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Monthly Newsletter of Vigyan Prasar

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VP News

Inside

Popular Science Lectures

Vigyan Prasar has been organising Popular Science Lectures every fortnight for the last six months . The lectures are meant for members of the Department of Science and Technology and Vigyan Prasar but are open to anybody interested as well. The topics generally deal with recent developments in science and technology or contemporary issues affecting the society in a significant manner. Even though the focus is to encourage younger members to deliver talks, but at times well known scientists and science communicators are also invited.

In the month of August 2001 there were two interesting talks. One was by Ms. Vinita Sharma (PSO, Science & Society division, DST) on the 9 August 2001 and the other by an eminent ecologist Dr. A. T. Dudani on the 31 August 2001. Ms. Sharma spoke on "Gender Perspective in Technology Transfer" in which she highlighted that even in certain work areas that are women centered, gadgets and implements are not being developed which may be convenient for use by women. She illustrated this fact with the help of interesting case studies.

Dr. A.T.Dudani's lecture was on "Vehicular Fuels: The Choice Before Us". Once again this was a very thought provoking lecture that focussed on workable choices and solutions before us *vis-à-vis* alternatives to the popular choices in practice. He drew comparisons between the effects of both on the environment and the economy.

The next lecture in this series would be by Dr. Biman Basu, the topic being "Should We Clone Humans?".

Amateur Radio Meet in Delhi

A get-together of the radio amateurs in Delhi was organized by Vigyan Prasar on 12 August, 2001. 35 radio amateurs participated in the get-together. The need for disaster preparedness especially in Delhi was brought out. It was agreed to prepare a list of hams with details of equipment they possess and equipment/accessories, which they can spare at the time of urgency. Vigyan Prasar would maintain this database and also help the coordinating efforts for setting up a disaster communication network. Vigyan Prasar would write to the agencies/NGOs involved in the disaster mitigation programmes and relief operation regarding the willingness of the ham community in Delhi in extending their services in disaster management. It was felt that in an emergency situation the radio amateurs going for such type of operation have been facing the problem of installation of antenna systems. Under such situations, the availability of mobile/roof top telescopic antenna systems would be an advantage.

Radio amateurs of Delhi deliberate. Seen are a few of the participants including Shri Sahruddin, President ARSI (extreme left) and Dr. V. B. Kamble, Acting Director, Vigyan Prasar

The problem of illegal long distance cordless telephones, causing interferences to the various radio communication services was also discussed. Shri Sahruddin, President, Amateur Radio Society of India, apprised the participants about severity of the problem. One

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

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Child Prodigies

Tathagat Avtar Tulsi cleared his class X examination in 1996 at the age of nine, B.Sc. in 1997 at ten, and M.Sc. in 1999 in Physics with a first class at twelve from Patna University. In December 2000, before he turned fourteen, he qualified for the lectureship by clearing the National Eligibility Test conducted by CSIR / UGC. He was a member of a team of young scientists / research scholars which visited Germany last June for an interaction with Physics Nobel Laureates. According to some media reports, it appeared that he was forced to memorise a lot of Physics jargon without knowing their significance. When he returned from his sojourn in Germany, the tag of fake was attached to him by the media. Tathagat has a burning desire - fuelled by his father - to be the youngest Nobel Laureate. His father claims that Tathagat has been a result of his sustained and painstaking experiments – governed by his private science of unproven assumptions!

In any case, there is no doubt that Tathagat's academic achievements are truly remarkable. He may not have been a prodigy he is made out to be, but, he is apparently gifted with intelligence rarely matched by children of his age. A parallel but lesser known case is that of Akrit Pran Jaswal, reported in the newspapers recently. His father, an economist who wanted to study medicine himself, made a decision for Akrit. Akrit was taken to a house in Himachal Pradesh, where he could concentrate on medicine. At seven years of age, he wants to study both neurology and oncology, and find cures for all types of cancer. But, whether it is Tathagat or Akrit, one thing is clear : pushy parents parading their children as prodigies are primarily fulfilling their own needs, and that whatever the potential of the child, he / she is performing on command, as some psychiatrists opine.

As a matter of fact, there have been exceptionally gifted children in the limelight over the years, all tauted as child prodigies. Take the example of Mousumi Biswas of Purulia, West Bengal, who holds the record for clearing the class X examination at the age of eight years and seven months, or eleven year old Aarti Jajjoo who cleared the class XII examination conducted by the Rajasthan State Board. Or, remember the four year old Ajay Puri who has already mastered several computer software programmes? What is common with most of these children? They have someone marketing them, often their own parents, taking advantage of people's fascination with things not commonly seen or heard. In most cases, however, it is the parent's choice which is thrust upon these gifted children, with no consideration to their special needs. Under the circumstances, not only the brittle sensitivity of a child gets hurt, but, the child may not even be able to achieve his / her true potential. One psychiatrist points out that if a child is isolated, the child will do as he / she is taught. If the child sees the same thing every moment of his / her life, the child will retain only that. It is hence imperative that parents are careful to always provide their child with a choice. However, it is a fact that some of the greatest minds in science like Thomas Alva Edison and Albert Einstein had a highly unexceptional childhood. Indeed, they had to toil hard to attain their goals. At the same time, acknowledged child prodigies like Mozart and Beethoven continued to hold forth. It is also true that a large number of child prodigies begin to fade out as they grow and turn into adults. By then, other "ordinary" children catch up with them and then the realisation that you are no better than the rest may prove to be devastating. We do hope that Tathagat and Akrit do not have to face a similar situation. Let these bright children not fade into oblivion.

Finally, let us have a look at our own children. Don't we push our children, sometimes even beyond their capacities - just the way Tathagat or Akrit are being pushed? Our goal may not be a Nobel for the child. It could be to make it to a professional course like engineering or medicine! How often do we allow a choice to our children? Aren't we doing harm than any good to them by trying to determine their lives? At eight or nine, a child must have a childhood. Later, a child must have adolescence. During the process of growth, one must pass through all the stages in a normal way. It is imperative that we refrain from stressing one dimension of personality and overlooking others consciously avoiding any hype or hoopla to get publicity. A child is emotionally unprepared to manage the limelight that falls on him / her. There is a danger a child may start identifying himself / herself from the headlines in the newspapers - and before we realise, a push may turn into a shove! Let us refrain from trying to determine the lives of our children.

❑ *V.B. Kamble*

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G.N. Ramachandran (1922-2001)

A Jewel in the Crown of Indian Science

❑ *Subodh Mahanti*

"If you think you know it, then you do not know it, and if you know that you cannot know it, then you know it". Ramachandran elaborated on this interesting paradox from the ancient Hindu philosophy used to describe the Divine force of the Universe in *Kena Upanishads* in one of his Mathematical Philosophy (MATPHIL) reports.

"...Ramachandran, a remarkable creative individual with an active mind that never relaxed, constantly striving to shed light on one problem or another. His life has been one of varied experience punctuated by ups and downs, success and failure, as is the case with many other famous scientists of our times. Ramachandran suffered serious psychiatric problems during most of his adult life. Fortunately they did not impact on his scientific creativity or productivity; it simply added a new dimension to his life. In spite of all that he put India on the map of molecular biophysics. Clearly Ramachandran belongs in the same league as some of the most famous Indian scientists of this century, for example Sir C.V. Raman, M.N. Saha or S.N. Bose (of Bose-Einstein Statistics fame). Clearly his contributions in the field of biophysics are of the Nobel Prize calibre.

Raghupathy Sarma *in Ramachandran : A Biography of the Famous Indian Biophysicist (1998)*

Gopalasamudram Narayana Ramachandran (or simply GNR to those who knew him well) is one of those few scientists who have made India proud by their research. He had many lucrative assignments for doing research in the advanced western countries but like his mentor, C.V. Raman, he decided to work in India against all odds. He was one of the most brilliant Indian scientists of the 20th century. He made several important discoveries in molecular biophysics, especially in the study of protein structure. The discovery of triple helical structure of collagen was a fundamental advance in the understanding of peptide structure. "The Ramachandran phi-psi plot" or simply the "Ramachandran Plot" has become a standard description of protein structures in text books. When Ramachandran was doing research in biophysics in India the subject was just taking shape in the advanced countries and undoubtedly he was a pioneer in this field. He started two centres of molecular biophysics, first at the University of Madras, Chennai and second at the Indian Institute of Science, Bangalore. Both the centres became internationally recognised centres for research in biophysics. He inspired a large number of young people to take up science, who made significant contribution in various aspects of biophysics. He had a deep interest in philosophy and in classical Indian and western music. He interpreted the philosophical ideas of *Syaad Nyaan*, 'the doctrine of may be', an age-old system in Jain philosophy, in mathematical form which he called 'Boolean Vector Matrix Formulation'. Besides being an accomplished great scientist he was a very good speaker. He could easily present highly complicated concepts in simple words which could be understood even by high school students. These days we hardly find such a scientist particularly in India. By any standards he was a superb teacher. He wrote poems on science, religion, philosophy and the *Upanishads*. He made exemplary donations to charitable institutions.

G.N. Ramachandran
(1922-2001)

Ramachandran was born on October 8, 1922 in Ernakulam near Cochin in Kerala. Ramachandran was the eldest son of G.R. Narayana Iyer and Lakshmi Ammal. At the time of his birth, Cochin was ruled by a Maharajah, who had full autonomy under the British Government. The Maharajah of Cochin was an enlightened ruler, under whose aegis educational and cultural institutes thrived. For higher education Cochin had a college known as the Maharajah's College. His father was a well-known professor of mathematics and he retired as the Principal of Maharajah's College. To quote Ramachandran on his father : "Because of his ability and thoroughness he became the most senior and respected member of the department and retired as the Principal. He had a very sharp mind in mathematics and he used to teach me mathematics. I had been exposed to most of the theories in analytical geometry even before I went to college. When I was in high school, he would bring books on mathematics from the library and give me some challenging theorem to prove every day. He would write equations and ask me to solve them. He was a wizard in mathematics". So no wonder that Ramachandran would develop a deep interest in mathematics since his childhood. We are told that as a school student he used to get a perfect score of 100 on all his mathematics examinations. After the Intermediate Examination, in which he stood first in the entire Madras State, Ramachandran joined the St. Joseph's College in Trichy in 1939. Here he enrolled himself in the BSc (Honours) degree in physics. Among the teachers in St. Joseph's College who stimulated Ramachandran's interest in physics were P.E. Subramaniam and a Jesuit priest, Father Rajam. Ramachandran stood first among all the physics honours students in the entire Madras Presidency.

Ramachandran's father, Narayana Iyer, wanted his son to take up the Indian Civil Service Examination. However, Narayana Iyer failed to persuade his son in doing so. He then

sent Ramachandran to Delhi to take the Indian Railway Engineering Service Examination. But even this was not liked by Ramachandran. It is said that he deliberately performed poorly in the entrance examination to ensure that he was not selected. After this digression Ramachandran joined the Electrical Engineering Department of the Indian Institute of Science, Bangalore, for his MSc degree. However, soon he realised that his interests lay in physics and so he decided to switch over to it. It is very likely that his decision might have been influenced by the fact that at that time the legendary Prof. C.V. Raman was the Director of the Institute as well as the Head of the Department of Physics. Knowing Ramachandran's interest, Prof. Raman requested the head of the Electrical Engineering Department to allow Ramachandran to join the Physics Department. However, when the request was persistently refused, Raman told the Head of the Electrical Engineering Department: "I am admitting Ramachandran into my department as he is a bit too bright to be in yours..." And in this way Ramachandran not only came to the physics department but he eventually became the most distinguished of Raman's students. Ramachandran was deeply influenced by C.V. Raman. The other two scientists who influenced Ramachandran were William Lawrence Bragg (1890-1978) and Linus Carl Pauling (1901-) .

Maharaja's College, Ernakulam, where Ramachandran had his early college education. His father was the Principal and a Professor of Mathematics in the same college

Ramachandra's parents, Professor G.R. Narayana Iyer and Srimathy Laxmi Ammal

To know a little about how he started his research career in the Indian Institute of Science and what he thought about Raman, we quote Ramachandran : "Raman knew that I understood principles of optics. He gave me a very important problem. This problem has been treated earlier by Raleigh-Jeans. Raman gave me Raleigh's paper and a book pertaining to this problem. In one day I was able to write the equation to the problem and work out the solutions. I was horrified to see the solution containing several hyperbolic sines and cosines. I had seen it before and I went to the library and found this volume with several formulas and equations. I was very pleased to find completely corresponding equations and solutions in that book. I wrote a very rigorous proof and showed it to Raman. He was so pleased. He said we should publish the results, this was within one week of my joining Raman. That was a very useful result, which I used twenty years later in studying crystal perfection and the difference between mosaic and perfect crystals."

Prof. C.V. Raman

"Raman recommended me for a scholarship of 60 rupees a month. But the administrators of the Institute said that I had to have a master's degree. Raman said, `Don't worry about it, I will give you a fellowship of 130 rupees a month, you get an associateship degree from the Institute.' There were no courses to take, only research. The degree awarded was called A.I.I.Sc. I was in charge of setting up an X-ray diffraction unit, it was a demountable X-ray tube."

"In the Institute I used to give lectures on crystallography, starting with symmetry. I studied crystallography all by myself. I studied a book on group theory, and it became very useful throughout, particularly in my work on logic. There were very few books on group theory and this book was by Herman Weyl. That changed my whole attitude to science."

"Raman had great respect for students who were better than him in mathematics. He gave me another problem to study the scattering of light by small particles, 3 or 4 times the wavelength of the radiation used."

"Raman had ten to fifteen students working under him. He was a virtuoso, and each student was working on a different problem. Raman tried to bring famous scientists from abroad and he even tried to get a faculty position for Max Born, who was a visiting professor in his department. He wanted Erwin Schrodinger to come to India. This was a time when many scientists were leaving Germany. At that time Raman was the Director of the Institute, but after the first three years, the administrators of the Institute told him: `We don't want you'."

Ramachandran obtained his MSc degree in 1944 from the Madras University. In those days the Indian Institute of Science was not a degree granting institution. Students working there had to submit their theses for a degree from one of the other universities of India. Ramachandran's thesis for his MSc degree contained the result of the theoretical and experimental investigation that he carried out on the propagation of light through optically heterogeneous media. The external examiner of his thesis was Prof. K.S. Krishnan, who was then professor of physics at the University of Allahabad. After obtaining his master degree Ramachandran continued his research work for a doctoral degree under the supervision of Prof. Raman. His doctoral research involved photo-elasticity and thermo-optic behavior of different solids such as diamond, fused quartz, fluorspar and zinc blende. Research

publications resulting from his doctoral work contained some of the earliest applications of X-ray diffractions to the study of variation in perfection of crystals. He also coined the term 'topograph' for such pictures. It should be emphasised that the research paper published carried his name as the single author and did not include Raman's name. These days hardly any research scholar, particularly in India, will be allowed to do the same.


Prof. K.S. Krishnan

Ramachandran obtained his Doctor of Science (DSc) degree in 1947 and decided to go to Cambridge in England to work in the Cavendish Laboratory, where Sir William Lawrence Bragg was the Director. Ramachandran succeeded in getting a prestigious scholarship for higher studies in England provided by the Royal Commissioners of the 1851 Exhibition. As he had already studied X-ray diffraction for his doctoral work in the Indian Institute of Science he easily became a part of the Cavendish group of crystallographers. However, he could not get the opportunity to work directly under Lawrence Bragg. He was assigned to work with Dr. W. A. Wooster.

In Cambridge, Ramachandran decided to work again for a doctoral degree. While explaining why he chose to work for a second doctoral degree in Cambridge, Ramachandran said : "In 1947 I went to Cambridge, England, to work in the Cavendish Laboratory with Dr. Wooster. Dr. Taylor was the head of the crystallography group. I did not attach myself to any College in Cambridge and I was in Fritzwilliam House. I did not like to wear those gowns like the ones the undergraduates were expected to do. I decided to work for a doctoral degree because then there would be something to show for my work; simply getting a few publications does not impress authorities in India. My decision may have definitely helped me in getting my first job in Madras..." Ramachandran considered his stay in Cambridge quite fruitful. He said : "Going and staying for two years in Cambridge did a lot of good things for my research. I attended Dirac's course on Principles of Quantum Mechanics...Most students, in Dirac's class were undergraduates who were second-or-third year physics majors. He used matrices and tensors a lot. Later I used the same symbols in my mathematical treatment of logic. Whatever I tried to design for my experiments could not easily be implemented because there was no suitable engineering programme in Cambridge University." In Cambridge he also met Linus Pauling for the first time. This was a great moment for young Ramachandran, at the time he was 25 years old. For Ramachandran, Pauling was a great hero, who had just discovered the alpha helical structure of polypetides. Moreover Ramachandran's vision of chemistry was shaped by reading Pauling's books and articles. Ramachandran admired Pauling throughout his life. He even dedicated a poem to Pauling. Ramachandran wrote a number of poems on scientific concepts. We quote below two stanzas from the poem that he dedicated to Pauling.


Linus Pauling

Linus Pauling
Is a name to conjure with,
In chemical bonding
And whatever forthwith
Follows for all matter,
Both inanimate and alive
Their nature and character
And how they will behave.
His great alpha helix,
That opened the path
For the solution of structures
Of all biopolymers,
Is a star that will adorn
The firmament of Science,
For it has revealed to biologists
Completely new ways.

In Cambridge, Ramachandran worked in three projects — instrumentation, electronics and the development of a mathematical theory to study diffuse X-ray diffraction, and use it in determining the elastic constants of crystals.


Willem Lawrence Bragg

After finishing his doctoral work in Cambridge he returned to India in June of 1949. He was appointed as Assistant Professor of Physics, in the Department of Physics of the Indian Institute of Science. He was made in charge of the X-ray Diffraction Laboratory that he was instrumental in building as a student. Earlier in the same department he had worked for his DSc degree under the supervision of Prof. C.V. Raman. But this time Raman was not there. He had left the Institute of Science and had started his own institute, Raman Research Institute. The Department of Physics was then headed by Prof. R.S. Krishnan. Ramachandran could attract some very bright young men such C. Radhakrishnan, Gopinath Kartha and Y.T. Thatachary to his research group. The X-ray Diffraction Laboratory set up by Ramachandran grew over the years to home one of the strongest research groups in the physics department.

After about two years in the Indian Institute of Science he shifted to Madras University, one of the three universities that were first set up in India. The other two were Calcutta University and Bombay University. At that time Dr. A. Lakshmanaswamy Mudaliar was the Vice Chancellor of the Madras University. It was Mudaliar, who being influenced by the legendary. Prof.

C.V. Raman, planned to establish post-graduate department in experimental physics at the University of Madras. He requested Prof. Raman to head this newly established department and he offered him financial and administrative autonomy for the development of the proposed department. Raman expressed his inability to head the department; but at the same time he recommended the name of Ramachandran. And this is how Ramachandran joined the Madras University in October of 1952 as the first professor and head of the Department of Physics. At the time, Ramachandran was just 30 years old. The Department of Physics was started with two faculty members, Ramachandran in experimental physics and Alladi Ramakrishnan in theoretical physics. Ramakrishnan was the first to join the department in April, 1952 and in that way he was the founding member of the department. The department was first located in a single room of the main building of the University on the Marina beach in Madras. Ramachandran's laboratory was also located in the Alagappa Chettiar College of Engineering Technology Complex in Guindy, a suburb of Madras.

C.V. Raman & A.L. Mudaliar

Ramachandran's research work carried out at the Madras University brought an unprecedented level of recognition to the University. He organised two international conference in 1963 and 1968 and he was successful in bringing some of the most famous scientists in molecular biology and biophysics to Madras viz. Linus Pauling, Severo Ochoa, Mauris Wilkins, Paul Flory and others.

A view of the main building of the Indian Institute of Science, Bangalore

After the retirement of Mudaliar as Vice Chancellor of the Madras University, it became extremely difficult for Ramachandran to carry out his research work. Mudaliar was succeeded by Sundaravadivelu, who was the Director of Public Education in the State Education Department. It has been reported that Sundaravadivelu had no appreciation for Ramachandran's seminal research contribution and instead of supporting Ramachandran's efforts he created obstacles wherever he could. And so finally Ramachandran resigned from the Madras University in 1970 and came back to the Indian Institute of Science where he had earlier studied and worked for two years after coming back from Cambridge. At the time Professor Satish Dhawan, a well-known space scientist, was the Director of the Institute. Ramachandran was given the responsibility of starting a new department of molecular biophysics. The department which was formally started in 1971 grew into a major centre of structural biology.

Alagappa Chettiar College of Technology in Guindy, Madras where all research laboratories of Science Departments of the Madras University were located. The research laboratories of the Physics Department headed by Ramachandran was also located in this building.

To grasp exactly what Ramachandran did, one should have a certain background in physics and chemistry. Here we do not intend to go into detail about his research work.

Explaining why he was attracted to biomolecular conformation he wrote : "I should perhaps explain why I was attracted to this fascinating subject. This is not merely a personal history, but it has relevance to the reason why researchers in the field of biomolecues turned in the way they did from about the beginning of the 50's. Even in the first year of my pre-doctoral studies in the early 40's with Raman, I was attracted by two books on his shelf, namely "Nature of the Chemical Bond" by Linus Pauling and "Natural and Synthetic High Polymers" by Kurt Meyer. These left a profound impression on me, although at that time I was working mostly on optics and diffraction theory under Prof. Raman. I took crystal chemistry as an extracurricular subject of study and as part of this, crystal structures came in serious consideration. Even at that time, I used to wonder why so few of the materials that formed the building blocks of living systems were fully explored by crystallographic techniques. No doubt, the structures of silk and of cellulose and related materials were reasonably well established, by studies starting right from the 1920s, and finally confirmed by the work of Meyer and his co-workers. Similarly the pioneering studies made by Astbury on Keratin, myosin, etc., had clarified the fact that there exist two types of structures in the fibrous proteins, namely the alpha and beta types."

Ramachandran worked in a number of fields in physics, chemistry and biology. He contributed more than 250 publications and several reviews in well-known international journals.

His first major research contribution was the discovery of the triple helical structure of collagen. Ramachandran was drawn to collagen by J.D. Bernal's remarks that structural proposals for collagen were unsatisfactory. Bernal made these remarks in a casual conversation during his visit to Madras in 1952. Triple helical structure of collagen was first

published in 1955. Ramachandran co-authored this paper with Gopinath Kartha. Their concept of coiled-coil structure proved to be a fundamental advance in the understanding of polypeptide structure. Coiled-Coil structure means each of its three polypeptide chains are arranged in the form of a helix, and then the three chains together form a second helix. However, his structure was criticised by none other than Francis H.C. Crick, who alongwith James D. Watson, unraveled the helical structure of D.N.A, the double helix. Crick and Alexander Rich wrote in the November 1955 issue of *Nature* : "Very recently Ramachandran and Kartha have made an important contribution by proposing a coiled-coil structure of collagen. We believe this idea to be basically correct but the actual structure suggested by them to be wrong." Their structure consists of three polypeptide chains each having approximately three-fold screw axis. In addition the chains slowly wind around each other to form a coiled-coil, thus reproducing the observed non-integer screw axis. The major helix is right-handed, the minor one left-handed. Each chain is held to its neighbors by two sets of systematic hydrogen bonds. The allowed sequence of residues is –G-R-P-G-R-P- etc., were G implies glycine only, R implies any residue, but usually proline or Hydroxyproline . We believe this structure to be wrong for two reasons :

FHC Crick

J.D. Bernal

1. It is stereochemically unsatisfactory. In particular there is a very short C alpha C alpha contact of 3.3 A° (normally 3.6 to 4 A°) and an extremely short C -O contact of 2.6 A° (normally 3.2 to 3.5 A°). In addition, hydrogen bond angles are on the outside limit of the values usually found.
2. It is not compatible with recent work on the amino acid sequence which shows that -gly-pro-hypro- is a common sequence in collagen.

An auditorium in the Central Leather Research Institute in Madras was named "Triple Helix", after the triple helical structure of collagen discovered by Ramachandran and Kartha in 1954.

Twenty-seven students completed their Master of Science (MS) or doctorate (PhD) theses under the supervision of Ramachandran. Many of these students have made significant contributions in the field of biophysics.

The criticism of unacceptably short interatomic contact in the proposed structure of collagen led Ramachandran to devise a general method for describing stereochemical criterion for polypeptide structure and proteins. Ramachandran and his colleagues, V. Sasisekharan and C.Ramakrishnan laid the foundations for the conformational analysis of polypeptide chains. They introduced a two dimensional map what is today known in biochemical literature as the "Ramachandran phi – psi diagram" or simply "Ramachandran plot", which provide a rational basis for describing all stereochemically possible structures of polypeptides. They reduced the `structure space' of protein chains to two-dimensional with dihedral (torsion) angles serving as variables. This had a profound impact on stereo-chemistry and structural biology.

Fourier transforms fascinated Ramachandran. He applied Fourier transforms for developing the theory of Image Reconstruction from shadowgraphs (such as X-Radiographs) using the Convolution Technique. In 1971 Ramachandran alongwith A.V. Lakshminarayana published a seminal research paper on three-dimensional image reconstruction. This marked the beginning of studies on tomographic methods. The idea was adopted for the development of Catscan equipment which has played an important role in the development of medical diagnosis and surgery. In 1976 Ramachandran turned his attention to Fundamental theory and Mathematical philosophy which led to the development of a new Boolean Algebra Vector Matrix Formulation.

Ramachandran had received over a dozen of national and international awards. He was elected a Fellow of the Royal Society of London in 1977. As a part of its Golden Jubilee Celebration, the Indian National Science Academy created five special research professorships and the first one, the Albert Einstein Professorship went to Ramachandran. Surprisingly Ramachandran was not given any Government's civil awards as given to many other scientists. The Central Leather Research Institute in Chennai has named the building housing its auditorium "Triple Helix' after the triple helical structure, of collagen discovered by Ramachandran and Gopinath Kartha in 1954.

A write-up on Ramachandran may not be complete without mentioning about his mental make-up. It was an open secret that he used to receive psychiatric treatment. He used to believe that other people were trying to read his mind and disturb his thought process. However, this did not affect his productivity in scientific research. He was a very highly temperamental man. Nobody knew when he would flare up. But then he would not

hesitate to apologise to the person whom he offended by his behavior. He was a great teacher, but his students were afraid of him. He would hardly come down to an equal level with either his colleagues or his students, which is necessary for frank academic discussion. He had to leave the departments which he himself established and that too under unpleasant circumstances. And after leaving the departments, he hardly kept any interaction with his former colleagues or students.

Ramachandran and his wife, Rajam

For an outsider it would be difficult to say to what extent Ramachandran himself was responsible for all this. Making judgement on such issues is rather difficult. We may recall that Prof. C.V. Raman also left Indian Association for the Cultivation of Science at Calcutta, and the Indian Institute of Science under unpleasant circumstances. What is important to note is that none can undermine Ramachandran's scientific achievements, and that too which he accomplished against all odds.

Ramachandran died on April 7, 2001.

We would like to end this article by quoting few lines from the editorial tribute in *Current Science* by P. Balaram and R. Ramasheshan, both of whom had seen Ramachandran in action and who are themselves accomplished scientists :

"Ramachandran was clearly a "Nobel Class" scientist, to borrow a phrase from Eugene Garfield. But his active career was all too brief by modern day standards. For the last twenty years Ramachandran was not really visible internationally, reminding us of one of the ironies of modern science; achievement alone is not enough, packaging and marketing play an important role. In India, where administrative positions are often considered a mark of scientific success, Ramachandran was essentially an `outsider' to the establishment. We have yet to learn that idiosyncratic personalities often make the most original contribution to our science. Ramachandran did all his work in India, following in the footsteps of his mentor, C.V. Raman.... Like many extraordinary gifted individuals, Ramachandran often had an uneasy relationship with his surroundings. It was not easy for him to come to terms with mediocrity. Elevated to the formidable position of a head of the department at 30, he grew to be isolated from his colleagues, rarely establishing the easy academic relationships that make science a pleasure. But even at the height of his career Ramachandran most enjoyed scientific discussion; unfortunately his surroundings could rarely rise to the levels he demanded... In many ways, when the end came it was indeed time to go. But, Ramachandran has left behind a rich scientific legacy. His achievements will serve as a source of inspiration for generations to come. Ramachandran was undoubtedly one of the most outstanding scientists of post-independence India and truly, a jewel in the crown of India's science".

* *I would like to thank Prof. Santosh K. Kar of Jawaharlal Nehru University for giving me the book, Ramchandran : A Biography of the famous Indian Biophysicist, by Raghupathy Sharma, which has immensely helped me in writing this article. - S. Mohanti*

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SUMMARY OF G.N. RAMACHANDRAN'S CAREER

Gopalasamudram Narayana Ramachandran
Born on October 8, 1922
Father : G.R. Narayana Iyer
Mother : Lakshmi Ammal
Education :

1939-42	BSc(Hons) Physics, St. Joseph's College, Trichy
1942-44	MSc Physics, India Institute. of Science (IISc), Bangalore
1944-47	DSc Physics, IISc (Under the supervision of Prof. C.V. Raman)
1947-49	PhD Crystallography, Cavendish laboratory, University of Cambridge, England

Professional Occupations

1949-52	Assistant Professor of Physics, IISc Bangalore
1952-70	Professor & Head of Deptt. of Physics, University of Madras
1971-78	Professor & Head, Molecular Biophysics Unit, IISc, Bangalore
1978-81	Institute Professor, Mathematical Philosophy, IISc, Banglore
1981-84	CSIR Distinguished Scientist
1984-89	INSA Albert Einstein Professor, Mathematical Philosophy Group, IISc Bangalore

He also held the following assignments : Director, Centre for Advanced Study in Biophysics & Crystallography, University of Madras (1962-70); Jawaharlal Nehru Fellowship (1967-71); Part-time professor of Biophysics, University of Chicago, Chicago.

Fellow of the Indian National Science Academy (FNA)
Fellow of the Royal Society of Arts, London (FRSA)
Fellow of the Royal Society, London (FRS)
Founder Member of the Third World Academy of Sciences
Member, Council of International Union of Pure & applied Biophysics (IVPAB) (1969-74)
Member, various Sub-commissions of the commission on Biochemical Nomenclature of the IUPAC-IUB (1966-79).
Professor Ramachandran was a member of editorial boards of a number of national and international journals.
Membership in professional organisaitons/bodies (all are not included)

Important research Contributions :

His most important contributions were :

- Discovery of the triple helical structure of the connective tissue protein called collagen.
- 'The Ramachandran phi-psi Plot' which has become a standard description of protein structure.
- Development of the theory of image reconstruction from shadawgraphs (such as X-radiograms) using the Convolution Technique.
- Ramachandran received a number of national/international awards.

He died on April 07, 2001.

Cometary Thoughts*

An Indian Context

❑ *Prahlad Chandra Nayak+*

India has a rich heritage of astronomy. There are good many instances of direct and Indirect descriptions of stars and planets in the Vedas, Puranas, Buddhist and Jain scriptures and Samhitas. Particularly, the Tantras, Karanas and Siddhantas deal with motion of celestial objects and events on mathematical basis. The events dealt in are rising and setting of Sun, Moon and Planets, the phases of moon, solar and lunar eclipses, conjunction and transits of planets. But the traditional Indian astronomers seem indifferent in keeping records of particular events occuring during certain time. This may be a reflection of the philosophy of detachment, developed in this land.

Occasional appearance of comet is a common phenomenon in nature. But the works on mathematical astronomy mentioned above do not carry any description of comets or their appearance. However, the Rig Veda, Atharva Veda, Ramayana, Mahabharatam, Matsya Purana, Agni Purana and Bhagabata describe comets as forms of demons and their appearance as bad omen, Besides, Sanskrit and regional literatures also sometimes give description and record of appearance of comets.

The Samhitas are another class of works dealing with astronomy and astrology. The Adbhuta Sagara is also a similar work. These works carry some descriptions of the comets. Parasara, Garga and Narada Samhitas are the earliest sources with such descriptions. But Brihat Samhita of Varahamihira composed in the 6th Century A.D. gives systematic descriptions of comets. In this work, the author refers to the earlier works and then lays down his own views.

The 11th Chapter of the Part I of Brihat Samhita translated by M. Ramakrishna Bhat is entitled 'Ketu Carah', i.e.transist of comets. Introducing the chapter the author says, "I am now explaining in a perspicuous manner the movements of comets, after seeing the works of the Sages Garga and Parasara and of the masters, Asita, Devala and a host of others, bearing on this subject". "Ketu" is the generalised word used for comets here. In the second verse of the chapter the author divides the ketu in to three kinds, i.e., Celestial, Atmospheric and terrestrial. The identification of a Ketu goes as follows:

CHART OF COMETS-I

1 Name	2 Born of	3 No.	4 Form and Description	5 Direction in which they appear	6 with crest, or without crest & description
Kirana	The Sun	25	Resemble pearl necklace, gems or gold	East or West	With crests
Agnisutah	Fire	25	Resemble parrots, fire, Bandhujiva flower, lac or blood	South east	Without crest (according to Garga)
Mrityusutah	Death	25	Rough and dark	South	With crooked crests
Dharasutah	Earth	22	Round like mirror and radiant, resembling water or oil	North-east	——
Sasisutah	Moon	3	Resemble moonlight, silve,r snow, lotus or jasmine	North	——
Brahmadanda	Brahman	1	With three colours	Any direction	With three crests
Caturasiti or Visarpaka (Garga)	Venus	84	Glossy and of the form of large white stars	North or north east.	
Kanaka	Saturn	60	Glossy and lustrous		With two crests
Vikaca	Jupiter	65	Glossy, having a single white star		
Taskara	Mercury	51	Faint, very slender long and white		
Kaumkuma	Mars	60	Resemble blood or fire		Three crests
Tamasakilaka	Rahu	33	Black, resemble crow, truncated body or weapon		
Visvarupa	Fire	120	Surrounded by rows of flames		Without crests (According to Garg)
Aruna	Wind	77	Dark-red without starry form like chowries, rough and with scattered rays	Any direction	
Ganaka	Prajapati	8	Resemble a cluster of stars		
Caturasra	Brahman	204	Triangular or square, with white rays		With crests (according to Garg)
Kanka	Varuna	32	Shine like the Moon and resemble a cluster of bamboos		With two crests
Kabandha	Kala (Death)	96	Resemble truncated bodies, but without stars, yel low or red in colour		
Vidiksutah	Intermediate Quartes	9	With one large, whtie star	In the intermediate directions	

(Varahamihira's Brihat Samhita)

CHART OF COMETS - II

Name	Description, Characteristics etc.	Direction in which it appears
Vasaketu	Big, Glossy, elongated towards the north	West
Asthiketu	Do. Rough	West
Sastraketu	Glossy, Big	East
Kapalaketu	With rays and crest smoky-traversing half and heavens	East on the New Moon day
Raudraketu	With trident-like crest, and flame rough, grey and red-traverses 1/4 sky	In the Dahanavithi in the east
Calaketu	Its crest, one inch raised, is turned to the south; its length increases as it moves northward, touches the great Bear and Pole star Abhijit, travels 1/2 sky and sets in the South	West
Svetaketu	Its crest is turned to the south. Glossy or otherwise	East at midnight to be seen for 7 days
Ka	Has the form of a yoke glossy or otherwise	West to beseen with the previousone for 7 days
Sveta	Rough, black, resembles matted locks, travels 1/3 sky, retreats in anti-clock wise manner	———
Rasmiketu	Has ash-coloured crest	Appears near the star Krittike
Dhruvaketu	Its motion, size, colour & shape are irregular, Sometimes glossy	Travels in three worlds.
Kumudaketu	White like lotus, with its crest stretched in the east.	In the west only for one night
Maniketu	A tiny little star with a straight, white crest	In the west visible once for three hours only.
Jalaketu	Glossy with a crest raised towards the west	West
Bhavaketu	A tiny glossy star, with a crest turned to the right resembling a lion's tail	In the east for one only night
Padmaketu	As white as the fibre of lotus-stalk	In the west only for one night
Avartaketu	Glossy or red with crest turned to the south	In the west at midnight
Samvarta Ketu	Of dreadful appearance, resembles a trident, with a crest that is smoky and coppery in colour - occupies a third of the sky	Appears in the west at sunset

(Varahamihira's Brihat Samhita)

"In places where, despite the absence of fire, there is still the appearance of fire, Ketu's presence is recognised save for the presence of glow worms, phosphoric lights, on graves, game, crystals, marble places and the like".

The atmospheric Ketus are those that are sighted on flag staffs, weapons, buildings, trees, houses and elephants and such other quadrupeds. Ketus appearing amidst the star constellations are described celestial. All other Ketus are called terrestrial. Varahamihira says that Parasara speaks of 101 Ketus, while Garga speaks of 1000 Ketus. But in Narada's view, only one Ketu appears in various forms.

But Varahamihira shares with Garga and gives descriptions of 1000 Comets and then speaks of 18 more. We cite in the two charts of comets according to Varahamihira given by Sri Bhat, as a concise account of various types of comets, and their characteristics.

In literature particularly in Marathi. There is record of appearance of comets in Eknath Bhagabata. In this work, the poet described the appearance of three comets, one of which was a Sikha Ketu with a spectacular tail. It is historically established that the Saint Eknath lived between 1528-1599 A.D. So the Sikha Ketu of Eknatha may be the comet of 1577.

It will not also be out of place to mention here that the Christian Missionary, Father Richard at Pondichery used a telescope to discover a comet in 1689 A.D.

Reference

1. Varahamihira's Brihat Samhita, M. Ramakrishna Bhat, Motilal Banarasidas, Delhi , 1981.
2. NCSTC leaflets on comets: 1996-97

* *This article is in continuation with the earlier two articles on the development of cometary thoughts, published in Dream 2047 (Feb. - March 2001).*

+ *Dr. P.C. Nayak was Deputy Director, Pathani Samanta Planetarium Bhubaneswar. At present he teaches physics at a government college in Orrisa.*

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(VP News contd. from page....1)

of the prominent participants in this get-together was Shri Muktesh Chander, IPS (Deputy Commissioner of Police to the PM's Security) who is also a radio amateur with the call-sign VU2HJZ. The radio amateurs present in the meeting took the opportunity to draw his attention about the long range cordless telephone interference in the amateur radio bands. He stated that the existing laws are sufficient to curb the problem. It was desirable that the Wireless Monitoring Agency may consider a suitable action against these illegal users.

The problem of non-availability of low cost equipment was also discussed in the meeting. The Director, Vigyan Prasar, had expressed his willingness to initiate such an effort provided an individual/agency with expertise and experience came forward with a definite proposal.

It was suggested that Vigyan Prasar may organize a talk on the efforts underway towards fabrication of the Indian Amateur Radio Satellite. It was felt that the monthly ham meets could be made more useful if a talk or lecture/demonstration could be organized on a relevant topic of interest to hams. Shri Atanu Dasgupta, VU2ATN agreed to deliver a talk on "Homebrewing for Novice" in the next get-together.

One of the newcomers to this get-together was Shri Varun, VU3DVS, the youngest (12 years) ham in India. He was felicitated on his achievement.

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Shriram Institute : Meaningful Research with Profit

❑ *Dilip M. Salwi**

Applying scientific research to solve the problems of society is the goal of most of research institute in India today. But there are very few which are able to deliver the goods, bogged down as most of them are by bureaucracy, red-tape and politics. There are still fewer which are able to sustain themselves without Government support. One such is the Shriram Institute for Industrial Research in Delhi which is both independent and self-supporting. At an international workshop organized by the UNIDO and international Science Center, Italy, in 1994, it was even highlighted as a model for developing countries. "All our scientists, "said its dynamic Director, Dr. D.A. Dabholkar, proudly, "earn their salaries through the sponsored research".

Shriram Institute for industrial Research on University Road, Delhi

The Institute was founded in 1950 by the great visionary, Lala Shriram, who envisioned the need for such an institute after India gained independence and was all set for industrialization. He knew that Indian industries would face scientific and technological problems from time to time whose solutions had to be sought in the country itself. His vision has proved right as over the last 51 years, the institute has not only solved the problems of industries but has also produced a large number of commercially viable products and processes, Today, it is growing at the impressive rate of 20 per cent every year ! For a non-profit contract research institute, which does not accept grant from any source, this is highly commendable.

The Institute has conducted research in various specialized fields of interest to industries, such as, polymers and plastics, biomaterials, natural and synthetic fibres, industrial chemicals and waste management. It has also conducted research in some fields which directly concern a common man. To give some recent examples, the institute has developed pressure sensitive adhesive patches for instant repair of tubes and tyres of vehicles. "A company is planning to manufacture these patches, "said the scientist incharge, Dr. D.S. Mehra, "We 're even planning to file an international patent for this technology".

The technology to manufacture low cost sanitary napkins and diapers has also been developed at the institute. Said the scientist incharge Dr. Amita Malik. "This technology can even be adopted by the rural sector. Like the "Lijjat Papad"., it can be produced by rural women and marketed in rural areas at affordable prices". To reduce the damage caused by rodents to huge food stocks, the institute has developed a rodent repellent bitumen jute which can be used as a waterproof flooring for godowns as well as a packaging material. "Presently, we're also developing rodent-repellent telephone and electrical cables, "said the scientist incharge Dr. Pervez.

During the scrapping the ships, considerable oils and paints are released alongwith steel. Whereas the steel is recycled back safely for steel production, the oils and paints cannot be as they contain the extremely harmful Polychlorinated Biphenyls (PCBs). A project is undertaken at the institute under Dr. Neeraj Gupta not only to assess PCBs in various oils but also to destroy them so that they (oils) could be recycle safely. Earlier, the institute had also developed booting material for master slave manipulator of the IGCAR nuclear reactor to Kalpakkam, hot melt pressure sensitive adhesives for surgical applications, synthetic skin for dinosaur models, water-based adhesives for tyre retreading, superabsorbant polymers, blood bags, etc.

Besides, the scientists of the institute have studied air pollution caused by crackers at 30 stations simultaneously in the National Capital for three consecutive Diwalis from 1998 to 2000. "Our recommendation led to the banning of crackers during Diwali," said Dr. Dabholkar. Before the implementation of EURO norms and other directives of the Supreme Court, the institute scientists had studied automobile pollution at 250 stations in the National severe level of pollution, while residential areas showed moderate level of pollution. The institute has also carried out environmental monitoring at Bokaro steel plant and studied quality of ground water in nine states, among other things.

Located adjacent to the green ridge of Delhi University campus, on what was once a quiet and isolated road, called University Road, the institute today consists of four major divisions, namely, Material Science Division, Analytical Science Division, Life Science Division and Quality Assurance Division. Besides, it also contains a Toxicology Laboratory. Analytical Science Division also provides calibration services, non-destructive testing, clinical testing and standardization. It also imparts training to analysts working in industries and helps the latter in setting up quality control laboratories.

Seminars, exhibitions and lectures on various specialized subject of interest to industries are regularly organized by the institute. Its most prestigious lecture is the 'Founder Memorial Lecture' which is delivered by a

One of the well equipped laboratories at the Institute

A pressure sensitive adhesive for instant repair of automobile tubes and tyres undergoing trials at the institute's laboratory

noted scientist or technologist every year. Noted scientists and technologists, namely S. Chandrasekhar, D.S. Kothari, M.S. Swaminathan, C.K.N. Patel, Sam pitroda, etc. have delivered these lectures which were brought out in a volume titled Indian Science Era of Stabilization on the occasion of the Golden Jubilee celebrated by the institute last year. On this occasion, several other programmes were organized at the institute and a book titled Reminiscences and Perspectives was also brought out.

Success achieved by the institute has raised eyebrows in various quarters. It is questioned whether as a model it can also be copied elsewhere. To prove it, the institute set up in 1984 a branch at Bangalore called 'Shriram Applied Radiation Centre,' with the cooperation of the Bhabha Atomic Research Centre, Mumbai. Today, SARC successfully develops, demonstrates and promotes radiation processing technologies and their applications in diverse fields, namely, medicines, foods and polymers.

The institute is also the first in the country to obtain ISO-9001 certificate. Patent filing to protect the commercial interests of sponsors is routinely done in the institute. In fact, it is the first institute in the country to realize the importance of intellectual property rights and has been filing patents regularly since 1980. "The techno-commercial nature of our research should not give any one the impression that our scientists don't do basic research, " said Dr. Dabholkar, " In fact, our scientists are encouraged to maintain baseline data while doing any kind of research and report their worthwile findings in research journals and Ph.D theses". During the last five years, 55 scientists of the institue registered themselves for Ph.D., of which 37 have already been honoured with the degree.

*Dr. Dilip M. Salwi is a popular science righter & lives at M.I.G. Flat no. 132, Pkt- 8B, Sector- 3, Rohini, Delhi 110 085, Phone: 7043696

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IRS-1B Completes 10 years of Remote Sensing Mission

The Indian Remote Sensing satellite, IRS-1B Which was launched on board the Russian Vostok launcher on August 29, 1991, has successfully completed 10 years of operation. The 990 kg satellite carries two cameras – Linear Imaging Self Scanner (LISS-1) with a spatial resolution of 72.5m and a ground swath of 148 km and LISS-IIA and LISS-IIB with a spatial resolution of 36.25 m and a composite ground swath of 146 km. The satellite is placed in a polar sun synchronous orbit at a height of 904 km with a orbital of 103 minutes. The satellite can image the entire earth once in 22 days.

It is significant that IRS-1B has far outlived its design life of three years. The performance of the satellite has been quite excellent, in that there has been no degradation of image quality taken at the beginning of the satellite mission and the imagery obtained even now. The date from this satellite has not only been received and used in India, but also by the USA. In all, the cameras on board IRS-1B have been operated for more than 7000 tines over India in the last 10 years and for more than 4100 times over the USA between April 1994 and February 1999.

IRS-1B gave a valuable experience for designing and launching its follow-on satellites IRS-1C and IRS-1D, considered as the world's best of spatial and spectral resolution.

Even after 10 years of operation, IRS-1B will continue to be used for conducting various experiments including studying the design margins of the various subsystems and to test different modes of operation using the available fuel.

Source : Press Release issued by K. Sasikumar, Public Relations Officer, ISRO Headquarters, Antariksh Bhavan, New BEL Road, Bangalore - 560 094

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Radha Gobinda Chandra

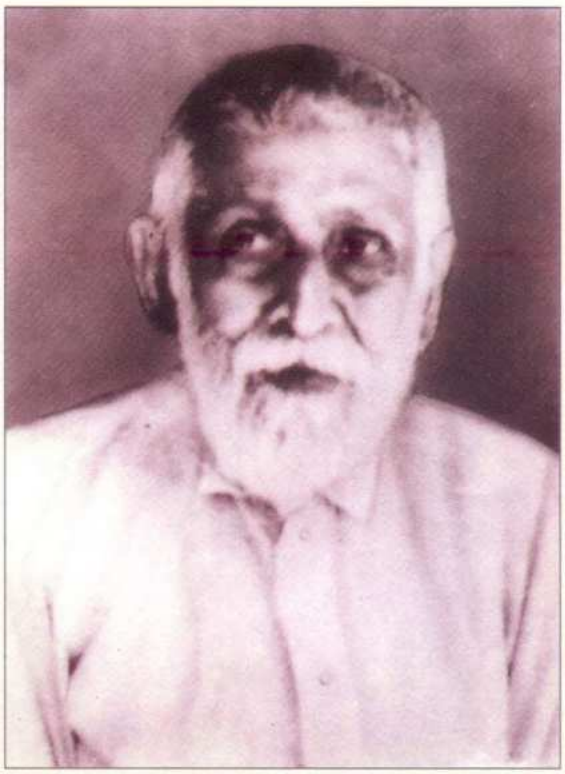
The Villiage Astronomer

❑ *Ranatosh Chakrabarti**

The names of Michael Faraday, Charles Darwin or William Herschel are familiar to many in India, but many of us, even those with interest in astronomy, may not be acquainted with the name of a person who is credited to be the first person in India to have observed a new star-Nova Aquila. 3, on June 7, 1918 in the Aquila constellation. Astronomer Radha Gobinda Chandra was little known in his own country, yet he was well known to astronomers of Europe and America.

Radha Gobinda was a dedicated observer of the stars and planets in the sky. So accurate were his observations that they had been widely acclaimed by the western astronomers.

Radha Gobinda was born in a remote village, called Bagchar in Jessore, now in Bangladesh on July 16, 1878. He spent his early life in the same village. Gorachand and Padmamukhi were his parents. His academic career was brief and simple. What about a University degree, he could not even clear the then entrance examination. He tried thrice but failed. He made his last unsuccessful attempt at the age of 21. However, in his boyhood he became deeply interested in stars and planets after reading a book, Brahmanda Kee Prakanda (How vast is the Universe !) in Bengali, written by Akshoy Kumar Dutta. Thenceforth he used to observe the night sky with the help of a binocular. In the meantime, after his marriage he took a job at the collectorate office of Jessore, with a monthly salary of Rupees fifteen only.



Radha Govinda Chandra (1878-1975)

Radha Govinda might have ended his career as a petty clerk, but his acquaintance to Jagadananda Ray, a science teacher of Shantiniketan (under Rabindranath Tagore), who primarily helped Radha Gobinda in his observational studies of astronomy, connected him to the Western astronomers. He also suggested that Radha Gobinda should procure a telescope.

Alone and self-taught, Radha Gobinda started observations on various astronomical phenomenon like comets, meteors, eclipses and so on. He took much interest in 1910—appearance of Halley's comet. With the help of a simple binocular what he observed was narrated in his valuable book "Dhumketu", in Bengali. Meanwhile Radha Gobinda bought a three-inch refractor from London, at a cost of Rupees 160, from his meagre salary.

With the help of this three-inch telescope, Radha Gobinda's achievement was remarkable. On June 7, 1918 he observed a new bright star in the Aquila constellation which was not in the star map. He wrote about his discovery of this new star to Jagadananda, who suggested him to send immediately a write-up to Harvard Observatory. Thus Radha Gobinda made contact with E.C. Pickering of Harvard.

From whatever is available in his old and dilapidated records, it appears that contemporary western astronomers attached great importance to the observations made by Radha Gobinda. Most of his contributions to foreign observatories were on variable stars. The brightness of many stars is not constant, it varies. The variation periods may range from few hours to several years. The accurate measurements of the variations of brightness of these variables are of much significance for the astronomical findings. His outstanding contributions in the field of variable stars helped to a great extent in the classification of these stars. Adequate references of this can be found in the abstracts of astronomy and

Box –1

A letter of consulate General of France to Radha Gobinda

Consulate General of La Republique France, Calcutta

Dear Sir,

In connection of my letter dated 26.03.28, I have the honour to inform you that the Ministry of Education has decided to confer upon you the distinction of "Officer d' Academic".

You will find herein enclosed the Brevet and the Badge of this distinction for which I shall be obliged to receive a receipt.

I am pleased to convey to you my best congratulations for the token that has been granted to you in recognition of your valuable services to the observatory of Lyon.

Mr. R.G. Chandra, Bagchar, Jessore

Box – II

A letter of Director of Harvard College Observatory to Radha Gobinda

HARVARD COLLEGE OBSERVATORY
Cambridge 38, Massachusetts, December 12,1950

Dear Shri Chandra

The American Association of Variable Star Observers, with headquarters at the Harvard Observatory, is honoured to salute you as one of its important contributors from abroad. On the occasion of the thirty-ninth annual meeting, we of the Association and of the Harvard Ovservatory joined in recognizing that astronomical work such as you accomplish is a significant contribution in the cause of international good will and cooperation. From seventeen different countries come the systematic measures of the sun and the variable stars that are of supra-national interest to all of us; we are, in a sense, a stellar United Nations.

We wish you continued success in your work during this fortieth year of the Association, and hope that you realize, and that your tell others, that in this modest enterprise of ours we are providing an example of cooperation. The members of the AAVSO are showing how people the world over can substitute for strife and suspicion this intellectual and technical collaboration, and how we can build the scientific friendships that are essential for a continued civilization.

President
American Association of Variable, Star Observers

Director
Harvard College Observatory

astrophysics and also in the journals of many astronomical observatories.

The astronomers of America and Europe were the constant source of inspiration for the painstaking work made by Radha Gobinda, it is evident from the old records. One

The Telescope from Harvard is now at Kavalur-named as Bappu-Chandra Telescope

Box –III

Radha Gobinda's comments on Rahu : a communication to British Astronomical Association

RAHU – There have been several communications to the Association regarding "Rahu", but so far there has been no correct explanation. Hindoo astronomy may be divided into two sections, mythological and mathematical. In the Indian Epics there are many narratives and fables relating to celestial bodies, and these may be taken to constitute the first of these sections. As well as Rahu there is another term Ketu, and there are with these, planets called "nabagraham" viz. Rabi, the sun; Shome, the moon; Kuja; the mars; Budha; the mercury; Guru, the jupiter; Shitau, the venus; Manda; the saturn; Rahu being the ascending node and Ketu the descending node. These are regarded as powerful deities having influence on the affairs of humanity, and they are also used in Indian astrology.

In the Sreemat Bhagabat Puran, Part-8, Chapter-9, Shloks 21-23, it is narrated that Rahu was a Danab (demon), the son of Shinghika, the wife of Biprachitti. The Danabs were the antiparty of the Devs, having no right to drink the "Amrita", a divine liquor which made the Devs immortal. Rahu made an attempt in disguise to drink the Amrita along with the Devs, but this was pointed out by Surya (the Sun) and Chandra (the Moon). On this, Hari, the Prince of the Devs, cut off the head of Danab Rahu, but as a small quantity of the Amrita entered the throat his head became immortal and was placed in the sky as a "Graha". The Sun and Moon heaving betrayed his attempt to drink the Amrita, Rahu developed a hatred for them which has resulted in his endeavouring to devour them whenever he gets an opportunity: this he cannot do because he has only a head and no body.

This is the story of Rahu from the epic and the cause of eclipses; but Indian astronomers have known the real causes from time immemorial.

As Rahu's body was not immortal it was thrown away, but at a later date Indian astronomers and astrologers placed the body as Ketu, so from Rahu in the Zodiac : 80^0

In Hindoo mathematical astronomy Rahu and Ketu the ascending and descending nodes of the planet's orbits resemble the Greek Dragon's Head and Tail and are the two points where eclipses occur, being referred to as Patha in the Surja Shidhanta—R.G. Chandra

letter addressed to him from Harvard College Observatory on January 17, 1920 states :

"The observations which you contributed are very good and we hope you will continue to send them every month". Similarly, a letter from the British Astronomical Association, dated December 27, 1923 says : " Your excellent observations and remarks are always much valued by this section (variable star section) and I hope we may continue to enjoy your hearty enthusiastic support".

Few years back in reply to a letter from the author, the Director of the American Association of Variable Star Observers (AAVSO) wrote : "Mr. Chandra submitted thousands of variable star observations. His report forms fill two huge folders in our permanent files. His observations are in the permanent records, also of each star he observed. He was a very valued member of the AAVSO".

Radha Gobinda with his telescopes-the bigger one is from Haravard Observatory.

To help Radha Gobinda in his observations, Harvard Observatory presented him with a 6/1/4 inch telescope in the year 1926, which was sent to his native village directly from the United States. After a gap of two yeas, the Education Department of the France Government honoured him by conferring on him the title "Officer d 'Academic Republic Francaise". The title and a medal were forwarded to him by the Consulate General of France in Calcutta on August 1, 1928 (See box-I). In recognition of his scientific contributions, the British Astronomical Association, the Harvard College Observatory, American Meteor Society, American Museum of Natural History, Lyon Observatory of France and some others offered him their memberships.

A letter from the Harvard to Radha Gobinda, which should be considered as good as a certificate is placed here. The letter dated December 12, 1950, Harlow Shapely, Director of Harvard Observatory, wrote - "The American Association of variable Star Observers, with headquarter at the Harvard observatory, is honoured to salute you as one of the important contributors from aborad" (Box-II)

The other field in which Radha Gobinda made substantial contribution is the Calendar Reformation Movement on which he published a good number of valuable articles. He was closely associated with N.C. Lahiri, Meghnad Saha and other noted scientists who took interest in calendar reforms. But the details of the contribution is not widely known. Radha Govinda's comments on Rahu are reproduced in Box-III.

Radha Gobinda spent most of his life in a remote village of Jessore (Bangladesh). After independence he with his family migrated to India from erstwhile East Pakistan, But his astronomical observations were disturbed. In the later years of life, when he could no longer take observations, he handed over the telescope presented to him by Harvard College Observatory to the late M.K.V. Bappu, the then Director of the Indian Institute of Astrophysics, Bangalore. It is still kept there as a tribute to his dedicated work.

Radha Gobinda Chandra died on April 3, 1975 at the ripe old age of 97. His scientific articles, written in Bengali, are scattered in various journals and magazines. His valuable books on astronomy are still in manuscript form. No serious attempt has so far been made to explore the complete works of this dedicated Indian village astronomer, who won international acclaim. A man without any formal training, university degree or a modern equipped laboratory, Radha Gobinda had shown by his own life's example how work done patiently with perseverance and devotion would be rewarding.

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Letters to the Editor

During a discussion, two interesting questions attracted my attention most. One was reagrding the title-Emergence of Modern Science. It was asked, "The development of the modern scientific method with emphasis on experiments to verify the theory, and of the flowering of scientific outlook due to the work of Scientist like Gilbert, Harvey and Galileo, took place in the latter half of the 16th century onwards. This period is usually tagged with the emergence of modern science. The period 1895-1905 is usually referred with the emergence of modern physics. I told that it was a matter of details. Though physicists attach importance to modern physics, other important developments (e.g. birth of biochemistry, rediscovery of Mendel's laws) took place during the same period.

Another query was reagrding the actual period- 1895 to 1905. The total no. of years is 11. How to reconcile it to a decade? I had an easier way here. I told that though the year is reckoned from 1895, the event of the discovery of X-rays took place in November of that year. The theoretical aspect of this significant period showed up remarkably well with theory of relativity before June 1905. The total period is hence just a decade and no more !

**The term emergence of modern Science is used only to distinguish the period prior to 1895, which could be termed as the "classical" era.*

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I have come acros your monthly magazine 'Dream- 2047 in some library at Kolkata. It was very interesting. It is a real science magazine, the information which was given in that edition was excellent.

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Recent developments in Science & Technology

First Evidence of a Human Response to Pheromones

Pheromones are volatile chemical substances secreted to produce a response by others of the same species, particularly by insects. But now scientists have found evidence of a response to pheromones in the human brain. According to , a study published in the August 30 issue of the journal "Neuron", scientists at Huddinge University Hospital in Sweden have detected a pheromone effects in humans.

Ivanka Savic and his colleagues used positron emission topography to scan the brain of 12 men and 12 women and found that thease synthetic compounds are related to the hormones estrogen and testosterone. The estrogen compound caused the men to experience increase blood flow to the hypothalamus, the region of the brain rodents use for pheromone detection, but had no effect on the women. The testosterone-related compound, meanwhile caused heightened blood flow in the women, but not the men.

Above specific reactions in brain gave strong support to the theory that human can detect pheromenal signal, although the exact pathway for detection is as yet unknown.

Source: Scientific American, August 2001

Artificial Heart Transplant

On 3 rd July 2001 surgeons at Louisville successfully implanted the first artificial heart in human body. This heart is named AbiCor and has been developed by Abiomed Lab. This new revolutionary step gave the relief to millions of people who suffer from heart disease.

AbiCor is a battery powered artificial heart and no wires or tubes passing through the skin. This has a battery of the size of VCR tape. Through an external coil on the patients midriff , battery gives power a surgically implant system that feed electricity to heart. To recharge the battery the patients has to simply plug it into AC outlet.

The research have been going on for developing artificial heart since 1953 when John Gibbn developed a heart machine. In 1982 Jarvik –7 heart developed. This artificial heart needed 350 pound compressor and consoles and it survived only 112 days when it was testing in a patient . The AbiCor is the latest artificial heart which had successfully been tested on calves. The human heart beats 35 billion times a year .Now question arises that could this new heart produce more number of beats without any maintenance?

Source: Scientific American, August 2001

Computer helps police face facts:

At British Association for the Advancement of Science, Glasgow, on September 2001, it has been told by the Researcher that face-morphing computer programs could transform how police develop pictures of crime suspects. This program could solve two of the main problems in composing pictures of suspects ; how to improve a faulty image when the witness cannot articulate what is wrong with it, and how to handle description from several eyewitness at once.

Peter Hancock, who has been developing a face averaging programme with colleagues at the university of sterling UK says "If several people see the same crime it would be good if all contribute to a picture. This program blends different suspect by mapping equivalent points on the faces and averaging their locations. "Each individual face captures some aspects of the criminal. Hancock told the Glasgow meeting .if you average them out, you get something closer to commonality.

To test program Hancock asked to come up with 'eyewitness' description of celebrities. Program show six possibilities and it is found that 90% of the persons who looked at an averaged picture identified it correctly. When you have bunch of pictures of a criminal you don't know which is the best and which is worst. So if you have something that routinely ranks best picture, that is good.

Hancock has also been working on an evolutionary program that produce 20 different pictures from a witness description and then ask the witness to choose six of them which looks nearest to the look most the target. Hancock also says that this programme doesn't work as well as the averging one.

Source :"Nature" News ,Sept 2001

Carbon monoxide can be good for you

Although it has long been thought that carbon monoxide is a poisonous deadly gas, But scientists are now discovering that Carbon monoxide (CO) could actually be therapeutic to the body at the right concentration under specific condition.

CO is synthesized by an enzyme called Heme Oxygenase type 1 (HO-1) in response to conditions of low oxygen. David Pinsky and colleagues at Columbia university, New York discovered that mice lacking the gene for this enzyme whose lungs have been starved of blood and oxygen were able to recover by inhaling the gas. They further discovered that CO activates a system involving soluble granulate which in turn suppress plasminogen activator inhibitor - 1 (PAI-1). This allows the fibrinolybic cascade of enzymes which break down blood clots to become activated. Thus with safe doses, CO can save tissue that would otherwise die

Source:Nature medicine, August 2001

Compiled by : Kapil Tripathi

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