



Vigyan Prasar

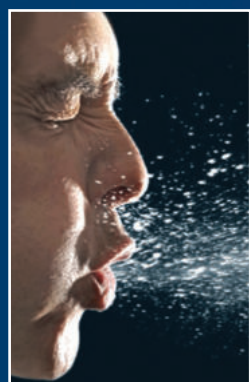
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Keeping Swine Flu at Bay

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Total Solar Eclipse (22 July 2009)

Photographs taken by
Vigyan Prasar
at a height of 25,000 ft from
Indian Air Force Aircraft AN-32



The Spectacle of the Century

Tourists, astronomers and the local people across a swath of Asia turned their eyes to the heavens on the morning of 22 July 2009 as the longest total solar eclipse of the 21st century got under way. The viewing for many was marred by heavy monsoon clouds and rain, but the drama of the total solar eclipse as the darkness swept over a narrow path across the continent was unmistakable. The phenomenon began at dawn over the Gulf of Khambhat, the western coast of India, passing over Surat, Indore, Bhopal, Varanasi, Patna, Siliguri, and then moving over east across Nepal, Bangladesh, Bhutan, Burma, along China's Yangtze River valley, and Japan before moving over the Pacific Ocean. In Japan's Ryuku islands, the totality lasted 6 minutes and 39 seconds, the longest in the century.

It was unfortunate that the Sun was clouded out in many parts of western, central, northern, and the north-eastern regions of India through which the path of totality passed, disappointing thousands who had gathered to observe the greatest celestial drama of the century. The partial phase was observed from many parts of the country lying outside the path of totality. Undoubtedly, the enthusiasm amongst students and the general public to observe the rare phenomenon was extraordinary, far exceeding the previous occasions of 1995 and 1999. Almost all observatories, science centres, planetaria, educational institutions, and even individuals made arrangements to help people watch the great spectacle.

What was most remarkable was the phenomenal number of people flocking at various places along the path of totality - scientists, students and the general public, especially in India and China. In India, the event was witnessed by millions directly using safe solar viewers. Everywhere people came out in droves! Taregna, a dusty village near Patna, found itself on the centre-stage due to the fact that it experienced totality for nearly four minutes, and also because the weather was predicted to be relatively cloud-free on the eclipse day. Vigyan Prasar (VP) organised camps at Indore, Bhopal, Patna and Dibrugarh. The weather, however, did not cooperate with the eclipse enthusiasts at these and many other places to allow them an experience of a lifetime - except the darkness during the totality! Only a few places, in particular, Varanasi and Robertsgunj, could witness the totality in all its glory. Those unable to watch directly due to clouds or geography took advantage of broadcasts on television and the Internet. A private airline even operated a chartered flight at 41,000 feet (12,500 metres) above the ground, flying over Gaya in Bihar.

Though eclipses have always remained important occasions for ages, easy flow of information on all aspects of an eclipse through newspapers, television and the internet has made more people aware of it. This probably is one reason why nobody wanted to miss this opportunity. In 1995, the event was brought to our homes by Doordarshan, while this year many news channels were vying with each other to bring the eclipse live from over 100 places along the path of totality.

Many scientific expeditions from different parts of the world, including India travelled to Eastern China, close to Shanghai, where weather prospects were much better than in India and the duration of totality was over five minutes. The experiments carried out during the totality generally include taking observations of the solar corona in specific wavelengths and in white light; and obtaining spectra in different wavelengths to understand the structure and various processes that take place in the corona. There were expeditions sent to China by Indian Institute of Astrophysics (Bangalore), Udaipur Solar Observatory, and the Aryabhata Institute for Observational Sciences (Nainital).

Realising that the observations of the eclipse from ground could be a tricky affair in view of the monsoon and the low elevation of the Sun at the time of eclipse, VP proposed to collaborate with Indian Air Force (IAF) to fly two scientific missions - one on board an AN-32 transport aircraft flying at a height of about 25,000 feet (7,600 metres), carrying scientists and experiments; and the other on board a Mirage 2000 fighter aircraft flying at a height of about 40,000 feet (12,000 metres). Indeed, during the total solar eclipses of 1995 and 1999 also, VP had coordinated similar missions with IAF. It may be of interest to note that in 1995, a MiG 25 aircraft of IAF took pictures of the solar corona up to a distance of 12 solar radii from a height of 80,000 feet (24,400 metres) above the ground level. Till date, Group Captain S. Mukerji (now Air Marshal) and

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Rita Levi-Montalcini

Discoverer of Nerve Growth Factor

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“Levi-Montalcini’s groundbreaking research on neuro-embryonic development revealed an important clue to the mystery of cellular growth and differentiation.”

Katherine Cullen in *“Pioneers in Science: Biology – the People Behind the Science”*, Viva Books Private Limited, New Delhi, 2007.

“The early studies of Levi-Montalcini represent a key advance in the understanding of mechanisms controlling embryological tissue development. Indeed, in the 1980s it was established that the nerve growth factor discovered by Levi-Montalcini influences the growth of nerves in the brain and spinal cord. The value of her work earned her the 1986 Nobel Prize for physiology or medicine, which she shared with Stanley Cohen.”

A Dictionary of Scientists, Oxford University Press, 1999.

“Montalcini’s training was difficult; her Italian-Jewish family long opposed her entry to medical school, and when she graduated the Second World War began and as a non-Aryan she had to go into hiding. Her early research, with her medical school instructor G. Levi on the neuro-embryology of the chick was done in her bedroom...”

The Cambridge Dictionary of Scientists, Cambridge University Press, 2002.



Rita Levi-Montalcini

would interfere with the duties of a wife and mother. He therefore decided that three of us—Anna, Paola and I—would not engage in studies which open the way to a professional career and that we not enroll in the university.”

Levi-Montalcini was enrolled a girls’ finishing school, a less academically rigorous school. This is because, as stated above, her father did not want his daughter to take up a professional career. However, after seeing her former governess die of a cancer, Levi-Montalcini decided to become a physician. She convinced her father in favour of her decision. She enrolled in the Medical School of the Turin University in 1930, where she was taught by the famous histologist Giuseppe Levi.

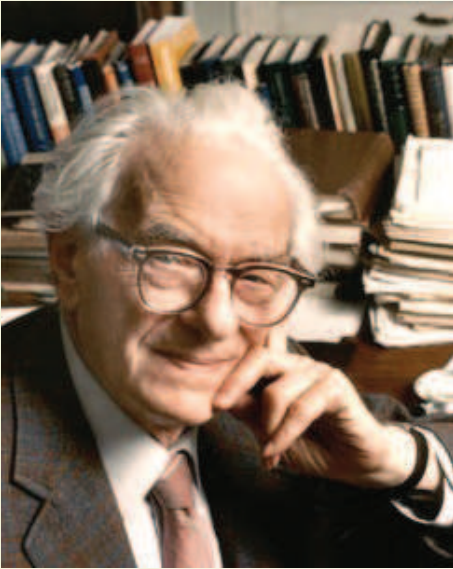
In 1936, she graduated “with highest honour” or “with highest praise” (*summa cum laude*) from the University of Turin Medical School in Medicine and Surgery. In 1940, she completed her specialised degree in neurology and psychiatry. She was uncertain whether she should devote herself fully to the medical profession or pursue basic research in neurology. But she had to face an altogether different kind of problem. By the time she completed her university education the Second World War had begun and a fascist regime under the leadership of Benito Mussolini (1883-1945) was in control of Italy. Benito Mussolini’s 1938 Manifesto of Race and the subsequent introduction of laws barred non-Aryans including Jews from

The discovery of nerve growth factor represents an important milestone in the process that led to modern cell biology. NGF was the first growth factor to be identified for its action on the morphological differentiation of neural-crest derived nerve cells. Subsequently its effect on neuronal cells of the peripheral and central nervous system and on several known neuronal cells was also determined. She along with her colleague Stanley Cohen received the 1986 Nobel Prize in Physiology or Medicine “for their discovery of growth factors.”

NGF is a member of neurotrophin family of proteins. While “nerve growth factor” refers to a single factor, “nerve growth factors” refers to a family of factors. NGF is a smaller secreted protein, which is critical for the survival and maintenance of particular neurons or nerve cells. After NGF is secreted it reaches out to specific receptors or molecules located on the surface of cells that recognise and bind NGF. Not all cells have the specific receptors for NGF. Those cells, which have such receptors, are called target cells. Once NGF is attached to its receptor, it triggers a series of biochemical changes within the cell leading to activation of

proteins that induce the nerve cells to grow axons.

Levi-Montalcini was born 22 April 1909 in Turin, Italy, to an intellectual Sephardic Jewish family. Together with her twin sister Paola, she was the youngest of four children of her parents. The children grew up in a loving but traditional family. Her father Adamo Levi was an electrical engineer and gifted mathematician. Her mother Adele Montalcini was a talented painter. Her older brother Gino became one of the most well-known Italian architects and a professor at the University of Turin. However, her father, being a conservative, was not in favour of his daughters taking a professional career. In her autobiographical note written for the Nobel Foundation Levi-Montalcini wrote: “The four of us enjoyed a most wonderful family atmosphere, filled with love and reciprocal devotion. Both parents were highly cultured and instilled in us their high appreciation of intellectual pursuit. It was, however, a typical Victorian style of life, all decisions being taken by the head of the family, the husband and father. He loved us dearly and had a great respect for women, but he believed that a professional career



Viktor Hamburger



Stanley Cohen

academic and professional careers. Levi-Montalcini was a Jew and so neither she could work in a university nor practise medicine. But Levi-Montalcini was determined to continue her studies of the development of chick embryos. She set up a laboratory in her bedroom to continue her research on neurogenesis. The equipment of her home-laboratory consisted of a small binocular microscope, a stereomicroscope for operating on embryos and an incubator made by her brother. For dissecting she used watchmaker's forceps, tiny ophthalmologic scissors, and scalpels and spatulas made out of sewing needles. In her research effort she was joined by her teacher Giuseppe Levi. Levi being a Jew was also removed from his university job by the fascist regime.

In 1941, when the Allied forces started bombing the city of Turin heavily, Levi-Montalcini with her family moved to a country cottage in the Piedmont region. She built a makeshift laboratory in the family's country cottage. The Germans invaded Italy in the fall of 1943 and the family had to move again. This time they went to Florence and lived there underground till the end of the war. Italy was finally freed from the Germans in August 1944 by the Allied forces. This gave Levi-Montalcini an opportunity to work as a doctor among refugees in Florence. She worked in a refugee camp where she treated epidemics of infectious diseases and abdominal typhus.

After the end of the war in 1945, Levi-Montalcini started working as research

assistant at Levi's laboratory at the University of Turin. In September 1947 she accepted a research position offered by Viktor Hamburger, Head of the Zoology Department of the Washington University in St. Louis, USA. She was to work on a project on the regulation of chick embryonic development. In 1951, she became an Associate Professor of Zoology, and then in 1958 she became a full Professor. She retired as Professor Emeritus of Biology in 1977.

Levi-Montalcini demonstrated that a specific factor was needed for normal nerve cell growth and differentiation. She diligently studied microscope slides of sections taken from various stages of development to count new nerve cells and to identify their locations. By doing so she was able to reconstruct the process of nerve cell growth and differentiation step by step. By 1947 she realised how nerve cells migrate to predetermined locations and how certain cells are destroyed by the embryonic immune system. She hypothesised that a factor or hormone produced in the limbs acted as a feedback signal to sustain the growth of new neurons.

Following Hamburger's suggestion Levi-Montalcini surgically attached fragments of mouse tumour to chicken embryos. The result was quite spectacular. She found a chaotic growth of nerve cells in the tumours and all around them. She concluded that a potent chemical growth factor capable of stimulating growth of nerve cells was produced and released by the tumours. After this she attached the tumour to an external membrane, which was connected to the embryo only through the blood. This time also she found nerve cells were still growing. This meant that the signalling factor was a humoral factor, a factor, which was transported through blood. She needed to conduct more experiments for a definitive conclusion. But there were problems in repeating the experiments and she decided to move to Rio de Janeiro to work in tissue culture laboratory established by one of her friends, Hertha Meyer. She described the reasons for moving to Rio de Janeiro in her Nobel Lecture. She said: "Attempts to replicate these effects by implanting dried tumor pellets or by injecting extract of either sarcoma were unsuccessful. I then thought of resorting to the tissue culture technique,

which I had practised with G. Levi at the University of Turin. Lack of facilities in this field in the Department of Zoology at Washington University, prompted me to ask hospitality from Professor Carlos Chagas, Director of the Biophysics Institute of the University of Brasil in Rio de Janeiro. There, a friend of mine, Hertha Meyer had built and was director of a tissue culture unit. Upon approval and invitation by Professor Chagas, I boarded a plane for Rio de Janeiro, carrying in my handbag two mice bearing of mouse sarcomas 180 and 37."

Hertha Meyer was an expert in *in vitro* tissue culture. It may be noted that scientists have more control over the experimental conditions while conducting *in vitro* experiments than *in vivo* experiments. This is because *in vitro* experiments are carried out on tissue growing in glass or plastic dishes but *in vivo* experiments are performed in animals.

Stanley Cohen joined Levi-Montalcini on her return to St. Louis from Rio de Janeiro. Cohen's task was to study the chemical nature of the growth factor. Cohen needed a large amount of the factor for chemical analysis. Levi-Montalcini had to spend a year to grow enough mouse tumour for extracting the needed quantity of the factor. They were advised by Arthur Kornberg to use snake venom for purifying their fractions as the snake venom would help remove excess nucleic acids. This suggestion led to an accidental discovery. It was found that the snake venom was 3,000 times richer



Arthur Kornberg

in NGF than the tumour extract. So there was no problem of procuring enough quantity of NGF for chemical analysis. Cohen found it to be a protein. He also determined its molecular weight and other physicochemical characteristics. Then Levi-Montalcini analysed its biological properties and Cohen its chemical properties. Cohen went on to investigate another growth factor called epidermal growth factor (EGF), which controls the embryological development of tissues such as eyes and teeth.

While working at the Washington University, Levi-Montalcini also started spending time in her native country Italy since the early 1960s. She established a laboratory at the Higher Institute of Health in Rome. In establishing the laboratory, she was helped by Peoro Angelitti. In 1969, the Italian National Research Council in Rome transformed Levi-Montalcini's laboratory into the Institute of Cell Biology. She served as its Director till 1979 and then continued her association with the Institute as visiting as a guest researcher. In 1979, she became a guest professor at the Italian National Research Council's Institute of Neurobiology in Rome.

Apart from the Nobel Prize, she has received a number of awards for her significant contributions to science. The Italian President Carlo Azeglio Ciampi appointed Levi-Montalcini as Senator for Life. She considers this recognition more satisfying than even the Nobel Prize. In an interview granted expressly for FAO on 22

April 2009, her 100th birthday, she said: "Apart from the discovery of the protein capable of stimulating nerve tissue growth (nerve growth factor) for which I received the Nobel Prize, I was very honoured in 2001 to be appointed senator for life by the President of the Republic, Carlo Azeglio Ciampi. I consider that recognition more important than the Prize I received in Stockholm, because it was awarded by my own country."

Levi-Montalcini was the first woman scientist to receive the Max Weinstein Award (1961), given by the United Cerebral Palsy Association for outstanding contributions in neurological research. In 1987, she was awarded the National Medal of Science, the highest scientific award in America. Along with Stanley Cohen and Viktor Hamburger she received the Louisa Gross Horowitz Prize from the Columbia University (1983). She was made a member of the Pontifical Academy of Sciences (1975). She was the first woman to be a member of the Pontifical Scientific Academy. The International Feltrinelli Medical Award of the Accademia Nazionale dei Lincei, Rome (1969), the William Thomson Wakeman Award of the National Paraplegia Foundation (1974), the Lewis S. Rosentel Award for Distinguished work in Basic Medical Research of Brandeis University (1982).

In 1968, she was elected to the United States National Academy of Sciences - the tenth woman to be elected to the Academy. She is also a member of the American Academy of Arts and Sciences and the National Academy of Sciences of Italy.

In 1999, the Food and Agriculture Organisation (FAO) of the United Nations named Levi-Montalcini as one of its first four FAO Ambassadors, to help in its campaign against world hunger. According to her: "FAO has a fundamental role to play in tackling food insecurity which has seen an increase in people suffering from hunger in recent years. FAO should insist on the accountability of governments which often seem to be even indifferent to the scourge of hunger. FAO should always heed the necessities of human life, especially when these are restricted by living conditions that prevent a dignified existence; at the same time, FAO should encourage the use of different agricultural techniques, according to people's needs."



Giuseppe Levi

She has established a foundation named Rita Levi-Montalcini Onlus Foundation to help young African women get better education and have greater prospects of employment in their home country. The Foundation has awarded over 7,000 study fellowships to young women from different African countries.

Levi-Montalcini is the oldest living Nobel Laureate and the first ever to reach the 100th birthday. She celebrated her 100th birthday on 22 April 2009 at Rome's City Hall.

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(The article is a popular presentation of the important points on the life and work of Rita Levi-Montalcini available in the existing literature. The idea is to inspire the younger generation to know more about Levi-Montalcini and her work. The author has given sources consulted for writing this article. However, the sources on the Internet are numerous and so they have not been individually listed. The author is grateful to all those whose works have contributed to writing this article.) ■

Keeping Swine Flu at Bay

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The World Health Organization has declared the present outbreak of swine flu as a pandemic - public health emergency of international concern. India is considered to be in the 'containment stage'. This means the spread of the virus is not out of control and the disease can be tracked, screened and treated. While the government and health officials are taking all possible measures to tackle the emergence of swine flu, it is essential for the general public to be well-informed about some basic facts about the virus and take appropriate actions to reduce the spread of the infection.

A new virus

The present swine flu outbreak is caused by a new influenza A (H1N1) virus that has never before circulated among humans. This virus is not related to previous or current human seasonal influenza viruses. That is the reason our body immunity system does not recognise the virus and cannot fight it in most cases.

Swine flu symptoms

Symptoms of swine flu are almost similar to those seen in seasonal influenza. The main symptoms are the following:

- Fever, which is usually high (38°C)
- Cough
- Runny nose or stuffy nose
- Sore throat
- Body aches
- Headache
- Chills
- Fatigue or tiredness, which can be extreme

- Sometimes diarrhoea and vomiting
- Signs of a more serious swine flu infection may include pneumonia and respiratory failure.

Protection against getting infected

The main route of transmission of the new swine flu virus seems to be similar to seasonal influenza, via droplets that are expelled during speaking, sneezing or coughing. One can prevent getting



infected by avoiding close contact with people who show influenza-like symptoms (trying to maintain a distance of about 1 metre if possible) and taking the following measures:

- Avoid touching your mouth and nose
- Clean hands thoroughly with soap and water on a regular basis (especially if touching the mouth

and nose, or surfaces that are potentially contaminated)

- Avoid close contact with people who might be ill
- Reduce the time spent in crowded settings if possible
- Improve airflow in your living space by opening windows
- Practice good health habits including adequate sleep, eating nutritious food, and keeping physically active

Using a mask

If you are not sick you do not have to wear a mask. But if you are caring for a sick person, you should wear a mask when you are near the ill person and dispose it of immediately after contact, and cleanse your hands thoroughly afterwards.

If you are sick and must travel or be around others, cover your mouth and nose.

Using a mask correctly in all situations is essential. Incorrect use actually increases the chance of spreading infection.

Seeking medical help

You should seek medical care if you experience shortness of breath or difficulty in breathing, or if a fever continues more than three days. If you are a parent with

a young child who is ill, seek medical care if a child has fast or laboured breathing, continuing fever or convulsions (seizures).

Supportive care at home - resting, drinking plenty of fluids and using a pain reliever for aches - is adequate for recovery in most cases. A non-aspirin pain reliever should be used by children and young adults because of the risk of Reye's syndrome (a potentially fatal disease that causes damage to many organs, especially the brain and liver, as

well as causing dangerously low blood sugar levels).

Diagnosis of swine flu

You will not be able to tell the difference between seasonal flu and swine flu without medical help. Typical symptoms to watch for are similar to those caused by seasonal viruses and include fever, cough, headache, body aches, sore throat and runny nose. Only your medical practitioner and local health authority can confirm a case of swine flu caused by influenza A (H1N1) virus after clinical assessment and laboratory testing of the throat and nasal samples. Government of India has identified a number of hospitals and Health Care Centres for testing, isolation, and critical care of suspected/confirmed swine flu patients. You can check the list at <http://www.swinefluindia.com>.

Precautions in the event of flu-like illness

If you feel unwell, have high fever, cough or sore throat:

- Consult your family doctor or a health professional for advice
- If your physician advises you to go to a hospital or health centre for a medical examination, visit the nearest health facility.
- Follow all advises of your doctor or health professionals
- If the doctor has prescribed medicine for treatment or prophylactic purpose, follow the course of the medicine.
- Stay at home and keep away from work, school or crowds.
- Rest and take plenty of fluids.
- Cover your nose and mouth when coughing and sneezing and, if using tissues, make sure you dispose them of carefully. Clean your hands immediately after with soap and water or cleanse them with an alcohol-based hand rub.
- If you do not have tissue close by when you cough or sneeze, cover your mouth as much as possible.

No need to panic

- Swine flu virus is just another flu virus.
- Seasonal flu affects more readily and kills more people than swine flu virus.
- H1N1 is a mild virus. However, the virus does become fatal in a few cases despite timely treatment. We need to remember that a multitude of people die every day of other diseases despite receiving treatment. Swine flu is not an exception.
- The Union Ministry of Health, state governments, educational institutions and the civil society in India have responded well in time to the prevention and containment efforts. There is no need to panic.
- All news channels have been directed by the Union Ministry of Information and Broadcasting to telecast swine flu updates and awareness information two to three times daily.
- With immunity rising slowly, H1N1 will soon become a part of our community and we will learn to live with it as we have with other seasonal flu viruses, dengue, malaria, chikungunya, etc.

- Use a mask to help you contain the spread of droplets when you are around others, but be sure to do so correctly.
- Avoid meeting individuals of high risk group like children, pregnant women.
- Inform family and friends about your illness and try to avoid contact with other people as much as possible.
- Take all steps to reduce further spread of the infection.

Taking antiviral drug

You should only take an antiviral, if your health care professional advises you to do so. You should not buy antiviral or any medicine to prevent or treat swine flu without prescription from a doctor. You should also exercise caution in buying antiviral medicine over the Internet.

Breastfeeding

If you are a lactating mother you should continue to do breastfeeding unless the doctor or health care professional advises against it. Studies on other influenza infections show that breastfeeding contributes to increased protection and lowered risk of respiratory disease in babies since it passes on helpful maternal immunities. Breastfeeding provides the best overall nutrition for babies and increases their defence factors to fight illness.

Going to workplace

Whether you have swine flu or a seasonal influenza, you should stay home and away from work through the duration of your symptoms. This is a precaution that can protect your work colleagues and others.

Travel

If you are feeling unwell or have symptoms of influenza, you should not travel. If you have any doubts about your health, you should check with your doctor.

Swine flu cases in India are still under control and Government of India is taking all measures to reduce the incidence of disease. There is no need to panic. As an individual, we should comply with some simple guidelines to protect us from contacting the infection. In an unlikely event of contacting flu-like symptoms, one should immediately consult the doctor and follow all advises and precautions for proper diagnosis, treatment and containment of the disease.

FOOT CARE: Back to the Basics



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Our feet have no equal. Consider how would we stand, walk, run, and jump, if it were not for them. In a normal standing position each bears half the body's weight. That is just half the job they do when you walk or run. At that time, the entire weight



of your body is transferred first to one foot and then to the other. A big job, indeed! Particularly, if you consider that an average person walks more than two thousand kilometres a year. And in case, you happen to be a health freak or an athlete, the average can be thrice as much, or even more. It was not for nothing that Mother Nature put her best foot forward when she got down to structuring the human feet.

With twenty-six bones, nineteen muscles, and dozens of ligaments and tendons as its essentials, the human foot is a wonderful technological marvel. Its structures make two longitudinal arches—one on the inner side and the other on its outer side. These arches give the foot a spring-like elasticity that enables us to walk with ease.

Yet, in spite of such an ingenious structure and clearly designed mechanics, we fail our feet by our uncaring attitude. No wonder they sometimes put us in a spot of bother, and make us dance to their tune.

Small steps of thoughtfulness and care can keep the feet happy and running fit. Let's see how:

Cleanliness pays:

Always keep your feet clean and dry. Wash them every day with soap and water at least

twice, and dry carefully, particularly between the toes. During the humid season apply liberal amounts of foot powder. In all seasons, change your socks frequently, and never use a pair again without a wash. Use cotton socks; avoid nylons. This regimen will protect your feet from sweat, foul odour and fungal infections.

Work your feet:

A simple exercise such as alternatively spreading and curling your toes, and then flexing and pointing the whole foot, works wonders for your feet. You could also improve the circulation and strength of the small muscles in the foot by rotating the whole foot and then turning the sole inwards and outwards.

Walk bare foot:

The best exercise for the feet is to walk barefoot. But remember to avoid hard surfaces. Doing this over uneven terrain is best. That is how nature had programmed it to be. But remember to avoid hard surfaces.

Mind the toenails:

Keep the nails neat and short. Always cut them straight. Never cut away at the edges. If you are careless, you may end up with an in-growing toenail – the nail grows into the flesh at the sides, causing intense pain.



Keep your feet in comfort:

You must always lodge your feet in correct footwear. It need not be designer or expensive, but should simply suit your feet. The varied footwear shoe-designers fashion is not always the best.

Consider this bit of statistics : Women have four times as much foot trouble as men have because of the poorly designed footwear they choose to wear. Be considerate and take special care of a few points when you step out next to buy a pair of footwear:

Find a perfect fit : Buy a pair that is at least a centimetre longer than the feet. The best time to make the purchase is sometime in the evening or late afternoon, when the feet swell to the largest size of the day.

Very often, one foot is slightly larger than the other. You must, therefore, try out each shoe of the pair before saying 'yes' to the salesman. Walk around with the shoes that you intend to purchase. Try standing on your tiptoes; if the heel slides off easily, the shoes are unsuitable.

A salesman may try to hustle you into buying a pair of shoes a size short. He may tell you, "The shoes will stretch and open up with use". However, never fall for that. If a shoe is not comfortable when bought, it is sure to give you trouble later on. There is simply no "breaking in". Ill-fitting and tight footwear is the commonest cause for the painful, unsightly corns and bunions.

Do not cramp the toes : The design of the shoe should be such that it should not allow the foot to slide forward. Otherwise, the toes would get cramped. Shoes with laces or an adjustable strap are the best. Narrow-toed footwear may be fashionable, but they are not healthy for the forefoot.

Take a flexibility test : The pair you buy should not be rigid. Only flexible footwear can give you a springing step. It must also be supple, so that the toes can be bent with ease. The arch should, however, be firm to provide a solid support.

Save the heels : The height of the heels in any pair of shoes is extremely important.

Shoes with low heels are better simply because they distribute the weight more evenly. Contrarily, a heel of more than 6.25 centimetres puts great strain both on the feet and the body. High heels pitch your weight forward. As a result, the calf muscles shorten and the spine loses its balance. You can end-up with sore feet, ankle strain and a painful back. So if you cannot do without heels, wear them for short spells and kick them off at the first available opportunity!

Flat feet aren't necessarily a problem:

All babies appear to have flat feet. By the time we are teens, most of us develop arched feet. Arches go both from side to side and lengthwise and help distribute weight evenly across our feet.

However, some people never develop arches. Others become flatfooted after they put many miles on their feet. But that isn't necessarily a problem. People with flat feet sometimes have fewer lower back, leg or foot injuries.

Remedies for the problematic flat feet:

Flat feet can be a problem when they place pressure on your foot's nerves and blood vessels; cause imbalance and joint problems in your ankles, knees, hips or lower back; or if you carry excess body weight.

In these situations, the simplest remedy is to arrange for "arch supports" in a well-fitting pair of shoes. The arch supports would give you a better weight-bearing-position and keep your feet in good health. However, if your flat feet are continually painful, you should see a physiotherapist or an orthopaedic surgeon.

The case of the burning feet:

Some people, especially the elderly, complain of a mild burning or severe stinging pain in the feet. This condition may be constant or temporary, and is especially common in people older than 65 years. The cause may be difficult to pinpoint and may include irritating fabrics, poorly fitting shoes, athlete's foot (a fungal infection) or exposure to a toxic substance.

Unless the condition is a fall out of a more severe condition such as diabetes or nerve inflammation, simple remedies may work. Wear non-irritating cotton or cotton-



synthetic blend socks and shoes of natural materials that breathe. A specially fitted insole may help, if it's in good condition. Eliminate activities that aggravate your condition. Soak your feet in cool tap water for 15 minutes twice each day. Reduce your stress and get adequate sleep. However, you must suspect a nerve or blood vessel disorder if you have:

- Diabetes mellitus
- Burning with prickling, weakness or a change of sensation in your legs
- Burning with nausea, diarrhea, loss of urine or bowel control or impotence
- Other family members with the problem
- A persistent condition - In such a situation, it may be best to consult a neurologist.

No mysteries encase hammer toe and mallet toe:

A hammer toe (a toe that is bent permanently downwards, typically as a result of pressure from footwear) may occur in any toe, yet it most commonly affects the second toe. The toe becomes bent and painful. Generally, both joints in a toe are affected, giving it a claw-like appearance. Hammer toe can result from wearing shoes that are too short, but the deformity also occurs in persons with long-term diabetes who have muscle and nerve damage as a result of the disease. A mallet toe is a condition that occurs when the joint at the end of the toe cannot straighten.

Take care that your shoes fit well and accommodate your foot length and width.

A specially designed insert (orthotic) that fits into your shoe may also be most helpful.

Managing the bothersome heel pain:

Heel pain is irritating, but rarely serious. Although it can result from a pinched nerve or a chronic condition, such as arthritis or bursitis, the most common cause is 'plantar fasciitis'. This is an inflammation of the plantar fascia, the fibrous tissue along the bottom of your foot that connects to your heel bone (calcaneus) and toes. The pain usually develops gradually, but it can come on suddenly and severely. It tends to be worse when you are getting out of bed in the morning, when the fascia is stiff. Although both feet can be affected, it usually occurs in only one foot. The pain generally goes away once your foot limbers up. It can recur if you stand or sit for a long time. Climbing stairs or standing on tiptoes also can produce pain. A bone spur (usually painless) may form from tension on your heel bone.

Plantar fasciitis can affect people of all ages. Factors that increase your risk include excess weight, improperly fitting shoes, foot abnormalities and activities that place added pressure on your feet. Treatment involves simple steps to relieve the pain and inflammation. Don't expect a quick cure. It can take six months or longer before your heel is back to normal.

Meanwhile, simple self-help measures can work wonders. Cut back on jogging or walking. Substitute exercises that put less weight on your heel, such as swimming or bicycling. Apply ice to the painful area for up to 20 minutes after activity.

Stretching increases flexibility in your plantar fascia, Achilles' tendon and calf muscles. Stretching in the morning before you get out of bed helps reverse the tightening of the plantar fascia which occurs overnight. Strengthening muscles in your foot can help support your arch.

Buy shoes with a low to moderate heel (2.5 to 5 centimetres) and good arch support and shock absorbency. If you're overweight, shed excess weight. Try heel pads or cups. They help cushion and support your heel. You may also consider using over-the-counter analgesic medications should the pain be too troublesome.

Recent Development in Science and Technology

A drug to increase longevity?

Anti-ageing drugs – compounds that slow the aging process and allow humans to live far beyond their natural span – have long been fertile ground for science-fiction writers. More recently, however, the possibility that such compounds might exist, and might perhaps even be within

□ Biman Basu

e-mail: bimanbasu@gmail.com

from 1,078 to 1,179 for male mice (*Nature*, 9 July 2009). The researchers had earlier

might help people remain active and disease-free throughout their lives. The researchers believe that this may be the first step towards an anti-ageing drug that can make people live longer. The discovery could also have major implications for society, particularly in the treatment of age-related diseases such as cancer, heart disease and perhaps even neurodegenerative diseases like Alzheimer's and Parkinson's, according to the researchers.

Rapamycin is not stable enough in food or in the digestive tract to enter the animals' bloodstream. So the researchers had to improve the bioavailability of the compound through a process called microencapsulation. The reformulated drug was stable in the diet fed to the mice and bypassed the stomach to release in the intestine, where it could more reliably enter the bloodstream.

However, medical experts warn that taking rapamycin by humans in the hope of prolonging their lives may be dangerous because the drug also has strong immunosuppressive action, which may jeopardise the body's immune system. But they are hopeful that on the basis of animal models, rapamycin might prove useful in combating many age-related disorders. Also it may be possible to develop pharmacological



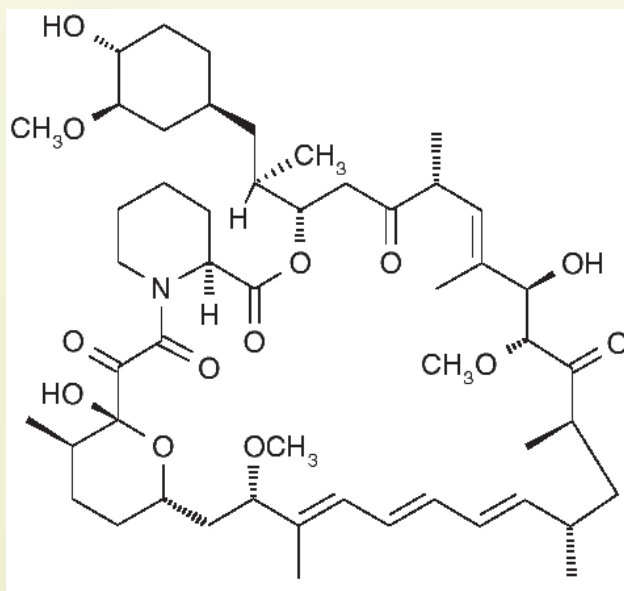
Easter Island is mainly known for its 'moai', which are large stone statues with faces and bodies. It was in soil from here that rapamycin was discovered in 1970.

reach, has gained scientific credibility. Recent studies have shown that the small molecule rapamycin, a pharmacological product used to prevent rejection in organ transplants, can extend the lifespan of mice considerably, raising the possibility that it may delay ageing in people. Rapamycin appears to have a similar effect to restricting food intake, which has also been shown to boost longevity.

Rapamycin is a product of the bacterium *Streptomyces hygroscopicus*, and was discovered in a soil sample from Easter Island in South Pacific in the 1970s. It has already shown benefits in treating a variety of medical conditions in humans. When rapamycin was fed to middle-aged mice about 20 months old (an age equivalent to 60-year-old humans), their life expectancy was found to increase by 28 per cent in males and 38 per cent in females. The maximum lifespan went up from 1,094 days to 1,245 days for female mice, and

crossbred male and female mice from four different strains of mice to more closely mimic the genetic diversity and disease susceptibility of the human population.

The study was done by a team of 14 researchers from three institutions, led by David Harrison from the Jackson Laboratory at Bar Harbor in Maine, USA. The other collaborating institutions were the University of Texas Health Science Center in San Antonio and the University of Michigan in Ann Arbor, both in USA. The studies are part of the National Institute on Aging (NIA) Interventions Testing Program, which seeks compounds that



Rapamycin molecule.



In tests on mice, rapamycin increased life expectancy by up more than a third. (Getty Images: Simon Baker)

strategies that provide the health and longevity benefits to humans without unwanted side-effects.

Eating less slows aging process

A 20-year study involving rhesus monkeys has provided the first strong evidence that caloric restriction without malnutrition slows the aging process in primates. The work is significant because rhesus monkeys are more closely related to humans than other animals used so far in studies of caloric restriction. The study conducted by researchers at the National Primate Research Center at the University of Wisconsin-Madison, USA, report that in rhesus monkeys, caloric restriction begun in adulthood reduces risk of the most common age-related conditions – diabetes, cancer, heart disease, and brain atrophy – by a third (*Science*, 10 July 2009).

The study, which began in 1989, involved 76 monkeys, half of them on the extreme diet. By now, the 33 surviving monkeys have reached old age. Thirty-seven percent of the monkeyson a normal diet have died of age-related diseases, compared with just 13 percent of the monkeys on the restricted diet.

One of the most significant findings of the study concerns metabolic disorders. While five of the monkeys on a normal diet became diabetic and 11 were pre-diabetic (having blood glucose levels higher than normal), monkeys on the restricted diet were completely free of the disease. The incidence of both cardiovascular disease and

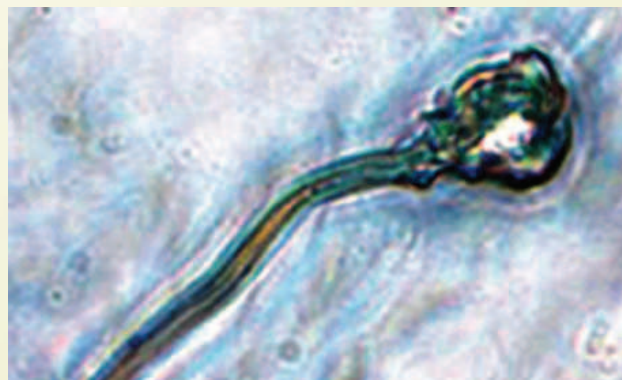
tumours was 50 percent lower in the diet group. And magnetic resonance imaging showed that caloric restriction preserved gray-matter volume in the brain as the monkeys aged. In general, the group on calorie restricted diet appeared to be biologically younger: age-related diseases, if they developed, occurred much later in life.

While the study does indicate that caloric restriction slows the aging process and onset of age-related disorders, the researchers are not sure whether it also extends life-span.

The monkeys in the Wisconsin study fall into two age groups; the average age of the oldest group is 29, which is very old considering that these animals, on average, live to about 25 in captivity. However, the longest a rhesus monkey has been known to live is 40 years. So it is too early to say if restricting calories in diet can increase longevity too.

Artificial human sperm raises hope for treating male infertility

One of the main causes of infertility in human males is their inability to produce sperms. There can be several reasons for



A microscope image of In Vitro Derived (IVD) sperm. (Photograph: PA)

this, including hormonal and physiological. Now there is hope for such men. Synthetic human sperm have been grown from embryonic stem cells for the first time, raising the prospect of advances in male infertility treatment (*Stem Cells and Development*, doi: 10.1089/scd.2009.0063). A team led by Karim

Nayernia of Newcastle University, UK, has created a culture of swimming human cells with tails and some of the biological characteristics of real sperm. According to the researchers, the artificial sperm had key traits of real sperm, including a haploid nucleus that has 23 chromosomes, instead of the 46 found in non-reproductive cells. The achievement suggests that it may be possible to grow new reproductive cells from stem cells, enabling men who make none of their own to father children.

Embryonic stem cells can develop into any kind of cell in the body, but researchers have struggled for years to produce reproductive cells from stem cells. The task is particularly difficult because it requires a complex form of cell division called meiosis, which reduces the number of chromosomes per cell by half. Nayernia and his team used a special cocktail of growth factors to transform stem cells into sperm. The breakthrough came when some cells continued to grow, elongating and growing a tail which caused them to move, and forming recognisable sperm cells.

Despite criticism from some quarters on ethical grounds, Nayernia described the success as an important development that will allow researchers to study in detail how sperm forms and will lead to a better understanding of infertility in men – why

it happens and what is causing it. According to him, the findings would not lead to human beings being produced 'in a dish', but were rather a way of investigating why some people are infertile and the reasons behind it. If there is a better understanding of what is going on it could lead to new ways of treating infertility that could help in developing new ways to

help couples suffering infertility so they can have a child which is genetically their own.

Man's oldest musical instrument

A bird-bone flute unearthed in a German cave is the oldest handcrafted musical instrument yet discovered. The flute was carved by early humans some 35,000 years



A thin bird-bone flute carved some 35,000 years ago. (Daniel Maurer/Associated Press)

ago. A team of researchers led by University of Tübingen archaeologist Nicholas Conard assembled the flute from 12 pieces of griffon vulture bone scattered in a small plot of the Hohle Fels cave in southern Germany. Together, the pieces comprise a 22-centimetre instrument with five holes and a notched end. The maker of the flute carved the instrument from the radius (the thicker and shorter bone) of a griffon vulture (*Gyps fulvus*) wing. This species has a wingspan between 230 and 265 cm and provides bones ideal for large flutes. According to the researchers, the find demonstrates that the earliest modern humans in Europe, around 35,000-40,000 years ago, already had a well-established musical tradition.

The flute is older than all previously discovered musical instruments. The team excavated the flute in September 2008, the same month they recovered six ivory fragments from the Hohle Fels cave that form a female figurine they believe is the oldest known sculpture of the human form. Together, the flute and the figure – found in the same layer of sediment – suggest that modern humans had established an advanced culture in Europe 35,000 years ago. These finds demonstrate that music played an important role in life of early humans living in the Ach and Lone valleys of southwestern Germany (*Nature*, 25 June 2009).

According to the researchers, it is likely that early modern humans – and perhaps Neanderthals, too – were making music longer than 35,000 years ago, but the Hohle Fels flute and the other artefacts found across Europe strengthen evidence

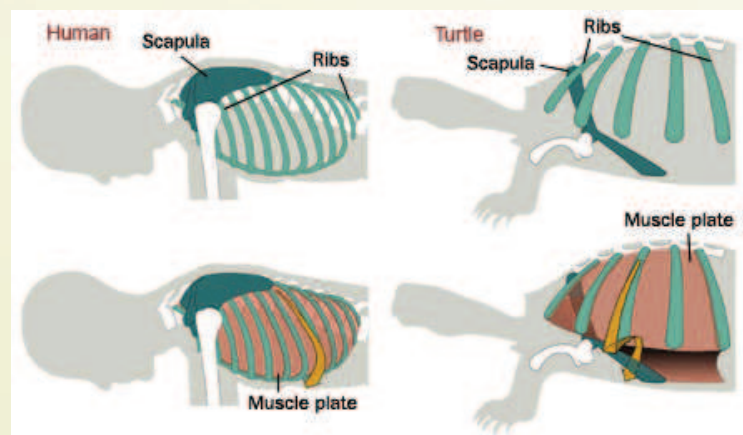
that modern humans in Europe were establishing cultural behaviour similar to our own.

How the turtle got its shell

The turtle is a peculiar animal – its body is completely surrounded by a bony shield. The upper shell of the turtle is called the carapace and the lower shell that encases the belly is called the plastron. The carapace and plastron are joined together on the turtle's sides by bony structures called bridges. No other animal, living or extinct, has a similarly constructed bony shield surrounding its body. Scientists had always believed that turtle shell developed over evolutionary time by fusion of small bony plates with the animal's skin. But a new

shoulder is just the same old land-dweller vertebrate stuff – with a little fold. Nagashima and his team discovered that at first a turtle embryo grows much like a chicken or mouse. But then the developing body wall makes a critical fold. Its ribs do not grow inside its chest as a cage but instead fuse in the developing skin layer on its back to create one bony armoured covering (*Science*, 10 July).

To sort out how turtles develop, Nagashima and his colleagues worked with eggs of Chinese soft-shelled turtles (*Pelodiscus sinensis*). They used tissue-specific stains as well as substances that detect activity of particular genes to figure out which bits of the tiny embryos were on their way to becoming the bones and muscles of the adult. The researchers compared the turtle embryos with developing chicken and mice embryos at each comparable stage in development. What they discovered was amazing. In turtles, chickens and mice, the earliest stages of development looked much the same. But, as the turtle embryo develops, part of its body folds in on itself. Shoulder blades get folded within the ribs. The ribs stay connected, but new connections also develop between bone and muscles. Then the shell starts to develop as the ribs fuse together and encase the shoulder blades.

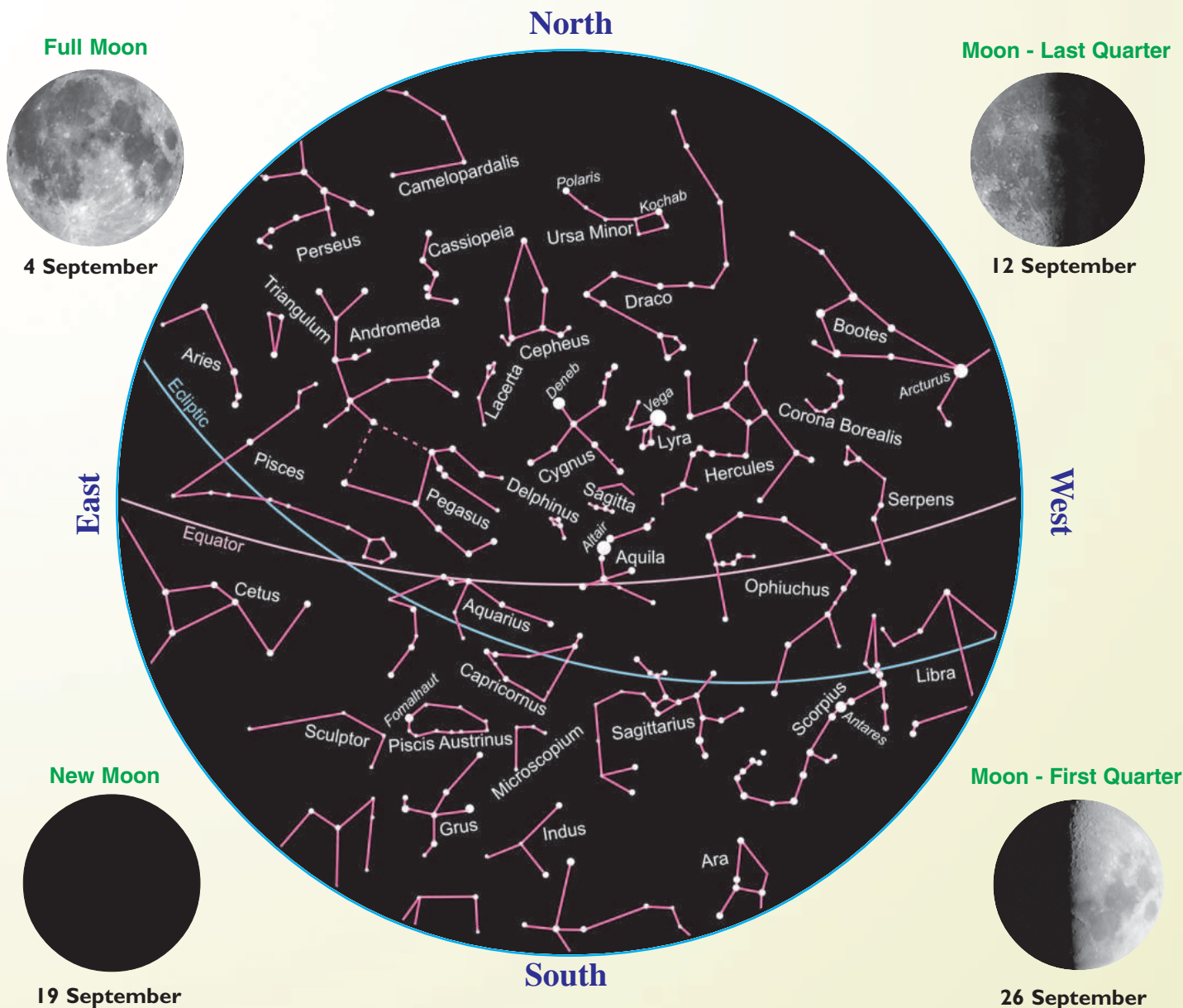


Shoulder blades, or scapulas, in people and most other land-dwelling vertebrates sit outside the rib cage (top left) but turtles look as if they've got it backward (top right). Looking at how turtle embryos develop, though, researchers find turtle embryos tuck inward toward the sides of their muscle plate (below right), so they are just a folded-in version of the usual body plan. (Credit: Shigeru Kuratani and Hiroshi Nagashima)

study shows that the pathway is totally different. According to Hiroshi Nagashima of Kobe University and his colleagues, the unusual arrangement of turtle's shell and

Thus, according to the researchers, the turtle's shell is just a folded-in version of the usual body plan of other animals including humans. ■

Sky Map for September 2009



The sky map is prepared for viewers in Nagpur (21.090 N, 79.090 E). It includes constellations and bright stars. For viewers south of Nagpur, constellations of the southern sky will appear higher up in the sky, and those of the northern sky will appear nearer the northern horizon. Similarly, for viewer north of Nagpur, constellations of northern sky will appear higher up in the sky, and those of the southern sky will appear nearer the southern horizon. The map can be used at 10 PM on 1 September, at 9 PM on 15 September and at 8 PM on 30 September.



Tips to use sky map:

- (1) Choose a place away from city lights/street lights.
- (2) Hold the sky-map overhead with North in the direction of Polaris.
- (3) Use a pencil torch for reading the sky map.
- (4) Try to identify constellation as shown in the map one by one.

Visibility of Planets (IST)

	Rising	Setting	In the Zodiac
Mercury	06:46	18:33	Virgo-Leo
Venus	03:55	16:46	Cancer-Leo
Mars	00:51	14:12	Gemini
Jupiter	16:24	03:39	Capricorn
Saturn	06:12	18:27	Leo-Virgo
Uranus*	18:19	06:17	Pisces
Neptune*	16:42	04:05	Capricorn

*Time shown is subject to vary (± 1 hr) from place to place.
*Not naked eye object

Sky Event

Date IST	Event
03	02:55 Moon-Jupiter
13	21:29 Moon-Mars
16	13:25 Moon at perigee
17	15:06 Uranus at opposition
17	23:34 Saturn Conjunction
20	15:31 Mercury in Inferior Conjunction
23	02:48 Autumnal equinox
28	09:03 Moon at apogee

□ Arvind C. Ranade

E-mail : rac@vignyanprasar.gov.in



YOUR OPINION

Dream 2047 has been inviting your opinion on a specific topic every month. The reader sending the best comments will receive a popular science book published by VP. Selected comments received will also be published in *Dream 2047*. The comments should be limited to 400 words.

This month's topic:

“Is rainwater harvesting a viable strategy for fighting drought?”

Response should contain full name; postal address with pincode and email ID, if any; and should be accompanied by a recent passport size photograph. Response may be sent by email (opinion@vignprasar.gov.in) or by post to the address given below. If sent by post, "Response: *Dream 2047* September 2009" should be clearly written on the envelope.



Vigyan Prasar

A-50, Institutional Area, Sector-62, NOIDA 201 307

Phone: 91-120-240 4430/35 Fax: 91-120-240 4437

Email: info@vignprasar.gov.in Website: www.vignprasar.gov.in

Winners of “Your Opinion” contest for May 2009.

Topic: "Do you consider beliefs in astrology, palmistry, feng shui, etc., as obstacles to development of scientific temper?"

Mrs. Harinder Kaur
Lecturer in physics
G.S.S.S. Khamanon
Distt. Fatehgarh Sahib
Punjab.



“A variety of superstitions and beliefs prevail in our society which can be categorised as religious, cultural and social. All these types of blind faiths are not only obstacles in building scientific temper but also a hindrance to development of society. Teachers should play the role model in creating scientific thinking in addition to teaching their regular curriculum.”

Mehraj Ahmed Dar
C/o Gh. Mohi-ud-din Dar
Ashmuji (Mirpora)
P.O. Ashmuji, Distt. Kulgam
Jammu & Kashmir - 192231



“There is no gainsaying the fact that the beliefs in astrology, palmistry, etc., satisfy and reassure us temporarily, but they destroy our scientific temper. These superstitious beliefs have become the curse of our society. Such beliefs must be tamed; otherwise our scientific development will be hindered. To combat these beliefs, we need to infuse scientific knowledge and inculcate scientific temper among our people.”

OTHER GOOD RESPONSES

MEHRAJ AHMED DAR
C/O Gh. MOHI-UD-DIN DAR
ASHNUJI (MIRPORA)
P.O. ASHMUJI
DIDTT. KULGAM
JAMMU & KASHMIR-192231

DEEPAK ASHOK JADHA
SUBHASH NAGAR,
YERAWADA
PUNE-411006

DR. ADARSH PANDEY
H.O.D. BOTANY
S.S. (P.G.) COLLEGE
SHAHJAHANPUR-242226
(U.P)

MISS MADHUMITA PAL
STUDENT OF CLASS-X
SHRI KRISHNA MISSION SCHOOL
AGARTALA, TRIOURA (W)

DEVAYATNAM
GALI NO. 1
PANCH NAGAR, SASNI GATE
ALIGARH-202001 (UP)

NARENDRA NATH
narnath@in.com

The winners will receive a copy of VP Publication

Editorial (Contd. from page 39)

Squadron Leader Y. S. Babu, who flew the mission, remain among those rare human beings who have witnessed and recorded a total solar eclipse from that height!

The first mission this year carried an experiment from Udaipur Solar Observatory / Physical Research Laboratory, to record the spectra of the corona in four different wavelengths, and also in white light; led by Professor P. Venkatakrisnan and three other scientists. There was a team of three scientists from Vigyan Prasar equipped to record the event before, during and after the totality. A Doordarshan crew of three members with the state-of-the-art cameras also accompanied the team. The aircraft took off from Agra and flew at a height of 25,000 feet (7,600 metres), flying westward, that is, opposite to the direction in which the umbral shadow moved. The ramp (at the rear of the AN 32 aircraft) was opened a few minutes before totality to enable the observations to be made. The outside temperature was close to -15°C and pressure below 400 mb. At ground level the atmospheric pressure is about 1000 mb. We were fortunate to view the eclipse in all its glory! Of course, the most beautiful part of the eclipse was when the Sun was completely covered by the Moon, and the corona became visible, forming a faint pearly white crown. We could not see the diamond ring before the totality began, but, just before it was over, the diamond ring showed up in all its glory! Since there is hardly any activity on the Sun of late, the corona was thin and showed streamers.

In another mission, two IAF Mirage 2000 trainee fighter aircraft took off from Air Force Station, Gwalior, to intercept the total phase near Bhopal. Air Commodore Neelakantan and Wing Commander Ashish Singh were in one aircraft carrying a Canon digital camera and Wing Commander Samyal and Squadron Leader Vijay Patil were in the

other aircraft carrying a Nikon camera. Professor K. E. Rangarajan coordinated the entire experiment with IAF.

Several photographs were taken before, during and after the total phase of the eclipse. Although the aim was to photograph the corona up to a distance of 12-13 solar radii, it could be seen only up to 2-3 solar radii since the corona did not have much activity, 2009 being the minimum solar cycle period. The saga of both the missions appears elsewhere in this issue along with photographs.

VP produced a variety of software on Total Solar Eclipse - resource articles, slide shows, three television programmes (telecast on Doordarshan), special radio programmes (broadcast from 117 All India Radio stations in 19 Indian languages), a book on eclipses and transits, and a versatile activity kit with a safe solar viewer made of black polymer. The resource material and the safe solar viewers were disseminated throughout the country through the State Councils / Departments of Science and Technology. The activity kit and the safe solar viewer were also distributed to 10,000 odd members of the Vigyan Prasar Network of Science Clubs. In association with NCSTC, VP organised four zonal training programmes for master resource persons drawn from every State. There is no gainsaying the fact that the untiring and concerted efforts initiated by VP and NCSTC; and carried forward by a number of organisations / agencies engaged in science popularisation, both Government and non-Government, have already started showing results. People in hundreds of thousands come out on their own to watch astronomical events. Remember the total solar eclipse of 16 February 1980? There was a virtual curfew throughout the country then!

As on previous occasions, this eclipse too pitted science against superstitions. 22 July 2009 was a day when a number of expectant mothers scheduled for Caesarian deliveries asked for a change of date, according a gynaecologist in Delhi. A pregnant IT

professional in Delhi confined herself into a darkened room on advice of her relatives. Astrologers predicted violence, or possibility of a war breaking out. Thousands took a dip in the Ganges River in the holy city of Varanasi to cleanse their souls. However, the ritual turned into a tragedy when an eighty year old woman died in a stampede, and eight others injured. Television channels had their own share in spreading myths and superstitions. Several private TV channels continued to prominently feature more astrologers than astronomers and scientists. These channels appeared to be more concerned with the so-called effects of the eclipse on human life than making people aware of the scientific aspects of this wonderful phenomenon. This time, the evil effect was said to be even more severe given the fact that the solar eclipse of 22 July was preceded by a lunar eclipse and also followed by one! Again, this is nothing uncommon and is a direct consequence of the orbital characteristics of the Moon and the Earth. All this, despite our conscious and concerted efforts to address superstitions and inculcate scientific attitude for nearly three decades! It is a never-ending battle, it seems!

Finally, it was gratifying to note that since the total solar eclipse of 1995, the number of people interested in science in our country has grown astronomically! The modern technology available to us has also significantly contributed to quick dissemination of information. However, if the media played a pro-active role, our country could transform into a nation of scientifically thinking people much faster.

The next total solar eclipse visible in India would take place only on 20 March 2034! The one that would be widely visible in India will take place only on 03 June 2114! But let us gear up for the annular eclipse of 15 January 2010 which would be seen from parts of Kerala and Tamilnadu.

□ Vinay B. Kamble

Total Solar Eclipse 2009

Vigyan Prasar and Indian Air Force jointly coordinated and executed a scientific campaign during the total solar eclipse on 22 July 2009 to record the eclipse. One transport aircraft AN-32 and two fighter aircraft Mirage 2000 participated in two different missions.

Mission I: Observations from AN-32 transport aircraft

Scientists and officials from Udaipur Solar Observatory and Vigyan Prasar carried out

corona at different wavelengths. Wg Cdr D. Singh was the captain while Flt lieutenant Palekar was the co-pilot. Wg Cdr Arvind Sharma was the navigator of the mission.

Dr. Kamble and Professor Venkatakrisnan chalked out detail flight plan in consultation with the captain and navigator. It was decided that the aircraft would fly from Agra to Gwalior and proceed towards Khajuraho and then enter in the belt of totality and fly along the central line

They were also given training on handling oxygen cylinder and the mask

On 21 July 2009, there was a practice flight on board AN-32 aircraft to finalise the path and to carry out minor corrections. However, during the flight, thick cloud cover was observed even at a height of 25,000 feet and Sun was visible only for a short duration. After a three-and-half-hour flight, the team returned to Agra Air Force base station. Corrections for the scheduled flight path on 22 July were made based on the weather report.

On 22 July 2009, all the members were ready by 0330 hrs. Mission briefing was held at by 0335 hrs. The aircraft took



Chromosphere (Time: 06:21:01)



Corona (Time: 06:24:20)



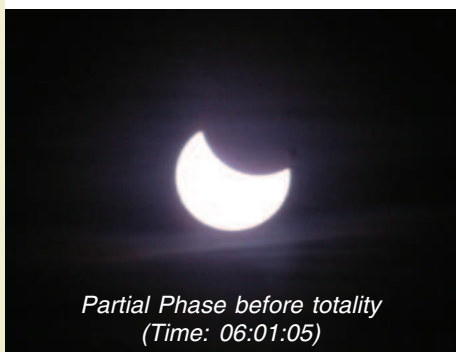
Diamond Ring (Time: 06:25:49)

Photographs taken by Vigyan Prasar at a height of 25,000 ft from Indian Air Force Aircraft AN-32

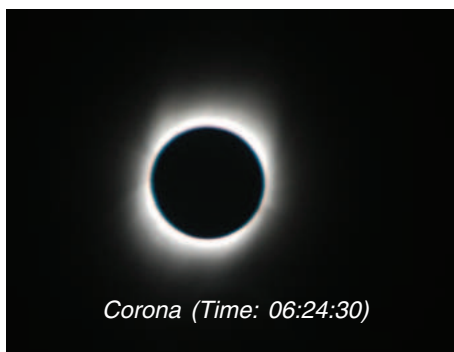
the experiments during the eclipse. Vigyan Prasar and a team from Doordarshan recorded the different phases of the eclipse before, during and after totality. Dr. V. B.

but in a direction opposite to the direction of movement of the umbral shadow, i.e., towards west. It was decided that elevation of the Sun should be at 10 degrees from

off at 0430 hrs. After reaching the belt of totality at Murwara at around 0535 hrs, the aircraft flew towards east for about 35 km. Then it flew in a path similar to race



Partial Phase before totality (Time: 06:01:05)



Corona (Time: 06:24:30)



Partial phase after totality (Time: 06:32:30)

Photographs taken at a height of 40,000 ft from Indian Air Force Aircraft Mirage-2000

Kamble, Director, Shri Rintu Nath, Scientist 'E' and Dr. Arvind Ranade, Scientist 'D' from Vigyan Prasar participated in the campaign.

Professor Venkatakrisnan and three scientists from Udaipur Solar Observatory carried telescope and other accessories on board the aircraft primarily to observe solar

ground to enable proper view while capturing the event from a height of 25,000 feet (7,600 m).

A medical checkup was conducted on 20 July 2009 for all the crew members and others who would go on the flight. Everyone was given detailed instructions on flight safety and emergency procedures.

course track with longer side about 10 km and shorter side 3 km, the 'hold' area. After three such loops at holding point, the aircraft turned towards west at a height 25,000 feet with its ramp open at 0614 hrs. Scientists from Udaipur Solar Observatory, Vigyan Prasar and the team from Doordarshan were positioned at the



Dr. V. B. Kamble, Prof. Venkatakrishnan and Shri Rintu Nath in front of AN-32 aircraft



Scientists and Doordarshan officials wearing oxygen mask and adjusting telescope and camera to record the eclipse at a height of 25000 feet

tail side of the aircraft and watching the Sun in its partial eclipse phase.

Scientists from Udaipur Solar Observatory took observations of the eclipse through telescope and conducted the experiments. Scientists from Vigyan Prasar and members of Doordarshan team recorded the event and took photographs. Totality started at 0621 hrs and continued till 0624 hrs. During this phase the chromosphere, diamond ring and corona were observed. After totality the sequence of events went on in the reverse order.

The ramp was closed at 0628 hrs. The aircraft returned to Agra base at 0745 hrs. The event drew good media attention. Several television channels were present at Air Force station on conclusion of the mission and interviewed Dr. V. B. Kamble, Professor Venkatakrishnan and the officials of Indian Air Force. Video feed of the eclipse was given to media.

Mission II: Observations from the Mirage 2000

Professor K. E. Rangarajan of Indian Institute of Astrophysics, Bangalore coordinated the mission on board Mirage 2000 to observe and photograph the solar corona up to a distance of 2 – 3 solar radii with a digital SLR camera using zoom/wide-angle lens. In view of the fact that there would be no gain in chasing the umbral shadow due to its very high speed, a decision was taken to fly the aircraft at an angle from north to south. A trial flight was arranged on the morning of 21 July 2009. The pilot flew the aircraft while the co-pilot took the picture. On 22 July 2009, two Mirage 2000 participated in the mission flown by Group Captain Samyal and Air Commander Neelakantan. Both the aircraft were successful in capturing very good photographs of the corona. ■

Vigyan Prasar website

Visit www.vigyanprasar.gov.in to know programmes and activities of Vigyan Prasar. You can read and download all the back issues of *Dream – 2047* and VIPNET newsletter. There are lot many other scientific content that you may find useful.



VP website is available in Hindi and English.

All our publications are available in Digital Library. Visit VP website, click on 'Digital Library' and become a member. As a member you will be able to read and download most of the VP publications. All these are absolutely free! Till date we have over 5000 registered users of Digital Library.



If you have queries related to Science and Technology, or if you want to share your views, just log on to VP website and go to 'Discussion Forum'. Register free and start uploading. Your queries may be answered by other users. You may also like to answer fellow participants' queries.

During the last four months, people from 74 countries (513 cities) around the world have visited Vigyan Prasar site. ■

National Campaign on Total Solar Eclipse – 2009

India witnessed the longest total solar eclipse (TSE) of this century on 22 July 2009. Total Solar Eclipse was visible from many cities of India including Surat, Vadodara, Indore, Bhopal, Jabalpur, Allahabad, Varanasi, Patna, Darjeeling, and Dibrugarh. The

ent parts of the country. The campaign was in February 2009 with school students of Delhi and NCR region. From February to June 2009, VP organised seven campaigns in various government schools with the cooperation of the Directorate of Education, Govern-

duced to the activities of Vigyan Prasar and about International Year of Astronomy 2009.

This was followed by a series of awareness programmes and campaign in places along the path of totality for observing the total solar eclipse on 22 July 2009. VP organised four such events at Indore, Bhopal, Patna and Dibrugarh for VIPNET club members and local students and teachers. These programmes were held in collaboration with DST and other state level organisations and NGOs.

At Indore, Madhya Pradesh

A two-day campaign at Indore was organised during 21 and 22 July 2009 at Emerald Heights International School jointly with Children Science Centre, Indore. On 21 July 2009, the awareness programme was inaugurated by Shri Muktesh Singh, President of Children's Science Centre and Chairman of Emerald Heights International School, Indore. During the inauguration officials from VP welcomed the participants and talked about the purpose of the programme and the activities of VP. During the session lectures on TSE, demonstration of Astronomy kit, projections methods for observing TSE were delivered by Ms. K. Dasgupta Misra and Shri Navneet Tyagi from Vigyan Prasar and Shri Saikat Chanda and Shri Rajendra



Lecture and demonstration during TSE campaign in different schools of Delhi

Moon's shadow touched India's west coast at 06:21 IST and moved in a north-westerly direction from Surat in Gujarat. The eclipse began early in the morning; in fact, from most of the cities in western and central parts of India the rising Sun was partially eclipsed. The longest totality was visible from Kitaio Jima, a remote island of Japan in the Pacific, where the duration of totality lasted about 6 minutes 34 seconds. The maximum duration of totality during this eclipse was 6 minutes 39 seconds when the Sun's altitude was about 86° and the path of totality was around 258 km wide.

Vigyan Prasar undertook a country-wide campaign to create awareness about the event among students, teachers and general public in differ-

ent parts of the country. The campaign was in February 2009 with school students of Delhi and NCR region. From February to June 2009, VP organised seven campaigns in various government schools with the cooperation of the Directorate of Education, Govern-

ment of Delhi and in some of the public schools like Amity group of schools, Bal Bharati Public Schools and others. There were around 250 teachers and more than 500 students from government schools of Delhi and public schools who were trained for safe observation of the eclipse. During the programme, presentations on eclipses with emphasis on TSE 2009 were given. The Astronomy kit developed by VP was demonstrated and demonstration of projection methods for observing TSE was shown to the participants. The participants were also intro-



Watching night sky through telescope at Indore on 21 July 09



Students gathered at Indore for observing TSE

Singh of Children's Science Centre, Indore. The resource material developed by Vigyan Prasara was distributed to the registered participants. There programme was attended by 400 participants including VIPNET club members, students of Emerald Heights school, teachers and other local schools and general public.

On the day of the eclipse (22 July 2009), the excitement of all the participants assembled early in the morning was dampened due to rain and cloudy weather. Though the weather was bad and rain disturbed the viewing of the eclipse, the participants experienced the sudden onset of darkness during of totality (6.21a.m. to 6.24 a.m.) and the behaviour of birds. The students enjoyed this unique experience for 3 minutes 15 seconds. There was wide media coverage of the event both in print and electronic media. In the afternoon, one of the local channels showed the entire TSE sequence taken from other places. A quiz on eclipses was conducted and a short play on the myths related to eclipses was enacted by the local resource persons and a film on eclipses developed by VP was screened.

At Bhopal, Madhya Pradesh

A national camp was organised for observing the total solar eclipse from the belt of totality at Bhopal in the foothills of Bhim Betka from 21-23 July 2009. The programme was jointly organized by NCSTC, DST, Vigyan Prasara and Science Centre, Bhopal. The three day camp was attended by the 110 VIPNET clubs (325 club members) from twenty States of the country. These clubs were selected



The TSE workshop at Bhopal



Demonstration of Astronomy kit at Bhopal during TSE

for joining the camp on the basis of the project reports submitted on "myths and superstitions prevalent in their area relating to Eclipse and other Celestial bodies." through nominations.

During the camp, a series of activities like demonstration

of kits, quiz on astronomy, interaction with scientists, film shows, sky observations, etc., were organised. Prof. Yash Pal was present as one of the key speakers and children interacted with him. Selected children specially the winners of various competitions were given prizes in the form of publication, CDs and kits on TSE. In this programme, about 300 children and teachers from the schools of Madhya Pradesh also participated. Due to heavy clouds and rain, participants could not see the Sun during the eclipse, but the total darkness for 3 ½ minutes at the time of totality was a unique experience to all of them.

As part of this programme, a telescope assembling workshop was organised at Bhopal from 18-21 July 2009 jointly with Science Centre Gwalior. This was the second workshop of the series, in which 60 teachers representing VIPNET Clubs from different schools participated. These teachers were also trained during the workshop to work as volunteers for the camp for observing the TSE on 22 July 2009. In this workshop about 50 Galilean telescopes were assembled and participants were given the telescope to start astronomical activities in their clubs. Shri B K Tyagi and Shri Kapil Tripathi, were present as resource persons from Vigyan Prasara. Shri Nimish Kapoor, Shri Navneet Gupta, Shri Ravi Yadav, Shri Chandra Pal, Shri Jagannath Shastri from VP participated in the campaign programme.

At Patna, Bihar

At Patna, the campaign was organised for VIPNET members by VP jointly with Science and Society for Bihar. VIPNET club members from Patna and



The overcast sky at Patna on 22 July 2009

adjoining districts along with local school students and teacher participated in the two-day programme on 21 and 22 July 2009. During the programme, resource persons delivered lectures, presentations and demonstration of the Astronomy kit. On the day of the eclipse, the participants gathered at the Gandhi Maidan, Patna for observing the eclipse. The participants could not see the initial sequence of the eclipse before totality due to sudden rain, but they could witness the sequence of the eclipse after totality. Here again the students were excited to see the night-like darkness at the time of totality. There were more than 300 participants in this programme. Dr. Venkateswaran, Scientist and Shri Tarun Prakash coordinated the programme from VP.



Participants assembeled at Dibrugarh University for TSE

The awareness programme was inaugurated on 21 July by the Vice Chancellor of Dibrugarh University. Prof. Anil Kr. Goswami, President,

Pragjyotish Amateur Astronomer's Association (PRAGS) welcomed the participants from different parts of Assam and nearby states. It was followed by an elaborate lecture and informative presentation by renowned

At Dibrugarh, Assam

At Dibrugarh, the total solar eclipse (TSE) campaign organised by VP jointly with Pragjyotish Amateur Astronomer's Association (PRAGS) at Dibrugarh University campus on 22 July 2009 was a grand success. An optimistic crowd of around 300 (comprising members of VIPNET Science clubs, university community, and BJVJ activists) had assembled at the Dibrugarh University Campus despite incessant rain in the early morning of the eclipse. Although the Sun was not visible, the participants could experience the darkness falling at the time of totality, which lasted 3 minutes 38 seconds. It was an once-in-a-lifetime opportunity for the TSE enthusiasts. Astronomy kits with solar filter goggles developed by Vigyan Prasar were distributed earlier to the participants.



Demonstration of Astronomy kit during TSE at Dibrugarh

amateur astronomer Shri Uday Narayan Deka and an interactive session. Dr. (Mrs.) Kalpana Duorah of Dibrugarh University spoke on various aspects of the 'International Year of Astronomy' at length. Shri Sandeep Baruah, Scientist VP also made presentation on TSE and demonstration of projection methods.

Doordarshan made arrangement for live telecast of the TSE on 22 July 2009. There were four experimental groups who made observations and study during the eclipse. ■

Letters to the Editor

Better than Internet

I had heard a lot of good things about *DREAM 2047*, but did not give them much credit. I had believed that in this era of the Internet informative magazines and encyclopaedias are out of vogue. I was in for a surprise when I leafed through the June 2009 issue of the magazine. I went through the whole magazine and realised that a popular science magazine still has a lot of importance, if well written and edited, which *DREAM 2047* certainly is. I have now gone through the July 2009 issue also and realised that there is consistency in the excellence and the June issue was not an exception. There is no irrelevant information and everything is authentic and verified, unlike the information we find in the Internet. The presentation is very good and all fields of science are covered in a balanced manner. Do continue the good work.

Pranjali Jauhar
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Simple language

I am a regular reader of your *DREAM 2047* magazine. It is a very interesting magazine, which keeps me up to date in every field of science. The language of articles is so simple that anyone can easily understand it. The article "Longest Celestial Drama of the Century" (June 2009) was quite interesting and informative. Publication in both Hindi and English languages helps me know the Hindi meanings of typical scientific words, which have been taught to us in English only. I request you to publish the biographies of great physicists.

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