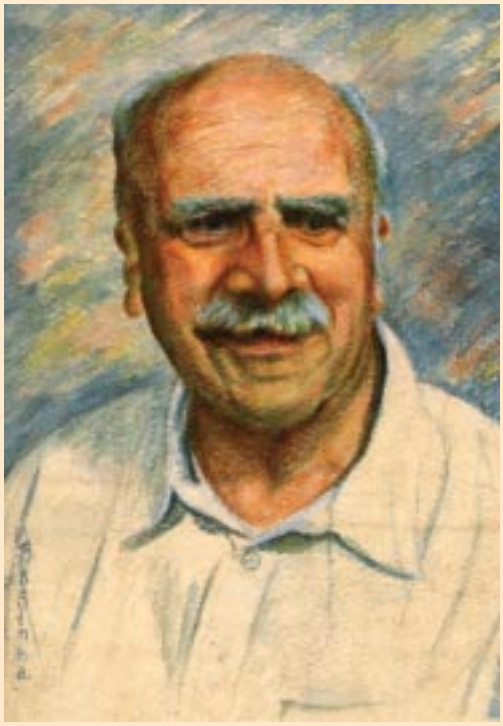
J.B.S. Haldane

"Haldane is one of the most eccentric figures in modern science. If his life has a theme, it is of bringing talents in one field of work to the solution of problems in quite a different area. He was self-confident, unpredictable and difficult to work with. His family was wealthy and talented, and his father was Britain's leading physiologist."

The Cambridge Dictionary of Scientists (2nd Edition), 2002

To many, John Burdon Sanderson Haldane needs no introduction. 'However, our aim is to introduce Haldane's life and work to younger people and a lay-audience and we feel that many of them may not be knowing who Haldane was and what he did. Many of the traits of Haldane's personality are truly inspiring. His concerns and views on the development of science and its relationship with society, the importance of the method of science, education, welfare of fellow human beings etc., are very much relevant even today. He spent last five years of his life in India and became an Indian citizen. Here we have attempted to highlight some aspects of Haldane's life and work. For obvious reasons it cannot be a definitive and comprehensive account.

As a scientist his best known contributions are in the mathematical theory of evolution. He is one of the founders of population genetics. He was a polymath in the truest sense. Haldane was actually interested in almost all the sciences. Besides all the sciences, he was interested in western classics, Hindu philosophy, linguistics, Marxism, economics and so on.



JBS Haldane
Courtesy: J.B.S. Halden : A Tribute (1992)
Indian Statistical Institute, Kolkata

He was a man of massive contradictions. While in science Haldane was the most open minded of men but in politics he was dogmatism incarnate. He could be the rudest man as well as the kindest. He was thrifty and never wasted anything. He disliked formalities and always meant business. He had no liking for social visits and non-scientific conversations.

J.B.S. Haldane was born in Oxford, England, on November 5, 1892. Haldane's family traces it ancestry to the mid-thirteenth century. His father John Scott Haldane (1860-1936) was a physiologist, noted for his investigations of human respiration. He established that the rate of breathing was regulated according to the concentrations of carbon dioxide in the blood. He also investigated the effects of high altitude deep-sea pressure on respiration and improved mine safety by demonstrating toxic effects of carbon monoxide.

His mother Louisa Kathleen Haldane (nee Trotter) was involved in activities aimed at relieving the "human predicament". Haldane was very much influenced by his parents; particularly by his father. He once observed: "I owe my success very largely to my father". Haldane received his initial scientific training from his father whom he assisted from childhood in the latter's private laboratory. Thus he later observed: "I learned much of my science by apprenticeship, assisting my father from the age of eight onwards and my university degree is for classics, not for science."

About his childhood Haldane wrote: "As a child I was not brought up in tenets of any religion, but in a household where science and philosophy took the place of faith. As a boy I had very free access to contemporary thought, so that I do not to-day find Einstein unintelligible, or Freud shocking. As a youth I fought through the war and learned to appreciate sides of human character with which the ordinary intellectual is not brought into contact. As a man I am a biologist, and see the world from an angle which gives me an unaccustomed perspective, but not, I think, a wholly misleading one.

"At school I deserted "classics", that is to say the study of Latin and Greek, at the age of fourteen and studied

chemistry, physics, history, and biology, with my father's full backing but to the annoyance of the headmaster, who said I was becoming "a mere smarter."

Haldane had a great regard for literature. We are told that he was fond of Shakespeare (1564-1616); Dante (1265-1321); Shelly, (1797-1851); Keats (1795-1821); Rimbaud (1854-91) and Balzac (1799-1850). He also used to read Dostoevsky (1821-81) and Tolstoy (1828-1910). He was friendly with G.B. Shaw (1856-1950) and H.G. Wells (1866-1946). He could read eleven languages and make public speeches in three.

Indian Statistical Institute, Kolkata
Courtesy: J.B.S. Halden : A Tribute (1992), Indian Statistical Institute, Kolkata

In 1911 he went to Oxford on a mathematics scholarship and took first-class honours in mathematical moderation. In his first year at Oxford; he also attended the final honours course in Zoology. At a seminar for Zoology students in 1911, Haldane announced his by discovery (based on the analysis of the data published by others) of the first case of what is now called linkage between genes in vertebrates. However, his evidence was not adequate and has had to wait till 1916 to get it published.

Before he could obtain a formal scientific degree, he had to leave Oxford and join the British army in 1914, as the First World War (1914-18) broke. On returning to Oxford after the war, he was elected a Fellow of New College and started teaching physiology. Besides his teaching assignment he started working on physiology and genetics.

Haldane's major contributions to science were in three different fields, i.e. physiology, biochemistry and genetics. He studied various aspects of human physiology, often acting as his own experimental animal. In fact Haldane is noted for his willingness to serve as "his own chief guinea pig", Haldane's work on regulation of blood alkalinity is basic textbook material.

In 1922, on invitation from Frederick Gowland Hopkins (1861-1947), Haldane joined the Cambridge University as Reader in biochemistry. He spent 10 years there. At Cambridge he concentrated on the study of enzymes and using some elegant mathematics he calculated the rate at which enzyme reaction takes place. Haldane (in collaboration with G.E. Brigs) showed that enzyme reactions obey the laws of thermodynamics. On his contribution to biochemistry Haldane wrote: "Perhaps my own most important discovery was that a substance, for which carbon monoxide competes with oxygen, now called cytochrome oxides, was found in plant seedling, moths and rats. The most remarkable thing about this discovery was that I was able to find out a good deal about a substance in the brain of moths without cutting them up or killing. However, my enunciation of some of the general laws of enzyme chemistry may have been more important."

Haldane is considered as one of the founders of population genetics. His main genetic discovery at Cambridge was the rule to determine the sex of the hybrid animal: "The rule that if one sex in a first generation of hybrids is rare, absent or sterile, then it is the heterogamatic sex". In 1933 Haldane left Cambridge for the University College of London where he was mostly preoccupied with human genetics. He prepared (1935) a provisional map of the X chromosome which showed the positions on it of the genes causing colour blindness, a particular skin disease and two varieties of eye peculiarity. His work on the mathematical theory of natural selection is a must for students of genetics and biology. In 1932, in his book, *The Causes of Evolution,* Haldane published the first estimate of a human-mutation rate. Another important contributions of Haldane to the field of genetics was his work for the *Journal of Genetics,* which he edited.

With his wife Helen Spurway (28 September 1956)
Courtesy: J.B.S. Halden : A Tribute (1992)
Indian Statistical Institute, Kolkata

Haldane and A.I. Operin independently suggested a plausible mechanism for the origin of life in an anaerobic pre-biotic world. Perhaps the most important aspect of Haldane's contributions to science was that he was able to bring to new fields the equipments and concepts he had acquired in other disciplines.

In Haldane's own words his scientific contribution may be summarised as follows: "My scientific

Inauguration of degree courses of the Indian Statistical Institute, 16 August 1960 (from L to R) P.C. Mahalanobis, F.R.S.; S.N. Bose, F.R.S.; P.N. Banerjee; J.B.S. Haldane, F.R.S.; C.R. Rao, F.R.S
Courtesy: J.B.S. Halden : A Tribute (1992), Indian Statistical Institute, Kolkata

work has been varied. In the field of human physiology I am best known for my work on the effects of taking large amounts of ammonium chloride and ether salts. This has had some application in treating lead and radium poisoning. In the field of genetics I was the first to discover linkage in mammals, to map a human chromosome, and (with Penrose) to measure the mutation rate of a human gene. I have also made some minor discoveries in mathematics".

Haldane was an outstanding science populariser. His popular writing was remarkably lucid. He had the ability to present complicated concepts of science in a simple way without distorting their meaning. His articles, lectures and broadcasts made him one of the best known scientists in the world.

He stressed the social responsibilities of science. Haldane considered it an important duty of a scientist to render science intelligible to ordinary people. He wrote volumes of essays explaining science to the layman. To science communicators Haldane advised: "You are not trying to show off; nor are you aiming at such accuracy that your readers will be able to carry out some operation. You want to interest or even excite them, but not to give them complete information. You must therefore know a very great deal more about your subject than you put on paper. Out of this you must choose the items which will make a coherent story. This does not mean that you must write for an audience of fools. It means that you must certainly be returning from the unfamiliar facts of science to those of everyday experience…When you have done your article, give it to a friend, if possible a fairly ignorant one. Or put it away for six months and see if you still understand it yourself. You will probably find that some of the sentences which seemed simple when you wrote them, now appear very involved. Here are some hints on combing them out …Can you get in a full stop instead of a comma or a semi-colon? If so, get in it. It gives your reader a chance to draw his breath. Can you use an active verb instead of a passive verb or verbal noun?" He believed that the non-scientific audience "…. has a right to know what goes on inside the laboratories, for some of which it pays."

He was a great advocate of the concept of learning by doing. For example once he wrote: "A feeling for numbers can only be acquired by practice. What should the practice be? As an example I want our students to make a census of all the trees in the compounds of number 203 and 204 B.T. Road. They will come up against real difficulties. Is this a tree or bush? Is this one banana plant or a dozen? This is no harder than deciding what is a factory or a household. I estimate that there are rather under 100 betel-nut palms in the compound of No. 203. I may be wrong. I haven't counted them. But I want our boys and girls to get the feel of what a hundred trees look like, and constantly to be asked `How many?', `How often?', How powerful ?' and so on."

He advised his students to highlight the relation between abstract scientific concepts and real-life experience, which he himself did throughout his life. Thus he noted: "You must constantly be returning from the unfamiliar facts of science to those of every day experience."

Haldane's comments on the then existing educational system are still worth considering. He observed: "Our present educational system is unjust to children because the majority of them don't get a fair chance and practically none are taught the truth of science from a human point of view. Science teaching should begin, not with a mythical body in rest or uniform motion, but with the human body. Mine did so begin at the age of three."

"Between different men and women there are immense inborn differences which no amount of education can

J.B.S. Haldane planting a sapling in the gardens of the Indian Statistical Institute (11 March 1958)
Courtesy: J.B.S. Halden : A Tribute (1992), Indian Statistical Institute, Kolkata

overcome. I do not believe that any training could have made Ramsay MacDonald into Jack Hobbs, or vice versa. The ideal society would enable every man and woman to make the best of their inborn possibilities. Hence it must have two characteristics. First, liberty, which would allow people to develop along their individual lines, and not attempt to force all into one mould, however admirable. Second, equality of opportunity which would mean that, as far as is humanly possible, every man and woman would be able to obtain the position in society for which they are best suited by nature. The waste of human beings under our present system is a far worse evil than any merely economic waste."

J.B.S. Haldane was very much concerned with human welfare. Being a liberal in his student days at Oxford, he moved towards left and finally formally joined the Communist Party in 1942. But before this, he wrote *The Marxist Philosophy and the Sciences* (1938) and a preface and notes (1940) for translation of Engles' *Dialectics of Nature* which had been left uncompleted in 1882. It seems Haldane was very much impressed by Engles' views. Thus he wrote, "Had his (Engles) remarks on Darwinism been greatly known, I for one would have been saved a certain amount of muddled thinking." He had become the Chairman of the editorial board of the *Daily Worker* for which he wrote more than 300 articles on scientific themes often mixed with political comments. He also wrote more than 100 articles in left-wing papers such as a the *Reynolds News*. Haldane became socialist because he wanted to see his fellow men and women enjoying the advantages, which he himself enjoyed. His social and political outlook was very much influenced by his rigidly quantitative approach, his immense knowledge of genetics, and his sense of duty. Haldane could not agree with the Communist Party's total lack of skepticism and moved away from it quietly.

J.B.S. Haldane, P.C. Mahalanobis and Niels Bohr (19 January 1960)
Courtesy: J.B.S. Halden : A Tribute (1992), Indian Statistical Institute, Kolkata

In 1957 Haldane moved to India, ostensibly in protest against the Anglo-French invasion of Suez. His decision to move to India was also influenced by the country's facilities for research in genetics and biometry. He joined the Indian Statistical Institute (ISI), Calcutta, at the invitation of P.C. Mahalanobis. At ISI he gave great impetus to the theoretical and applied research by initiating several research projects on quantitative biology. He was also instrumental in formulating (jointly with P.C. Mahalanobis) the academic programmes for Bachelor of Statistics (Honours) course at the Institute.

On his association with the Indian Statistical Institute Haldane observed: "I owe a great deal to this institute but I undoubtedly owe most is the opportunity it has given me of making some important discoveries, namely, the discoveries of a number of younger men than myself, who, I think are in the great tradition of scientific research." He resigned from the Indian Statistical Institute in 1961 and set up a research unit in his residence with the financial assistance from the Council of Scientific and Industrial Research and with the cooperation of his several colleagues. In 1962 he moved to Bhubaneshwar to set-up a Genetics and Biometry Laboratory.

Haldane had a deep appreciation of the Indian culture and he wrote extensively on its relations to modern science. He was deeply engrossed in Indian Philosophy. He had a good knowledge of Sanskrit. In April 1961 he became an Indian citizen. Commenting on why Haldane chose to migrate to India, Asit Kumar Bhattacharyya wrote: "Why did Haldane come to India to settle down permanently? What led him to become an Indian citizen? He had fought for Britain in two world wars and never regretted it. Still he always had a deep aversion for the British establishment and its imperialism—his conversion to communism in the thirties showed it clearly. However, the Lysenko affair after the second world war, disenchanted him. He realized that absolute power wielded by the erstwhile Soviet State under communism inevitably led to abuse of power. He found it imperative to distance himself from it. It was at this juncture that he was drawn to Nehruvian socialism in India. Its rationalist ethic, based on the deep reverence for life bequeathed by the Hindu-Buddhist tradition enshrined by Gandhi, appealed to him. So did the wide tolerance of different life styles and cults in India.

Indeed, he had a profound appreciation of the Indian culture. His popular articles on the subject relating it to developments in modern science that came out regularly in *The Hindu* and later compiled in the volume *Science and Indian Culture* bring it out clearly. The idea of non-attachment to material possessions appealed to this philosophical materialist. To my mind, his definition of *moksha*—the need to go beyond all needs—remains final. That was the need he felt within and finally renounced much of his past, leaving his concern for science and humanity as his legacy."

J.B.S. Haldane's birthday celebration in Amrapali (5 November 1957)
Courtesy: J.B.S. Halden : A Tribute (1992), Indian Statistical Institute, Kolkata

Haldane wrote on varied subjects. He continued to write till he died in 1964. He wrote twenty-four books (including science fiction and stories for children) more than 400 scientific research papers and innumerable popular articles. On his writings Haldane wrote: "Besides scientific books I have written a number of popular works, including a book on children's stories. I consider that a scientist, if he can do, should help to render science intelligible to ordinary people and have done my best to popularise it". Some of his important works are: *Daedalus; or Science and the Future* (1924); *Callinicus: A defense of Chemical warfare* (1925); *The Last Judgment* (1927); *Animal Biology* (1927 with J.S. Huxley); *Possible Worlds and other Essays* (1927); *The Origin of Life in Rationalist Annual* (1929 pp. 3-10); *Science & Ethics* (1928); *Enzymes* (1930); *The Inequality of Man and Other Essay* (1932), *Science and Human Life* (1933); *Fact and Faith* (1934); *The Causes of Evolution* (1933). *Science and the Supernatural* (1935 -–with A Lunn); *My Friend: Mr. Leakey* (1937 – for children); *The Marxist Philosophy and the Sciences* (1938); *Heredity and Politics* (1938); *Science and You* (1939); *Science and Everyday Life* (1940); *Preface and Notes to Dialectics of Nature* (F. Engels, translated and edited by C. Dutta, 1940); *Science in Peace and War* (1940); *New Paths in Genetics* (1941); *Science Advances* (1947); *What is Life* (1947).

For his outstanding contribution Haldane received many recognitions. Haldane was elected a Fellow of the Royal Society in 1932. The Royal Society awarded him its Darwin Medal in 1953" in recognition of his initiation of the modern phase of study of the evolution of living population". The French Government gave him the Legion of Honour in 1937 and the Academia Nazionale dei Lincei gave him the Feltrinelli Prize (1961). The other awards he received were: Weldon Memorial Prize from Oxford University; the Darwin Wallace Medal of the Linnean Society; the Huxley Memorial Medal of the Anthropological Institute and Kimbler Genetics Award of the US National Academy of Sciences. He was President of the Genetical Society (1932-36).

He died on December 1, 1964. As per his will his body was sent to the Rangaraya Medical College, Kakinada. "My body has been used for both purposes during my lifetime", Haldane wrote in his will, "and after my death, whether I continue to exist or not, I shall have no further use for it, and desire that it shall be used by others. Its refrigeration, if this is possible, should be a first charge on my estate".

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Nutmeg

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Nutmeg, spice consisting of the seed of the Myristica fragrans, native to the Moluccas or Spice Islands of Indonesia was the reason for many a colonial wars. Called jathikai in Tamil, Jaiphal in Hindi, the nutmeg tree is a large a tropical evergreen that produces two spices — mace and nutmeg. Nutmeg is the seed kernel inside the fruit and mace is the lacy covering (aril) on the kernel. As a part of the 'ecological imperialism', taken out from its native land and planted in the Caribbean, the spice became so important that it finds a pride of place in the flag of Grenada. Though called 'nut'meg, Nutmeg is not a nut, but the kernel of an apricot-like fruit. Mace is an arillus, a thin leathery tissue between the stone and the pulp. The English word "nutmeg" comes from the Latin "nux", meaning nut, and muscat, meaning musky. Tucking a nutmeg into the left armpit to attract admirers; used as amulets to protect against evil; Nutmeg has long been lauded as possessing or imparting magical powers.

Figure 1: Nutmeg tree

History

Nutmeg is indigenous to the Banda Islands, a tiny archipelago in Eastern Indonesia (Moluccas). However, the main producing countries today are Indonesia (East Indian Nutmeg) and Grenada (West Indian Nutmeg). While Indonesian nutmegs are mainly exported to Europe and Asia, Grenada nutmeg mostly finds its way into the USA.

Nutmeg grown in the East Asia was traded by Arabs to Europe since 6th century. The spice was well received and Chaucer the Poet commended

There springen herbs grate and smalle
The licoris and the setewole
And many a clove gilofre
And nutmemuge [nutmeg] to put in ale
Whether it be moist or stale

The Arabs were the exclusive importers of the spice to Europe until 1512, when Vasco da Gama reached the Moluccas and claimed the islands for Portugal. To preserve their new monopoly, the Portuguese (and from 1602, the Dutch) restricted the trees to the islands of Banda and Amboina. Around 1600s nutmeg was so important as an expensive commercial spice of the Western world that it was subject of Dutch plots to keep prices high and of English and French counterplots to obtain fertile seeds for transplantation. The Dutch were especially cautious, since the part of the fruit used, as a spice, is also the seed, so that anyone with the spice could propagate it. To protect against this, the Dutch bathed the seeds in lime, which would prevent them from growing. They even sent out workers to destroy renegade trees.

Alas; Man proposes but nature disposes; the design of the Dutch in restricting the growing of nutmeg exclusively to their enclave was thwarted by birds! Birds such as pigeons carried the fruit to other islands, before it was harvested, scattering the seeds, much to the chagrin of the Dutch. The Dutch sent out search and destroy crews to control the spread and when there was an abundant harvest, they even burned nutmeg to keep its supply under control. Despite these precautions, the French, led by Pierre Poivre (Peter Piper) smuggled nutmeg seeds and clove seedlings to start a plantation on the island of Mauritius, off the east coast of Africa, near Madagascar. In 1796 the British took over the Moluccas and spread the cultivation to other East Indian islands and then to the Caribbean. Nutmeg is deeply entrenched and was so successful in Grenada that it now calls itself the Nutmeg Island, designing its flag in the green, yellow and red; colours of nutmeg and including a stylized graphic image of nutmeg in one corner.

Main constituents

Nutmeg contains about 10% essential oil, which is mostly composed of terpene hydrocarbons (sabine and pinenes; furthermore camphene, p-cymene, phellandrene, terpinene, limonene, myrcene, together 60 to 90%), terpene derivatives (linalool, geraniol, terpineol, together 5 to 15%) and phenylpropanoids (myristicin, elemicin, safrole, together 2 to 20%). Oil of mace (up to 12% in the spice) contains the same aroma components in slightly different amounts, furthermore traces of eugenol and isoeugenol. Of the latter

Figure 2: Nutmeg and mace

group, myristicin (methoxy-safrole, typically 4%) is unique to Nutmeg and is responsible for its hallucinogenic effect.

Nonetheless, Nutmeg is only weakly hallucinogenic; therefore one needs large dosage typically, one half to one nut for a "trip". Warning: the large dosage may give rise to very unpleasant side-effects caused by other components of nutmeg, which include prolonged extreme nausea and long-term hypersensitivity to nutmeg. The hallucinogenic phenylpropanoids themselves are hepatotoxins and far from harmless for frequent users.

The Plant

A large tropical evergreen growing on average to 12 m and reaching as high as 20 m. The bark is a dark grey-green which produces a yellow juice which oxidizes to red. It is thickly branched with dense foliage with tough, dark green, oval leaves about 10 cm long. The trees are dioecious, meaning it has separate male and female plants, both being required for fertilization. It has small, light yellow bell-shaped flowers. The pale yellow fruit is a drupe, grooved like an apricot, splitting along the groove when ripe to expel the seed. It prefers the rich volcanic soils and hot, humid conditions of the tropics. Nutmegs are propagated by seeds in nursery beds and after about six months they are transplanted to the plantation. It takes five years for the trees to flower, so that the sex can be determined and the males can be thinned out, leaving the optimum situation of one male for every ten females. Full bearing occurs after 15 years and the trees continue to bear fruit for about fifty years. A single mature tree produces up to 2,000 nutmegs per year.

The Spice

The nutmeg seed is encased in a mottled yellow, edible fruit, the approximate size and shape of a small peach. The fruit splits in half to reveal a net-like, bright red covering over the seed. Under the aril is a dark shiny nut-like pit, and inside that is the oval shaped seed, which is the nutmeg. After collection, the aril-enveloped nutmegs are conveyed to curing areas where the mace is removed, flattened out, and dried. The nutmegs are dried gradually in the sun and turned twice daily over a period of six to eight weeks. During this time the nutmeg shrinks away from its hard seed coat until the kernels rattle in their shells when shaken. The shell is then broken with a wooden truncheon and the nutmegs are picked out. Nutmegs are usually sold without the mace or hard shell. They are oval, about 25 mm in length, lightly wrinkled and dark brown on the outside, lighter brown on the inside. Nutmeg whole or ground, is usually labeled as 'East Indian' or 'West Indian' to indicate the source; and often coated with lime to protect against insects and fungus. Nowadays though this practice is giving way to other forms of fumigation.

Mace is the aril -the bright red, lacy covering- of the nutmeg seed shell. The mace is removed from the shell and its broken parts are known as blades.

The history of mace is closely tied to the history of nutmeg for obvious reasons, though the two items have been treated separately. Because the yield of mace is much less than nutmeg's it has had greater value. A pile of fruit large enough to make one hundred pounds of nutmeg produces a single pound of mace. When the Dutch controlled the Moluccas (the Spice Islands), one colonial administrator, reportedly sent orders that the colonists should plant fewer nutmeg trees and more mace trees!

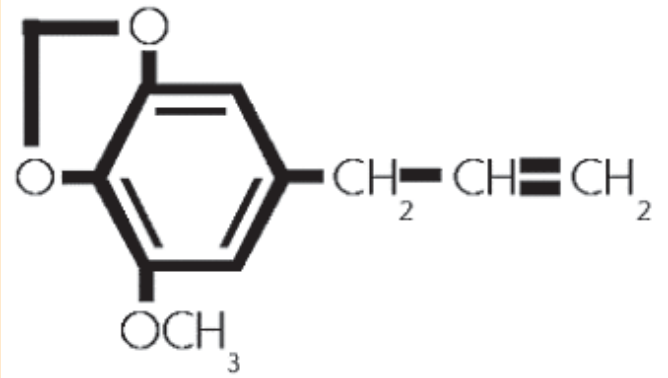

Figure 3: Molecular structure of Myristicin

In its natural state, mace is a bright crimson lace up to 35 mm long, encasing the brown nutmeg in irregular, fleshy lobes. As it is dried, it develops its characteristic aroma but loses its bright red colour. Mace from the West Indies is a yellowish brown colour and with fewer holes than mace from East Indian nutmegs which are more orange when dried.

Both spices are strongly aromatic, resinous and warm in taste. The flavour is described as nutty, warm and slightly sweet. Mace is generally said to have a finer aroma than nutmeg, but the difference is small. Nutmeg quickly loses its fragrace when ground; therefore, the necessary amount should be grated from a whole nut immediately before usage.

Myristicin is a naturally occurring insecticide and acaricide with probable neurotoxic effects on dopaminergic neurons. It is actually glyceryl trimyristate, $C_3H_5(C14H_{27}O_2)_3$, found in spermaceti and many vegetable oils and fats, especially coconut oil and fixed nutmeg (myristica) oil. It is reported to causes brain damage. It is probably converted to an amphetamine metabolite in the liver, therefore it is neuroactive. Intoxication of Myristicin or nutmeg essential oil may be similar to XTC intoxication, mimicing psychosis (e.g. false schizophrenia diagnosis, etc.). However, often the effect is no more than an extremely unpleasant, long-lasting nausea and long-time revulsion to nutmeg.

Culinary uses

Mace is used to flavour milk-based sauces and is widely used in processed meats. It is also added sparingly to delicate soups and sauces with fish or seafood. Pickles or chutneys may be seasoned with mace. Nutmeg is a traditional flavouring for cakes, gingerbreads, biscuits and fruit or milk puddings. Today, nutmeg's popularity has shrunken and the spice is less used, still most in Arab countries, Iran and Northern India, where both nutmeg and mace appear in delicately-flavoured meat dishes.

Attributed Medicinal Properties

Used in small dosages nutmeg can reduce flatulence, aid digestion, improve the appetite and treat diarrhea, vomiting and nausea. Nutmeg's flavour and fragrance come from oil of myristica, containing myristicin, a poisonous narcotic. Myristicin can cause hallucinations, vomiting, epileptic symptoms and large dosages can cause death. These effects will not be induced, however, in amounts usually made use of in culinary.

Other than culinary use, due to its aroma, the essential oil derived from Nutmeg has been used as a natural flavouring extract and as a perfume in the cosmetic industries. In particular, the oil has been used as a flavouring agent, replacing ground nutmeg in order to avoid leaving particles in foods and beverages. For example, it has been used to flavour baked goods, beverages, candies, meats and syrups. The essential oil has found widespread use in the cosmetic industry when a spicy odour is required. For example, it has been employed as a flavour in dental creams in combination with peppermint, methyl salicylate and cloves. Nutmeg butter, a fatty extract with aroma is used as mild external stimulant in ointments, hair lotions and plasters.

Historically, nutmeg has been used as a form of medicine to treat many illnesses ranging from those affecting the nervous system to the digestive system. However in the modern pharmaceuticals, a non-drowsy and alcohol-free cough syrup; impregnated tissue that helps to clear congestion; pain relieving ointment; all have the essential oil of nutmeg as a major ingredient.

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Contd. from page.....36 **(VP News) UNESCO Kalinga....**

popularisation activities being undertaken by him in Pakistan. Following a brief presentation on the activities of VP by Dr. V. B. Kamble. Prof. Hoddbhoy had a look at the popular science software (books, poster, activity kits, CD-ROMs, audio & video cassettes and slide-sets) brought out by VP. He was of the opinion that a good deal of VP's software could be brought out in Urdu for dissemination in Pakistan. Prof. Hoodbhoy already has initiated efforts in this direction.

Prof. Hoodbhoy delivered a popular science lecture on the topic "Possible areas of cooperation in Science and Technology between Pakistan and India" at Technology Bhawan, orgnaised by VP. Prof. V. S. Ramamurthy, Secretary, DST, also attended the talk. Prof. Hoodbhoy said that to begin with both the countries could explore the possibilities of sharing each other's experience by inviting scientists and educationists from different universities and research establishments in respective countries. Prof. Hoodbhoy was of the view that there are many areas, which could be identified for mutual cooperation. Professor V.S. Ramamurthy presented a memento to him a behalf of VP. Prof. Hoodbhoy would be back in India in February-March 2005 on a lecture tour.

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Contd. from page.....35 **(Editorial) The Tragedy....**

the consequences of the tragedy, they are the only ones who remember it," says one of the 500,000 who survived that night but continues to suffer from its effects!

The Bhopal Gas Tragedy lives on – even after two decades. It calls for a concerted effort on the part of the Government and the social groups for the care of those who survived the tragedy and their rehabilitation. How do we ensure that such tragedies will not repeat in future? Strict observance of the safety norms while establishing a potentially hazardous industry, on-going studies on the environmental pollution it causes, and preparedness of people living in the immediate neighbourhood to face up to a possible disaster should it ever take place, would go a long way in avoiding such tragedies. Further, it is imperative that the hazardous plants which are already working in different parts of the country be tested periodically for safety, and people living in the neighbourhood made aware of the plant, its products and the potential threat it poses. It is also advisable to conduct mock-drills and be prepared in case a disaster does take place. Peoples' science groups and science communicators need to have disaster management high on their agenda.

❒ **V. B. Kamble**

Taming The Silent Killer

Roadmap to a healthy blood pressure

❑ Dr. Yatish Agarwal
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The heat is on. With more than 15 per cent adult Indian hearts being pounded constantly by that stealthy killer called high blood pressure, and the disease recording a continuous upswing on community health surveys, it's time to take a look at some simple sensible lifestyle measures that can contain this disturbing trend. Maintaining a check on blood pressure isn't too difficult—provided you have the will! Let's see how:

BE PHYSICALLY ACTIVE : A number of studies have found a link between the physical activity and blood pressure. If your heart enjoys a normal circulation, it's time to put on your sneakers and set out for a walk. A simple 30 to 45 minutes of brisk walking most days of the week is one easy way to lower one's blood pressure. There are bonuses too: regular exercise will push up the heart-protecting high-density lipoproteins (HDL), consume excess calories, lower bad cholesterol and also reduce the risk of diabetes. It can also help in optimisation of body weight.

If you have face any difficulty in keeping up your commitment or feel that time pressure stands in your way, just remember that sedentary individuals with normal blood pressure have a 20- to 50-per cent increased risk of developing high blood pressure in comparison to their more active and fit peers.

LOSE WEIGHT IF YOU'RE OVERWEIGHT : Excess body weight—body mass index (weight in kilograms divided by height in meters, squared) of 27 or more—is correlated with increased blood pressure. Extra pounds are bad enough, but it also matters where those pounds are stored.

If they are around your belly, you are "apple-shaped". If they are around your hips and thighs, you are "pear-shaped". This is a trait that you mostly inherit from your parents, although there is a gender bias too. Men tend to be apple-shaped, and women pear-shaped. If you are apple-shaped, you are at a greater risk for hypertension, diabetes and heart disease.

THE BEST COURSE IS TO LOSE WEIGHT : Eat fewer calories than what you burn. Don't look for fast gains; it's best to lose weight gradually. And once you have achieved the seemingly impossible, make sure that you do not let go. A weight reduction of as little as 4.5 kg reduces blood pressure dramatically in a large number of obese persons with hypertension. This single step may alone suffice to restore the arterial pressure to normal. Even if it doesn't, it may help reduce the dependence on medication by a considerable bit.

A HEALTHIER DIET CAN WORK WONDERS : Many components in the diet have a close connection to your blood pressure. The oldest-known relationship in this regard has been between common salt and blood pressure. The

more recent data suggests that several other macronutrients in our diet, such as potassium, calcium and magnesium, and intake of fibre may also be substantial players in this game. Let's take a closer look:

Limit foods high in salt : Many studies have confirmed that a high-sodium intake is associated with higher blood pressure. The current recommendation is to limit sodium intake to 2,400 milligrams a day.

You must try low-salt (low-sodium) recipes. If you do not mind experimenting simply spare the salt and substitute it with other spices and flavourings, such as pepper, garlic, ginger, onion, or lemon juice.

Steer clear of such flavourings and ingredients, such as monosodium glutamate, soy sauce, and spice mixtures.

They contain large quantities of sodium. Also, avoid processed foods that are high on sodium content. The irresistible pickles, dalmoth, namkeen, bhujiya, papad and wafers are best left out.

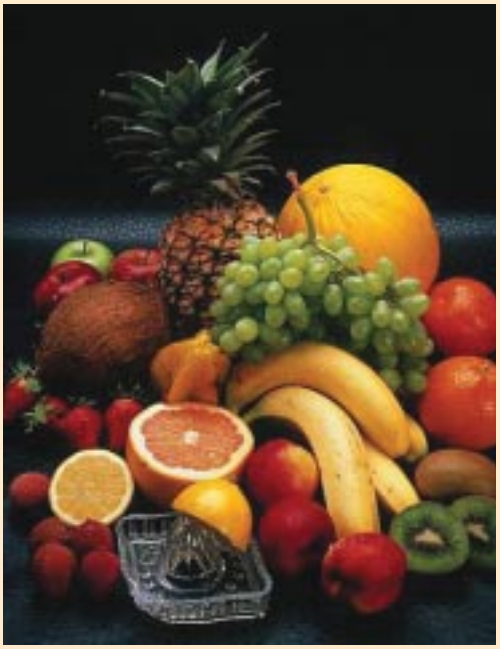
This rationing of salt however only applies to people who are salt-sensitive. Some are not, and they do not need to be salt-thrifty. If you are a hypertensive, check out more about this with your doctor.

Take sufficient potassium: Fresh fruits and vegetables have rich potassium content and may be useful in controlling the blood pressure. Studies suggest that it also aids blood pressure control in people who are hypertensive.

Calcium is healthy : Studies indicate that people who take a low-calcium diet are at a greater risk to develop high blood pressure. It is therefore a good idea to take a diet that has sufficient calcium content. Dairy products, such as milk, yoghurt and cheese are best-known sources of calcium. Other good sources of calcium include custard apple, collard greens, broccoli, soymilk, tofu, salmon, and calcium-fortified orange juice and grain products. In some areas, water is also a good source.

Magnesium may also be useful : A low intake of magnesium may also be associated with an increased risk of developing hypertension. This risk can be cut short by partaking foods which contain whole grains, green leafy vegetables, nuts, and legumes.

RESTRICT ALCOHOL : If you are fond of alcohol, limit your intake to no more than 30 ml of ethanol—for example, a bottle of beer, or 60 ml of whiskey. Any amount in excess increases the risk of developing high blood pressure. Women, because they absorb more ethanol than men, should limit their intake to no more than 15 ml of ethanol a day.



RELAX! Emotional stress can cause an acute rise in blood pressure. Practicing stress management therapies such as relaxation techniques, meditation and yoga can ease you out of stress and therefore prove useful. Try this out!

DON'T HESITATE TO TAKE MEDICATION : If you have borderline hypertension of more than 6-month duration which could not be checked by making lifestyle changes, or you suffer from a moderate hypertension, do not hesitate in taking recourse to medication. A large number of people shy away from anti-hypertensives because they feel they have no symptoms and if they begin taking medicines, they would be dependant on them for life. That's all wrong! By neglecting hypertension, you become a candidate for serious complications, such as a bad heart, stroke and blindness. Medicines can help you overcome these risks and keep you healthy. The idea must be to keep the blood pressure at 120/80 points or lower.

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Best Views of Titan and Tethys from Cassini-Huygens Mission

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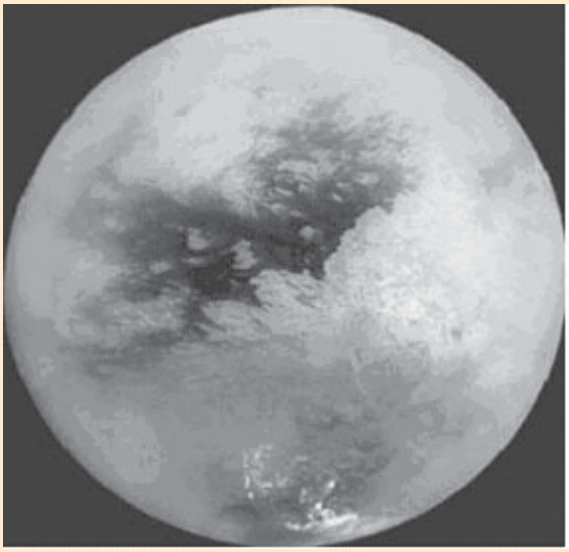
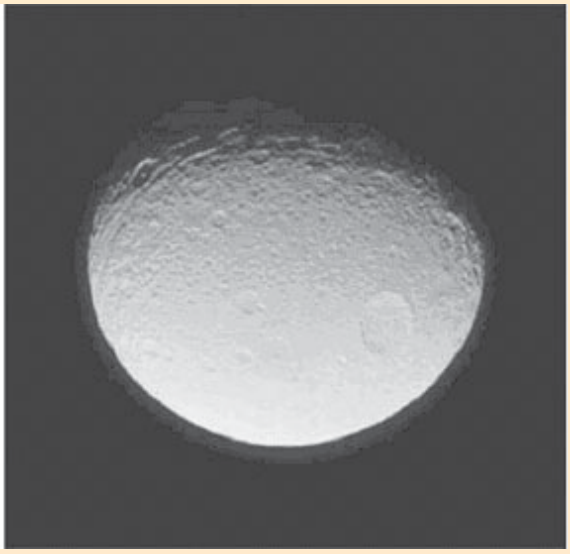
After seven years journey, Cassini spacecraft entered in the orbit near the Saturn on 30 June 2004 and started to explore the new discoveries about the ringed planet and its moons. Recently, Cassini's image team has released two new photographs taken with the narrow angle camera onboard the Cassini spacecraft. These images show two of Saturn's moons in unprecedented details, viz. Titan and Tethys. New views of Titan and Tethys represent the most detailed look at these moons to date and show a sharp contrast between them — one is foggy and one is cratered.



Titan



Tethys

The images that make up the mosaic were processed to reduce effects of the atmosphere and to sharpen surface features. The mosaic of images has been trimmed to show only the illuminated surface and not the atmosphere around the edge of the moon. The Sun was behind Cassini, so nearly the full disc was illuminated.

The picture of fog-enshrouded Titan is actually a mosaic of 9 individual images stitched together that were taken as Cassini approached. Surface features are best seen near the center of the moon. The surface features become fuzzier toward the outside of the image, where the spacecraft is peering through more haze. The brighter region on the right side near the equator is named Xanadu Regio. Scientists are debating what processes may have created the bizarre surface brightness patterns seen there. Titan's lack of obvious craters is a hint of a young surface. However, the exact nature of that activity, whether tectonic, wind-blown, river-related, marine or volcanic, is still unknown.

Two days after the close encounter with icy Titan, Cassini captured the images used in the mosaic of the battered and cratered moon Tethys. The photograph of Tethys is in natural colour. The images to create this mosaic were taken on 28 October 2004, at a distance of about 256,000 kilometers from Tethys. This view shows the trailing hemisphere of Tethys, which is the side opposite the moon's direction of motion in its orbit. Tethys has a density similar to water, so scientists believe the moon is mainly composed of water ice. As seen here, the surface of Tethys has a neutral hue. Three images form this natural color composite. The mosaic reveals a world nearly saturated with craters — many small craters lie on top of older, larger ones, suggesting an ancient surface. Grooves can be seen at the top and along the boundary between day and night. Tethys is known to have a density very close to that of water, indicating that it is likely composed mainly of water ice. Its frozen mysteries await Cassini's planned close flyby in September 2005.

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The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate, Washington, D.C. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at Jet Propulsion Laboratory (JPL). The imaging team is based at the Space Science Institute, Boulder, Colo.

Dreamer and Thinker

An artificial brain

❑ Manu Pratap Singh &
Ashish Chaturvedi

Man has been inquisitive from the very beginning. He has exceptional skills in resolving the mysteries of nature or in familiarising himself with the living organisms, birds, animals, lakes, mountains, oceans, forests or else about the multitude of planets, stars and their groups in the vast expanse of infinite space. Besides brain, man is also endowed with psychological power which gives him a wonderful ability of thinking, contemplating and taking decisions based on the needs of circumstances. These abilities of human beings make them distinct and superior to other living beings. That is precisely the reason why man's wants and needs are also more as compared to other living beings.

Whether a human being is in an awakened state or in slumber, in both the states he can dream, that is what is called his imaginative power. Even a six year old child is able to control a toy run by a remote control without any special effort or can play any such game which involves changing one's game plan according to the demands of the new situation.

Here a question arises whether a machine can also perform this task with equal efficiency and ease? It is a ponderable question whether a machine made of "silicon" metal, which we all call computer is capable of doing all those tasks which represent the intellectual potential of man? If so, then an arrangement has to be made, that enables a machine to display its intelligence so that it is able to perform all the tasks performed by a human being in exactly the same manner. Today, we have succeeded to a large extent in enabling computers to take decisions based on the needs of the circumstances, much like a human being; as, for example, playing of games like chess and other such games involving the on-the spot-decision making power of an individual. This particular area of computer science is called Artificial Intelligence.

For this it is extremely important to create a knowledge base inside a computer. Through the use and manipulation of this knowledge base, creation of new knowledge and exploiting it for taking appropriate decisions may be regarded as the primary aim of artificial Intelligence.

Experimentations on Artificial Intelligence, have brought home the fact that a computer is able to perform a host of jobs involving logical reasoning like playing games, solving some mathematical problems, translating languages and tasks of commonsense resolving; and is able to understand their implications and perform them as efficiently and easily as human being. But, a question that still remains unanswered is whether a computer can also dream? If we feed all the information relating to human beings in the knowledge base of the computer and make it well versed in contemplating, understanding and taking decisions accordingly, then the computer will work like an 'artificial brain'. If man can dream or create with his imaginations a new object, then why is it that an 'artificial brain' formed by the information received from man himself is unable to perform all these tasks. For this, it will first of all be necessary for us to see how a human being thinks on any subject and how he actually dreams. A human brain contains innumerable neurons. These neurons are interconnected to millions of other neurons. Whatever a person sees, hears or senses in the surroundings around him gets stored in the form of signals in the nerves joining the neurons. When man contemplates on any subject, he coordinate the information stored in these nerves to find solutions to these problems and for creation of new ideas. A similar process also helps man to dream. If we are able to provide similar kind of structure and feed this sort of an information to an artificial brain and if it is able to coordinate the same for solving problems and creation of new ideas then the abilities to think, comprehend and dream may also be developed in an artificial brain.

Human-like original thinking ability in a computer is only possible with the help of artificial intelligence through which abilities of contemplating, comprehending of dreaming like humans, and thinking about such objects which don't exist in this material world could be developed. For activation of this process, microprocessors can be simulated like neurons of the brain which might provide capabilities like the human brain. Till now, such an artificial brain has been utilized in manless rocket launchers, unmanned flight of space vehicles etc. The missiles aimed at specific targets used in warfare also work on the same principle. Their programming is done based on artificial intelligence.

The cognitive ability of any artificial brain depends on the capacity, training and correlation modes of the assembly of microprocessors present in it. Thus, it is highly probable in the near future that an artificial human being endowed with an artificial brain, which we call robot, may be able to do innate and inherent tasks that a human being does and may be helpful in diverse fields like Pollutions Control, Flood Control and warfronts. So then let'us all wait for that fateful day when we will be able to fulfill and cherish the dream of an artificial brain capable of taking decisions as dictated by the needs of circumstances and also capable of dreaming like human being.

(The Authors are working at the Institute for computer and Information Science, Khandari, Agra)

Translator : Abhas Mukherjee

Alloys and Composites – An Overview

❑ Rathindra Nath Datta

The Words “Alloys” and “Composites” are very commonly known to us. But if someone is asked what is an alloy and what is a composite – it will be quite difficult to get a proper answer if he or she is not a scientist or a technologist or at least a person having scientific awareness. If such a person is again asked to give an answer to this question just by applying common sense, the best possible answer will be “Both are the mixtures of some materials. The materials made out of metallic mixtures are called alloys and those from nonmetallic substances are composites”. But this is not the correct answer. Let us have a clear idea in the matter.

The mixture of one metal with another metal (s) or non- metal(s) results into formation of alloys. Properties of alloy can be very different form those of the component materials. Only microscopic views can show the structures of alloys and through chemical analyses only, the components of the alloys can be identified properly.

Composites are quite different form alloys. In alloys, the constituents combine or dissolve in each other and no longer identifiable except by chemical analyses. Composite material are made up of two or more different constituent materials which remain distinct from each other within the composites.

Alloys:

When one metal is mixed with another metal or a non-metal, the resulting material often shows properties superior to those of the component elements. The mixture in this case is called Alloy. In other words, alloys are metallic materials, which are obtained by mixing a metal with one or more other elements, which may or not be metals themselves. Properties of alloys can be very different form those of the component metals and materials. Structures and properties of alloy depend on their composition. Heat treatment can improve the properties of alloys to a great extent.

The properties of pure metal can be modified and often improved by combining it with other elements. The materials which result form such combinations are also metallic. Hence, it will be seen that all the alloys will show metallic properties. In majority of the case, the added elements are also metals but not always. For example, steel is an alloy of iron that includes carbon.

If two metals are mixed, the resulting alloy often has properties to those of the component elements. For example, brass (copper 65-73% and zinc 27-35%); bronze (copper 88-96% and tin 12-14%); steel (varying percentage of iron and carbon with other elements) are perhaps the greatest industrially important alloys. Depending on the type of use, percentage of components of any alloy are varied before its fabrication. Making of alloys plays an important role in the filed of modern and hi-tech metallurgy.

There are thousands of alloys with different compositions, which are of two types –ferrous and non-ferrous. Ferrous alloys are those, which contain iron while non-ferrous alloys do not. Steel and cast iron are the two important examples of ferrous alloys. Important example of non- ferrous alloys include those based on copper, aluminum, magnesium, titanium etc. Components of alloys never show their identical entity within it visually. Only microscopic views can show its structures with different components and through chemical analyses only, they can be identified perfectly.

Composites:

Composite materials are made up of two or more different constituent materials which remain “distinct” from each other within the compositions of composites. Composites are quite different from alloys in which the constituents combine or dissolve in each other and no longer identifiable except by chemical analyses. Each of the constitute materials in a composite is chosen for having some specifically desired properties e.g., strength, stiffness, weight, price, electrical nonconductivity, resistance to fire, corrosion by chemicals etc.

In the simplest form, a composite material consists of some type of fibrous reinforcing materials embedded in a different material called matrix, which binds the fibers together. Ultimately, the fibers and matrix act as a unit with some loads carried mainly by the fibres and others by the matrix. The properties of composites stand with the combination of properties of fibers and the matrix which are generally better than the properties of any of its constituents. For example, in a composite made of glass fibers in polyester matrix, the glass fibers are stiff and relatively strong, but they are brittle. The polyester matrix is not very stiff, but it is not brittle. When a composite is formed from these two materials, the resulting material is relatively stiff, strong and not brittle. Similarly, a piece of concrete, reinforced with iron or steel bars, gets a much better strength than as such available in the component ones individually from which it has been fabricated.

An important mechanism for developing strength in composites is crack resistance. Usually, a material fails under a load when it cracks. Initially superficial micro-cracks spread into the body of the specimen prior to its ultimate failure. Composite materials resist the spreading of such cracks and eventual breakdown because the cracks stop when they come to neighboring particle of the fibre embedded in the matrix. A much greater force is thus required for making failure to such a composite body.

(The author is working in Central Glass & Ceramic Research Institute, Kolkata-700032 as Technical Officer in the Information Dissemination Division)

Science popularisation activities in Chattisgarh

Vigyan Prasar has initiated an effort in Chattisgargh to explore possibilities of enhancing science popularization activities. To begin with a series of meetings were organized with between various-stake holders and VP officials. Dr. S. Mahanti, and Dr. T V Venkateswaran of Vigyan Prasar visited. Raipur between 27-29th October 2004 and deliberated with Prof. B.P. Chandra, Vice Chancellor, Ravishankar University & Director General of Chattisgarh Council of S&T (CCST), and Dr. P K Bhat, Executive Secretary, CCST.

A meeting of scriptwriters, artists and people involved in radio programme production in Chattisgarh was organized for identifying themes and source persons for making radio programme. In another meeting with the representatives of NGOs, discussion were held for exploring possible activities that can imitated in the State of Chattisgarh. Discussions were also held with AIR and Doordarshan officials.

As a result of the efforts put in by VP, the broadcast of a radio science serial, 'Biographies of Indian Scientists, produced by VP has commenced on All India Radio, Raipur and Ambikapur stations from 14th November 2004. Also on the pipeline is a workshop for NGOs so as to orient them towards science communication and to undertake formation of VIPNET Science Clubs. Further, production of literature in local tribal languages is also being taken up.

The participants at the workshop in Raipur

Contd. from page 36 (VP News) VP's Participation...

few scientific experiments using a PC. The objective of the demonstration was to dispel the notion that computers in schools can only be used as an upgraded typewriter or television set with Internet facility. During the demonstration, it was shown and explained how students can undertake projects using computer to measure and control physical parameters like temperature, intensity of sound/ light, humidity, pH, voltage, current etc. After the function, discussions were held with officials of Navodaya Vidyalaya Samiti for future activities in Navodaya Vidyalaya schools to be organized by VP.

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Shri Rintu Nath, Sr. Scientific Officer, VP, demonstrating scientific experiments using a PC

Vigyan Prasar participated in the Pune book fair held at Pune from 23-27, November 2004

Recent Devlopments in Science & Technology

Free search engine for academic literature launched

The Internet search engine Google launched a new service that will search academic texts only. Google Scholar searches for key words and phrases in peer-reviewed journal articles, theses, books, technical papers, as well as preprints (articles available on the Internet prior to publication). It does not return any non-academic websites that contain the selected key words.

Google Scholar uses a similar principle to the one used by the main Google search engine. It defines the importance of the references through a combination of the number of times they are cited by other texts, and how important the source is. Google Scholar also tells users how often a reference has been cited by other publications. It then allows the users to also see details of these texts.

As with all Google products, the service will be entirely free. While some of the papers are available online for free, others are not, but are still covered by the Google Scholar search. This is made possible by collaboration between the search engine's creators and academic publishers, who have agreed to let Google Scholar scan the text of their papers.

Source: scidev.net

Physicists Find Strong Evidence for New State of Superconductivity

Researchers have found the clearest evidence yet for a superconducting state that differs from its mirror image. Lead scientist Ying Liu of Penn State University says the results, which come after six years of effort, are "definitive proof" that strontium ruthenate, or SRO, exhibits "odd-parity" superconductivity, sometimes called spin-triplet superconductivity. The results are published in the current issue of *Science.*

Superconductivity occurs when electrons throughout a material form pairs, which then merge into a single quantum-mechanical state that carries electrical current with no resistance. In different materials, the pairs have different properties. In most superconductors, the electron pairs have "even parity," meaning that they look the same in a mirror. In SRO, in contrast, experiments suggest that the pairs form with odd parity at temperatures below one degree Celsius above absolute zero—that is, when the material becomes superconducting. A related state occurs in superfluid ^{3}He, and experts have theorized on the basis of indirect evidence that a handful of other superconductors exhibit this state as well.

Source: Scientific American

Smallest 'test tube' scoops world record

The world's smallest test tube has been created by UK scientists. And the tiny structures could be used to produce materials with unique properties.

A team with members from the University of Oxford and the University of Nottingham created minuscule test tubes which are in fact carbon nanotubes. They then filled each tube with fullerene oxide molecules which were coerced into polymerising in an ordered way as a result of the tube's shape.

"The important thing is that we have a controlled reaction," says David Britz, of the University of Oxford who led the research. He adds that the tubes do not interfere chemically with the polymerisation process. "As far as we can tell it's just an inert container," Britz says.

The researchers believe this process could be used to create materials with novel molecular characteristics or even components for quantum computers.

Source: New Scientist.com

Physicists Unravel Slippery Surface Problem

It's a driver's nightmare: losing control of the car when it over a wet road. This phenomenon seems straight forward, but explaining the loss of breaking power and rubber skidding remains an open problem for physicists. New computer modelling suggests that the tyre rubber forms a seal with the liquid on the road, resulting in a loss of friction.

Tyres travelling over wet road surfaces experience between 20 and 30 percent less friction than tyres do on dry roads. But current models that invoke hydrodynamics and surface adhesion effects do not adequately address this situation. Erio Tosatti of the International Center for Theoretical Physics and his colleagues developed a new hypothesis to explain what happens between wet surfaces and car tyres. In the December issue of *Nature Materials,* they posit that pools of water on a wet street serve to fill in small valleys on the road surface, which in turn prevents parts of the rubber tyre from entering the depressions. The resulting smoother surface causes less deformation of the rubber and less friction.

When the researchers compared their predictions to data collected using tyres on asphalt surfaces, they found them to be in excellent agreement. The results could prove beneficial for tyre manufacturers for new product design.

Source Scientific American.com

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