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The Grid Revolution

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

Chronic Lifestyles Chronic Diseases

Through development of vaccinations, antibiotics, improved sanitation and medical attention, it has been possible to eliminate the threat of death from most infectious diseases to a great extent, although we are engaged in a never-ending war against the microbes. Only in recent years, however, there has been an increasing concern on chronic diseases, also termed as “non-communicable” diseases (NCDs) or “lifestyle” diseases. These diseases have their roots in our modern lifestyles. As the name suggests, these diseases are not brought by bacteria or viruses, but by unhealthy lifestyles.

Sedentary habits or low physical activity, preference for unhealthy junk foods, excessive energy intake, and addiction to tobacco and alcohol are among the major risk factors responsible for the onset of lifestyle diseases. Incidentally; the term “lifestyle related diseases” is often used to emphasise the contribution of behaviour to the development of chronic diseases, which include obesity, diseases pertaining to heart and blood vessels or cardiovascular diseases, chronic respiratory diseases, stroke, cancer, and diabetes, among others. There are other chronic conditions and diseases that contribute significantly to the burden of disease on individuals, families, societies and countries. Examples include mental disorders, vision and hearing impairment, oral diseases, bone and joint disorders, and genetic disorders.

Indeed, the lives of far too many people in the world are being blighted and cut short by chronic diseases. It was thought such diseases were prevalent exclusively in high-income western countries. This is no longer true. According

to a report *Preventing Chronic Diseases: A vital investment* brought out by World Health Organization (WHO) in 2005, four out of five chronic disease deaths occur in low- and middle-income countries. This holds true for India as well. People in these countries tend to develop diseases at younger ages, suffer longer and die sooner than those in high-income countries. Chronic diseases are currently the major cause of death among adults in almost all countries and the toll is projected to increase even further in the years to come. It is an irony that the people in the third world are suffering from the ill effects of “development” superimposed on the problems of underdevelopment.

The chronic diseases have their origins at young age; and given their long duration, there are many opportunities for their prevention. But, sadly, we rarely utilise these opportunities and take corrective measures. In particular, the term “chronic diseases” suggests chronic disease epidemics that take decades to become fully established. Further, chronic diseases are heavily influenced by environmental conditions and are not the result of individual choices alone. Lifestyle chronic diseases by far are the leading cause of mortality in the world, representing 60 per cent of all deaths. In 2005, out of a total of 58 million deaths in the world, an estimated 35 million people died of chronic diseases. Thus, chronic diseases have assumed the dimensions of epidemic. How about India? The number of deaths attributable to chronic diseases was 3.78 million in 1990, or 40.4 per cent of all deaths. This figure is expected to rise to 7.63 million, or 66.7 per cent of all deaths, in 2020.

Let us have a quick look at some of the major lifestyle chronic diseases. Overweight and obesity can lead to cardiovascular disease – mainly heart disease and stroke. It can also lead to diabetes which has rapidly become a global epidemic, and some cancers. Sitting in the offices or in front of television for long hours and no physical exercises, coupled with high energy food, can lead to overweight and obesity. In India, nearly 20 per cent of the people are overweight! Cardiovascular diseases are the world’s number one cause of death, killing 17 million people every year. The causes of cardiovascular diseases are well established and well known. The most important causes of heart disease and stroke are unhealthy diet, physical inactivity and tobacco use. The effects of unhealthy diet and physical inactivity may show up in individuals as raised blood pressure, raised blood glucose, raised blood lipids (essential structural components of living cells along with proteins and carbohydrates), and overweight and obesity.

There are over 100 types of cancers, 40 per cent of which can be prevented by a healthy diet, physical activity and not using tobacco in any form. Tobacco use is the single largest preventable cause of cancer in the world. Tobacco use causes cancer of the lung, throat, mouth, pancreas, bladder, stomach, liver, kidney, and cancer of other types. Environmental tobacco smoke (passive smoking) can also cause lung cancer. It is essential that our youth do not get addicted to tobacco products. That is why the theme chosen by WHO for No Tobacco Day this year

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John Napier

The Inventor of Logarithms

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“(John Napier was) the person to whom the title of great man is more justly due than to any other whom this country has produced”

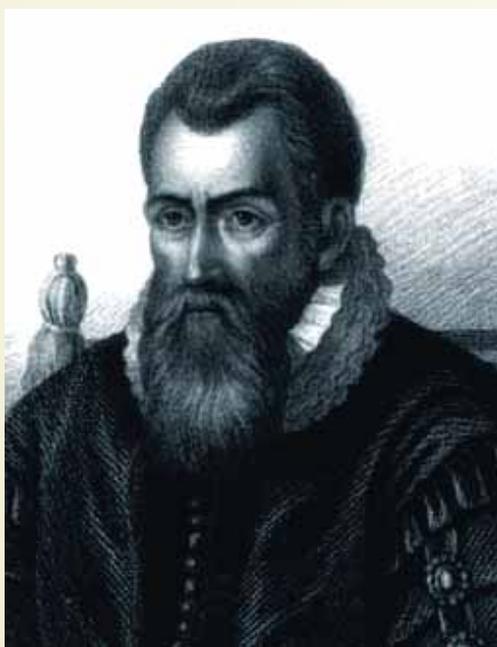
- Scottish intellectual David Flume

John Napier was a mathematician, physicist, astronomer, philosopher and inventor. He is mostly remembered as the inventor of logarithms and for popularizing the use of the decimal point. He invented a multiplication tool known as Napier's bones using a set of numbered rods. The device could be used for multiplying, dividing, and for taking square roots and cube roots. In his lifetime Napier was best known as author of a Protestant theological work. This work called the *Plaine Discouery of the Whole Reuelation of St. John (Plaine Discovery of the Whole Revelation of St. John)* was published in 1593. It ran into several editions and was translated into English, Dutch, French and German. He devised war engines of various kinds including a primitive tank for defence against Phillip II of Spain. Napier strongly believed in astrology and divination. He was a fervent protestant and also very active in politics.

It is interesting to note that Napier's surname was spelt in different ways like Napeir, Nepair, Nepeir, Neper, Naper, Naipper. What is more interesting to note is that the present form of his name did not appear in his lifetime. In his lifetime his name was commonly written as Jhone (old spelling of John) Nepper. He was nicknamed Marvellous Merchiston.

John Napier was born in 1550 in Merchiston Castle, Edinburgh, Scotland. The date and month of his birth are not known. Today his

birthplace is part of the Napier University. His father Sir Archibald Napier was an important public figure in late 16th century Scotland. He was a Justice-depute and was knighted in 1565. He became the Master of Mint in 1582. His mother Janet Napier (nee Bothwell) was the sister of the Bishop of Orney. There is not much



John Napier

information available about his early life. He entered the St. Salvator's College of the St. Andrews University in 1563. Apparently he did not stay at the St. Andrews University to complete his graduation and left for France and other countries of Europe. There is no record indicating exactly where he studied. He returned to Scotland in 1571 to find the

capital of the country plunged into civil war. On one side there were forces of Queen Mary who wanted a comeback and on the other side was her young son's Regent who was determined to maintain the Protestant reformed church. Napier's father was imprisoned in Edinburgh castle by the Queen's forces of the Regent.

In 1572, most of the estates of Napier family were made over to Napier. After this Napier planned to build an estate at Gartness the construction of which was completed in 1574. Napier devoted himself in running the estate. He invented ways for improving agriculture. It is generally believed that Napier did much of his work on logarithm at Gartness.

Napier invented and described his famous invention of logarithms in *Mirifici Logarithmorum Canonis Descriptio (Description of the Marvellous Canon of Logarithms)* published in 1614. The book contained 37 pages of explanatory matter and 90 pages of tables. Two years after its publication in Latin an English version was published. The translation was done by Edward Wright. It was formulated to simplify computations. It was Napier's studies of roots that led him to develop the principle of logarithm. He spent 20 years computing the tables. He started working on logarithms in 1594 and completed in 1614.

The word 'logarithm' was coined by Napier. It was derived from two

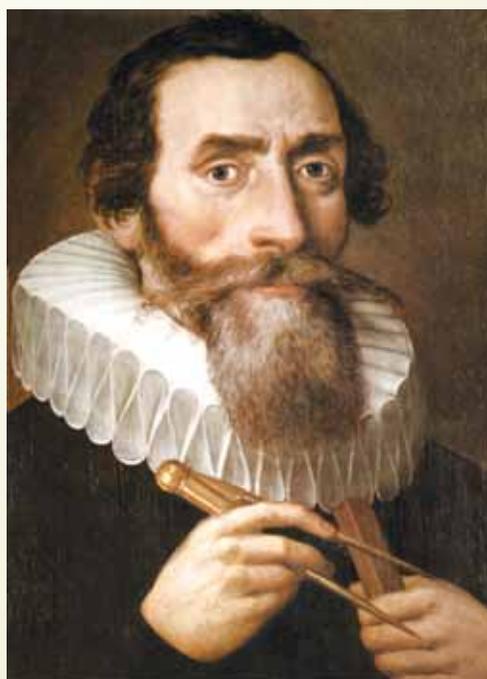
Greek words – *logos* meaning ‘ratio’ or ‘measure’ and *arithmus* meaning ‘number’. Logarithms made it possible to multiply or divide by addition or subtraction. Napier himself had written in the preface to the *Description of the Marvellous Canon of Logarithms* that “his logarithms will save calculator much time and free them from the slippery errors of calculations.” In the Preface to this work Napier wrote: “Seeing there is nothing that is troublesome to mathematical practice, nor that doth more molest and hinder calculators, than the multiplications, divisions, square and cubical extraction of great numbers...I began therefore to consider in my mind by what certain and ready art I might remove those hindrances.” Napier’s further work on logarithms was published after his death in *Mirifici logarithmorum canonis constructio (Construction of the Marvellous Canon of Logarithms)* in 1619.

The importance of Napier’s invention can be realised by the fact that Johannes Kepler had taken four years to calculate the orbit of Mars and it could have taken longer than a lifetime to work out the rest, had he not got hold of Napier’s logarithms. So, without Napier’s logarithms, Kepler could not have published his work on the laws of planetary motions in 1609. Kepler wrote to Napier in 1619 to acknowledge his indebtedness but he had no idea that the Scottish genius had died two years earlier. It was Kepler who was largely responsible for introduction of logarithms to a larger audience in Europe.

It is worthwhile to mention here that the Swiss J. Burgi (1552-1632) had independently developed the idea of logarithms about the same time as Napier but he did not publish until 1620.

Napier’s system used the natural logarithm base *e*. Logarithms to the base 10 (known as common or Briggsian logarithms) were later adopted, following a suggestion by English

mathematician Henry Briggs (1561-1630). After reading the Latin version of Napier’s book Briggs wrote to one of his friends: “Napper, lord of Markinston, hath set my head and hands a work with his new and admirable logarithms. I hope to see him this summer, if it pleases God, for I never saw a book which pleased me better or made me more wonder.” Briggs did meet Napier in the summer of 1615 as he had written to his friend. Briggs had to take a difficult journey from London to Edinburgh to meet Napier. Today one may wonder why the journey was



Johannes Kepler

difficult when it takes just 4 hours to reach Edinburgh from London. In those days it was a four-day journey by coach driven by horses. Briggs started his conversation by saying: “My Lord, I have undertaken this long journey purposely to see your person, and to know by what engine of wit or ingenuity you came first to think of this most excellent help unto astronomy, viz., the Logarithms...” Before coming to Edinburgh, Briggs had written to Napier suggesting that logarithms should be to base 10. During their meeting Briggs reiterated his suggestion that new

logarithm tables should be constructed with base 10 and with log 1 equal to 0. It has been reported that Napier told Briggs that he had also harboured the same idea after developing the table using *e* as base but “...he could not, on account of ill health and for other weighty reasons undertake the construction of new tables.” Briggs constructed such tables. Briggs published his *Arithmetica logarithmica (The Arithmetic of Logarithm)* in 1624. This work introduced the terms “mantissa” and “characteristic”.

Napier also developed a mechanical means of simplifying calculations. The method developed by him was called Napier’s bones and used “numbering rods” with numbers marked off on them. Napier used ivory rods and so naturally they looked like bones. This explains why Napier’s device was called Napier’s bones. He published his method of simplifying calculation in his *Radologiae, seu Numerationis per Virgulas Libri Duo (Study of Divining Rods or Two Books of Numbering by Means of Rods)* published in 1617.

It may be noted here that Napier studied mathematics more as a hobby. Besides the invention of logarithms Napier made other contributions in mathematics. It was Napier who introduced the decimal notation for fractions. His mathematical contributions also included mnemonic for formulae used in solving triangles and two formulae known as “Napier’s analogies”. He found exponential expressions for trigonometric functions. He had himself mentioned that he was so occupied in his theological work that he could hardly manage time for mathematical calculations. Based on Napier’s invention of logarithms slide rules were introduced in the 1630s. Slide rule is a mathematical instrument for performing multiplication and division. It consists of a rule that slides along a groove in another rule. Both rules are marked with logarithmic scales so that products and



Henri Briggs

quotients can be calculated by effectively adding and subtracting logarithms in the form of lengths of rule. Slide rules could be used to carry out lengthy arithmetical and trigonometric calculations by moving the scales alongside one another. Because of their speed, accuracy, and portability, slide rules remained in use until the 1970s.

Napier was considered by his neighbours as a sorcerer or a man who was "in league with the powers of darkness." He did not make any attempt to dispel this belief; rather he encouraged it. He was always accompanied by a black spider in a small box and black rooster. There were some definite incidents which contributed to his reputation as a sorcerer. One such incident was Napier's ability to identify which of servants had been stealing from his estate by using his rooster. For doing this he used to shut the suspects in a room with the rooster and asked them to hold it. Once the process completed Napier had no difficulty in identifying the culprit. In reality it did not involve any supernatural powers. Napier used to cover the rooster with charcoal and the servants who were innocent held the

rooster without any hesitation but the culprit would simply pretend that he done it. And so after examining their hands Napier would tell who was guilty because the one with clean hands would be the culprit.

Another such incident involved one of Napier's neighbours whose pigeons were found to be eating Napier's grains. Napier threatened his neighbour that he would be free to keep any of the pigeons found on his property. Napier's neighbour did not take the threat seriously. In fact he scoffed at Napier by saying, "Do so, if you can catch them." Next morning people saw Napier's servants stuffing hundreds of semi-conscious pigeons into sacks and they were convinced that Napier had bewitched the pigeons. However, there was no sorcery involved in the act. Napier had simply scattered succulent peas soaked in brandy and the pigeons after eating the peas became drunk and were incapable to fly!

Napier had made a contract with Robert Logan of Restalrig to search Fast Castle by means of magic for hidden treasure. There is no information available about the outcome of the agreement. Napier was also believed to have dabbled in alchemy and necromancy (conjuring up the dead). In those days it was not very uncommon for scientifically talented people being accused of being a necromancer.

Napier lived through one of the most turbulent periods in the history of Scotland. Though Napier's fame rests on his mathematical works, he was far from the image of a modern mathematician. Being a late-Renaissance man, Napier's power of lateral thinking got him involved in many things from agricultural improvement to devising engines of wars. Napier died on 3 April 1617 and he was buried in the Church of St. Giles. One Crater on Moon is named after Napier. It is called Nepper Crater

Some of the important works on Napier are: *Napier's bones: a history and instruction manual* by D. J. Bryden

(London, 1992); *John Napier: Logarithm John* by L Gladstone-Millar (Edinburgh, 2003); *Napier Tercentenary Memorial Volume*, edited by C. G. Knott (London, 1915); *The art of numbering by speaking rods: vulgarly termed Napier's bones* by W. Leybourn (London, 1667); and *Memoirs of John Napier of Merchiston, his lineage, life, and times, with a history of the invention of logarithms* by M. Napier (Edinburgh, 1904).

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(The article is a popular presentation of the important points on the life and work of John Napier available in the existing literature. The idea is to inspire the younger generation to know more about John Napier. The author has given the 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 authors whose works have contributed to writing this article.)

The Grid Revolution

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Ever since the first general purpose electronic computer ENIAC (Electronic Numerical Integrator And Computer) was unveiled in 1946, the processing speed of computers have increased in leaps and bounds. Today, a desktop PC can process information faster than a supercomputer of yesteryears. Data transfer through computer networks is becoming faster with the advent of new technology and optical fibre communication links. Nobel Prize-winning discoveries like Giant Magneto-Resistance (GMR) have opened up the possibilities of huge data storage capacities. However, these developments have not been able to keep pace with the computational needs of today's research work. Scientists are facing increasingly complicated computing problems which require much more than the present technology can deliver.

For example, consider the following situations:

- Huge amounts of data and satellite images of the Earth are stored in different institutions and it might take months to copy the data to one central computer in order to analyse it. It would save a lot of time if the computations could be done where the data are.
- A scientific team with members around the globe wants to share large amounts of data on the human genome and do complex analysis of the data rapidly online together, while discussing the results in a video conference.

- The Large Hadron Collider (LHC) of CERN (European Organisation for Nuclear Research) will produce about 10 petabytes (1 petabyte= 10^{15} bytes) of data per year (which would need about 20 million CDs to store). This data will record the results of collisions of extremely energetic particles. Thousands of physicists in dozens of universities around the world want to analyse these data!

The only way one could meet the above situations would be by having nearly



infinite computing power available, whenever needed, and by being able to collaborate with distant colleagues easily and efficiently, safely sharing with them resources, data, procedures and results without much expense – may be even for free!

Grid computing as a solution

Grid computing or simply the Grid is a technique for sharing the processing power and data storage capacity over the

Internet. The Grid goes well beyond simple communication between computers (which, anyway, the Internet offers), and aims ultimately at turning the global network of computers into one vast computational resource. The underlying technology of the Grid is still in a prototype phase, and being developed by hundreds of researchers and software engineers around the world. The Grid is attracting a lot of interest because its future is potentially revolutionary.

How does the Grid work?

One can enter the Grid using a software interface that runs on the computer. The user enters the user ID and password for the authentication. After the validation, the computer is connected to the core of the Grid, the Resource Broker (RB). The RB will query the information service to know which hardware and software are available at that moment. Once the appropriate resources have been located, the job is executed. The RB then sends the result back. To the user, the Grid acts as a single, huge and powerful computer!

Evolution of the Grid

The Grid evolved from the early desire to connect supercomputers into “meta-computers” that could be remotely controlled. The word “grid” was borrowed from the electricity grid, to imply that any compatible device could be plugged in anywhere on the Grid and be guaranteed a certain level of resources, regardless of where those resources might come from.

In the early development phase computers were bulky and processors were slow. To achieve faster processing power, scientists used to connect a few computers together

that enabled parallel processing. When two or more computers are used together to solve a problem, it is considered a cluster. Clusters are typically used for High Availability (HA) for greater reliability, or High Performance Computing (HPC) to provide greater computational power than a single computer can provide. The first such cluster is known as Beowulf. Beowulf Clusters are scalable; that is, they can grow simply by adding new PCs to it. Of course there are limits. Because, somehow the computers have to communicate with each other, and this can be really difficult to manage when there are a large number of computers. But clusters of a few hundred computers are not uncommon nowadays.

Cluster computing provided a solution to fast processing need. However, many organisations have a number of centres situated at different places. Each of these centres has its own data. To process all data simultaneously it is necessary to transfer all the data to one place having cluster computing facility or having a supercomputer. Quite often transferring a large chunk of data takes substantial time. There is also possibility of data loss. To address this problem, scientists developed 'distributed computing' – where processing of data is done at different places. The network of computers is then used as a single, unified resource. Distributed computing is a kind of Local Grid Computing.

When the concept of distributed computing is used for linking supercomputer centres with high-speed networks, it is called meta-computing. This was a common practice during early nineties. While research was going on to get more processing power by interconnecting a large number of computers, it was felt that

an efficient mode of data transfer over a long distance is necessary to share information.

Scientists soon realised the great potential of allowing computers to share information. It could open up new possibilities not only in the field of research and development, but common people could also be able to get

What is the difference between the internet, the web and the Grid?

The Internet is a networking infrastructure, which connects millions of computers worldwide. The name comes from the idea of *interconnected networks*.

When any two computers are connected to the Internet, they can communicate with each other. But being connected is not only a question of cables. To talk to each other computers have to speak the same language, i.e., use the same protocol. The common protocol for the Internet is called Transmission Control Protocol/ Internet Protocol (TCP/ IP).

The World Wide Web (WWW), or simply the Web, is an information sharing service built on top of the Internet. But it is not the only one. The Internet (not the web!) is also used for text-based e-mails (SMTP: Simple Mail Transfer Protocol), for file transfer (FTP), remote log-in (Telnet) and so on.

The Grid is a service built on top of the Internet, as the web is. The Grid goes one step further. The Grid promises to provide sharing computing power and resources like disk storage, databases and software applications.

While one computer may take days to complete a complex calculation, the Grid will make available hundreds of collaborative computers to get the same result faster and more efficiently. Once connected to the Grid, the user will see it as one large computer system, providing almost infinite computing power.

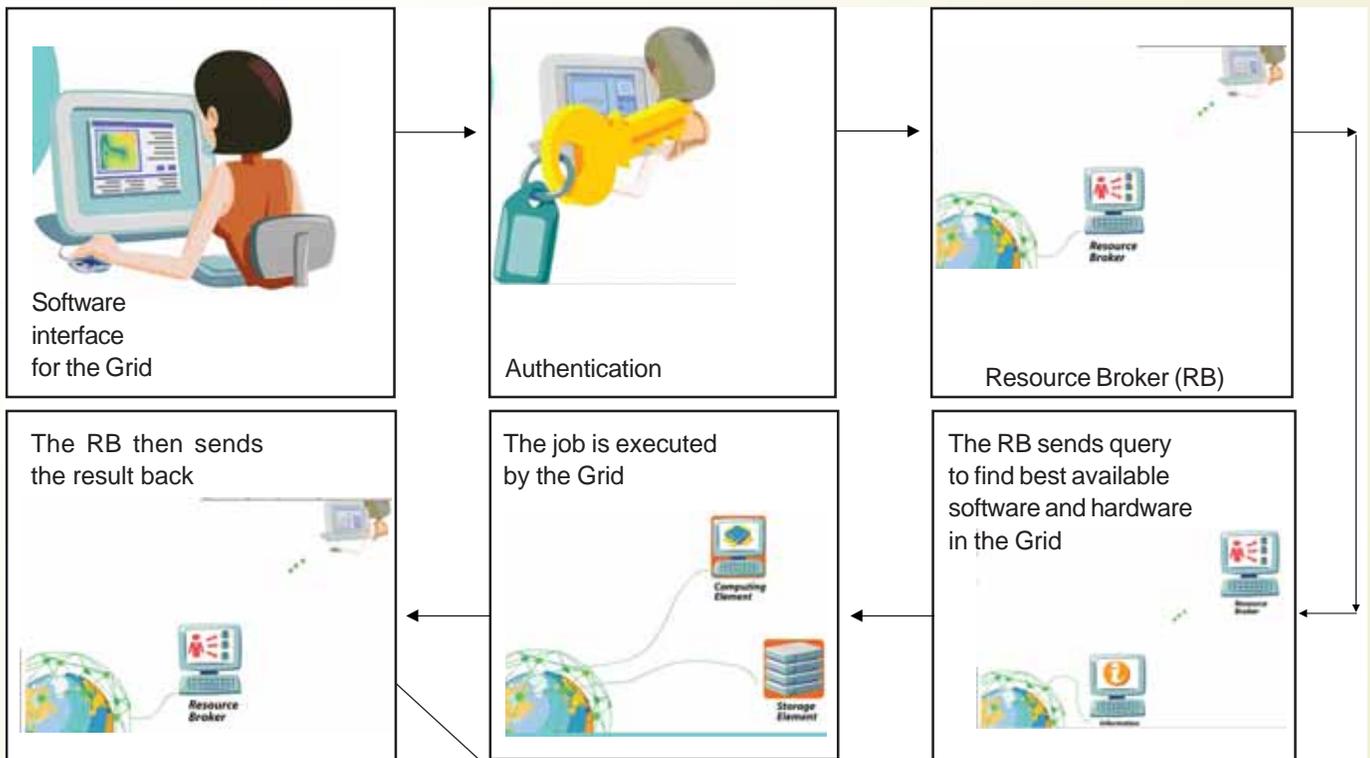
information they needed easily across the globe. Professor J.C.R. Licklider of MIT first proposed a global network of computers in 1962 while working as head of the Defence Advanced Research Projects Agency (DARPA), USA. Professor Licklider was a visionary. He

saw the need to spread DARPA's initiative to universities and other research organisations and laid the foundation for what would become the ARPANET (Advanced Research Projects Agency Network).

Around the same time Professor Leonard Kleinrock of University of California, Los Angeles, developed the theory of packet switching, which eventually became the basis of transferring data between connected computers. Professor Kleinrock connected a computer kept at Massachusetts with a computer at California in 1965 over dial-up telephone link. It had limited success; only a few letters could be transferred. But it showed the feasibility of wide-area networking, and also demonstrated the inadequacies of circuit switching used in telephone lines for computer communication. The experience gave Kleinrock's packet switching theory a firm footing.

The first public demonstration of ARPANET was conducted in 1972. A computer terminal was installed in the basement of the Washington Hilton Hotel to demonstrate the inter-connections of computers to share information. General public saw the first application of computer networks. Over the year a number of developments took place. ARPANET was made more generalised with standard protocol (TCP/IP: Transmission Control Protocol/ Internet Protocol) and eventually the Internet evolved.

It was realised that not only is a common protocol like TCP/ IP required to inter-connect computers globally, one also needs to have common presentation software to share information globally. In 1984, while working as an independent contractor at CERN, Switzerland, Tim Berners-Lee (popularly known as TBL) realised there is no common presentation



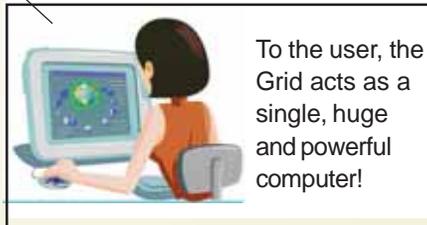
software through which physicists from around the world could share data. TBL and his collaborator Robert Cailliau, prepared a project proposal to create hypertext database with links and sought resources within CERN. In 1990 TBL created the World Wide Web (WWW) and the first web page, which described the project itself.

The development of powerful computer processors, very high-speed Internet connections and the concept of distributed computing eventually led to the concept of grid computing.

Grid computing

The Grid can be seen as the evolution of local grid computing to the global scale. Modern day computers are able to run quite complex middleware (middleware is the software that organises and integrates the resources in a grid) in the background without disturbing the task that the computer is trying to handle.

As Internet speeds increase, the difference between having two PCs in the same office, the same building, the same city, or the same country shrinks.



To the user, the Grid acts as a single, huge and powerful computer!

Development of sophisticated middleware makes sure that widely distributed resources are used effectively; grid computing gives the user the impression of shrinking the distances further. Furthermore, as the middleware gets more sophisticated, it can deal with the inevitable differences between the types of computers that are being used in a highly distributed system, which are harder to control than within one organisation.

Grid computing focuses more on large scale sharing, which goes beyond institutional boundaries. Also, grid computing uses dedicated systems such as scientific computer centres rather than cycle scavenging. Cycle-scavenging or cycle stealing is a technique by which processing power of a computer is utilised that would otherwise be wasted at idle time of the CPU. Finally, and

what is in some ways the most challenging aspect, grid computing aims at using resources that are not centrally controlled. The sharing is across boundaries – institutional and even national – which adds considerable complexity, while bringing huge potential benefits at the same time.

Ian Foster, Professor of Computer Science at the University of Chicago is one of the persons who coined the term 'grid computing'. According to him a full-blown grid must satisfy three criteria: i) no central administrative control (that eliminates clusters, and also local grid computing); ii) use of general-purpose protocols; and iii) high quality of service (that eliminates peer-to-peer and means that grids should not rely on cycle scavenging from individual processors, rather it should rely on load balancing between different independent large resources, such as clusters and local grids).

Another distinction is that a grid could, in principle, have access to parallel computers, clusters, farms, local grids, and would choose the appropriate tool for a given calculation. In this sense,

Facts and fictions about the Grid

Fiction: The Grid will replace the Internet.

Fact: Grid computing, like the World Wide Web, is an application of the Internet. It cannot replace Internet.

Fiction: People will be able to download movies 10,000 times faster using the Grid.

Fact: In order to get such data-transfer rates, individuals would have to set-up a dedicated fibre-optic link between home and the source of data (server). If one is able to do that, he/she can download the movie 10,000 times faster even now, without the Grid! With standard dial-up telephone link or shared broad-band connectivity, such speeds will remain a dream. The Grid cannot change the data transfer rate.

Fiction: The Grid is going to dominate www

Fact: Today's grid computing technologies and projects are geared toward research and businesses with highly specific needs, such as vast amounts of data to process and analyse within large, worldwide collaborations, like LHC project of CERN. While other computer users may benefit from grid computing through better weather prediction or more effective medications, they may not be logging onto a computing grid anytime soon.

the Grid is the most generalised, globalised form of distributed computing one can imagine.

What can the Grid do?

Well, if you are a scientist, and you want to run a colleague's

molecular simulation program, you would no longer need to install the program on your machine. Instead, you could just ask the Grid to run it remotely on your colleague's computer. Or if your colleague's computer is busy, you could ask the Grid to copy the program to another computer that is sitting idle somewhere on the other side of the planet, and run your program there. In fact, you wouldn't need to ask the Grid anything. It would find out for you the best place to run the program!

And if you need to analyse a lot of data from different computers all over the globe, you could ask the Grid to do the same. Again, the Grid could find out where the most convenient source of the data is available and do the analysis on the data wherever it is.

If you want to do this analysis interactively in collaboration with several colleagues around the world, the Grid would link your computers up so that it would be like you are on a local network. This would happen without you having to worry about lots of special passwords, the Grid could figure out who should be able to take part in this common activity.

The reality

As of now there is not one single 'Grid' (as there is one single 'Internet' and one single 'Web'). Indeed, there are some experts who believe that there may never be one single Grid. Instead, there are many grids evolving, some private, some public, some within one region or country, some of truly global dimensions. Some dedicated to one particular scientific problem while some are all-purpose.

All these Grids have very restricted capabilities for the moment. But they are gradually growing and becoming more sophisticated. There is a lot of enthusiasm for the same long-term vision: a scenario where the computer power and storage capacity of millions of systems across a

Middleware

Middleware is connecting software that allows multiple processes running on one or more computers to interact across a network. It allows communication across heterogeneous platforms.

One of the most popular middleware packages developed is called *Globus*; it is essentially a software toolkit for making grids. With such middleware, the aim is to couple a wide variety of machines together effectively, including supercomputers, storage systems, data sources and special classes of devices such as scientific instruments and visualisation devices.

worldwide network function as a pool that could be used by anyone who needs it. And to achieve this, effective systems of software and services must be developed. That is why many IT experts all over the world, from science and from software industry, have started Grid development efforts. The area which needs considerable attention is to evolve standards for the Grid. If everybody starts making their own kind of Grid, then it would become difficult and expensive to combine Grid technologies.

Fortunately, there is an activity under way since 2002 to define Grid standards, called the Open Grid Services Architecture (OGSA), which is supported both by a large part of the scientific community and by industry. OGSA is trying to harmonise the work going on to develop Grid standards by different stake holders. One could only hope that these efforts would in due course bring the dream of a global Grid to reality.

Insulin treatment in diabetes



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Until 1922, when insulin first became commercially available to the public, people diagnosed with type-1 diabetes faced a bleak future. Treatments were severe – some people were purposely starved so that their blood sugar levels could be controlled, while others were given enormous amounts of fluid, even alcohol, to flush their system of impurities. Regardless of the treatment, most people did not live longer than a year after their diagnosis. The landmark discovery of insulin in 1921 changed this all. Today, it offers a new lease of life to people with

engineered bacteria which churn it out in large amounts.

Before this advancement, the insulin used to treat diabetes exclusively came from the pancreases of cattle (bovine insulin), pigs (porcine insulin), or a combination of the two. Researchers worked for decades to improve the purity of insulin and to develop such preparations which could provide longer-lasting action in the body. However, the animal insulin was never free from limitations. Some people suffered allergic reactions because of the protein impurities, while others

gets destroyed in the stomach during digestion, and cannot get into the bloodstream.

Types of insulin

Many types of insulin are used, and they differ in the time it takes for them to begin working and in the period for which they are effective.

Regular insulin: Regular insulin is clear or crystalline in appearance. It starts working quickly, by 30 minutes to 1 hour, is working at its hardest between 3 and 4 hours, and its action lasts for 6 hours.

NPH and lente insulin: NPH and lente insulin are cloudy suspensions. They start working later than short-acting insulin, and their effect lasts longer. They start working by 2 hours; work hardest between 8 to 12 hours, and their effect lasts for 24 hours.

Pre-mixed insulin: To suit different people's needs, pre-mixed insulin with varying proportion of regular and lente insulin, and other short- and intermediate-acting insulin are also available commercially. They usually start working in 30 minutes to 1 hour, peak in their action in 3 hours and again at 8 to 12 hours, and continue to work for 24 hours.

Ultralente insulin: A long-acting insulin, ultralente insulin is a cloudy suspension. It takes several hours to work, but the duration of its peak action is greater than that of other forms of insulin. It starts working by 7 hours, is effective for more than 22 hours, and its action lasts for up to 36 hours.

Insulin regimens

The type and dosage of insulin a person needs depends on the pattern of his or her disease. You may need one or two types of insulin on a daily basis. Mixing two types of insulin can mimic natural insulin production in the body more accurately. You might take a short-acting insulin to simulate insulin secretion at



type-1 diabetes, and is an effective medication for type-2 diabetes, when everything else seems to fail.

Sources of insulin

Nowadays, the most widely used form of insulin is synthetic human insulin. It is called human insulin because its chemical makeup is identical to that of insulin produced by the human pancreas, but this insulin is produced in laboratories with the help of special genetically

engineered bacteria which churn it out in large amounts. Before this advancement, the insulin used to treat diabetes exclusively came from the pancreases of cattle (bovine insulin), pigs (porcine insulin), or a combination of the two. Researchers worked for decades to improve the purity of insulin and to develop such preparations which could provide longer-lasting action in the body. However, the animal insulin was never free from limitations. Some people suffered allergic reactions because of the protein impurities, while others

Why only shots

Insulin is always administered by injection, even though you might use a syringe, an insulin pen, or an insulin pump. It is not available in pill form because it

mealtime and a longer-acting insulin to mimic basal insulin secretions. Your doctor will guide you in deciding the insulin regimen which will work best for you. Several types of insulin regimens exist:

Mixed dose. You inject both short-acting and intermediate-acting insulins – mixed in one syringe – each morning.

Premixed single dose. You inject a dose of premixed insulin each morning.

Split dose. You give yourself two injections of intermediate-acting insulin each day. These injections are usually given before breakfast and before the evening meal, or before breakfast and at bedtime.

Split mixed dose. You give yourself two injections that contain a combination of a short-acting and an intermediate-acting insulin – mixed in one syringe – each day. These are generally given before breakfast and before the evening meal.

Split premixed dose. You give yourself two injections of premixed insulin daily. These are usually given before breakfast and before the evening meal, or before breakfast and at bedtime.

Using insulin

When first diagnosed with diabetes, you may feel frightened or nervous about

injecting yourself with insulin. That's natural. Learning about the process and doing it a few times will help you feel more comfortable.

Select the site: It is safe to inject insulin into any area of the body where a layer of fatty tissue is present and where large blood vessels, nerves, muscles and bones do not course close to the surface. However, since insulin is absorbed most evenly from the abdomen except for the 5-cm area around the navel, it is best to administer insulin in your abdomen. Rotate the site of each injection each time. You may also use other areas for injection, such as your hips, buttocks, upper arms and thighs. After you determine the site for your insulin injection, clean it with an alcohol wipe, and allow it to dry before giving yourself an injection.

Prepare well: Collect the materials you will need: alcohol wipes, insulin and the syringe. Check the insulin bottle for any changes in the insulin. Make sure no clumping, precipitation or change in clarity or colour has occurred. Any changes in appearance may mean that the insulin has lost potency. Now, wash your hands with soap and water.

Draw insulin into the syringe: With time and practice, drawing insulin into the



syringe becomes routine. Here's how to do it: Gently roll the bottle of insulin between your hands to mix the insulin. Shaking it may decrease its potency. Wipe off the top of the insulin bottle with an alcohol wipe. Remove the needle cap from the syringe. Pull the plunger to draw into the syringe an amount of air equal to the amount of insulin you need. Insert the needle through the rubber stopper of the insulin bottle and push the air in the syringe into the bottle. While keeping the needle in the bottle, turn the bottle completely upside down. Pull the plunger on the syringe slightly past the number of units of insulin you are to inject. Be sure that you are withdrawing insulin, not air. Air is not dangerous but it can decrease the amount of insulin in the syringe. Remove air bubbles either by pushing the insulin back into the bottle and withdrawing it again or snapping the syringe sharply with your finger and then pushing the plunger to expel the air into the bottle. Check the amount of insulin in the syringe. Pull the needle out of the bottle.

Inject insulin: Now, it is time to inject insulin. Hold the syringe like a pencil. Quickly insert the entire length of the needle into a fold of your skin at a 90-degree angle. If you are thin, it may be



best to inject at a 45-degree angle. Release the pinched skin and inject the insulin by gently pushing the plunger all the way down at a steady, moderate rate. Place the alcohol wipe on your skin next to the needle and withdraw the needle. Apply gentle pressure with the alcohol wipe at the injection site for 3 to 5 seconds. Don't rub.

Minimize skin reactions, pain and bumps: Occasionally, especially when you first start using insulin, you may notice redness and slight swelling at the injection site. This irritation usually disappears in 2 to 3 weeks. To avoid this, let the injection site dry after cleaning it with alcohol. If the skin irritation lasts more than 2 to 3 weeks or causes you discomfort, talk to your doctor.

To minimize pain during injections, make sure the insulin is at room temperature. If it is too cold, it can cause pain. Relax your muscles in the area of the injection, and be quick in penetrating the skin with the needle.

Some people develop indentations, hard lumps or thickened skin in areas where they inject insulin. You can avoid this problem by rotating the site of your injections well.

Insulin pens

Insulin pens are extremely innovative. They are a convenient, accurate and discreet means of administering insulin. The device looks like a pen with a cartridge – but the cartridge is filled with insulin rather than ink. Some pens use disposable cartridges containing pre-filled insulin. Other pens are completely disposable. You place a fine-point needle on the tip of the pen, turn a dial to select the desired insulin dose, insert the needle under your skin and then click down on a button at the end of the pen to deliver the insulin. The pen can be easily transported in a purse, briefcase or a coat's long pocket.

Insulin pumps

Today, portable insulin pumps are also available. They provide a continuous supply of insulin, and eliminate the need for daily shots. Smaller than a deck of cards, they can be hooked to a belt. Essentially, a small pumping device that you wear outside your body, an insulin pump contains a syringe reservoir that you fill with insulin. A small, flexible tube connects the reservoir of insulin to a catheter that is inserted under the skin of your abdomen. The pump disperses the desired amount of insulin through the catheter into your body based continuously

by slow infusion. You can also programme the pump to deliver larger amounts of insulin during meals. Every second or third day you need to change the infusion site. To do this, you pull out the catheter and insert a new one at a different site. The reservoir that holds the insulin also needs to be refilled every few days.

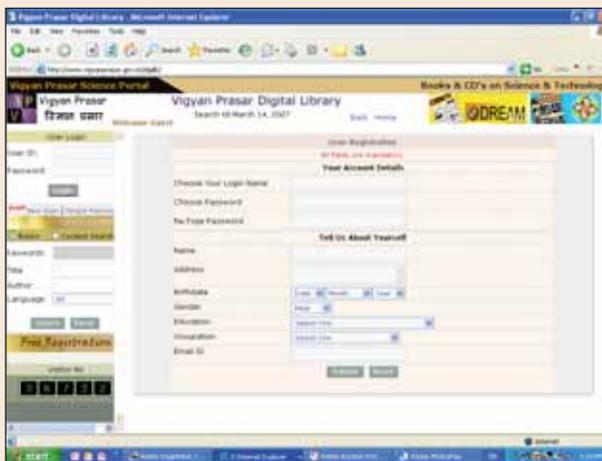
The main advantage of insulin pump is improved blood sugar control. The pump enables you to better match your insulin needs and insulin delivery. However, its use is not for everybody. It is expensive and you'll need some basic understanding and training, before you can use it well.

The possibility of insulin sprays

For past several years, bio scientists have been working hard at developing alternative ways to deliver insulin. Efforts are afoot to develop a special form of insulin that could be taken as a spray. Two types of inhaled insulin preparations are currently under experimentation. While one is deliverable through the mouth, the other could be received through the nose. However, it may still be several years, before researchers can perfect this new form of insulin and check whether it would be as effective and reliable as the currently available insulin. ■

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Recent Developments in Science and Technology

□ Biman Basu

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Phoenix lands on Mars

The landing of the NASA probe *Phoenix* on Mars on 26 May 2008 marked the first successful soft landing on the planet using retrorockets to soften the touchdown, as had been done for the landing of the Lunar Modules on Moon during the *Apollo* missions. All the earlier Mars probes, since *Viking-2* more than 30 years ago – including *Mars Pathfinder*, *Spirit*, and *Opportunity* – had crash-landed, using air bags for cushioning the impact. This is also for the first time that a space probe has landed near the polar region of Mars. Launched on 4 August 2007, the *Phoenix* mission is the first in NASA's Scout Program.



Fig. 1. This artist's concept depicts NASA's *Phoenix* Mars Lander a moment before its 2008 touchdown on the arctic plains of Mars. Pulsed rocket engines control the spacecraft's speed during the final seconds of descent. (Image credit: NASA/JPL-Caltech/University of Arizona)

The main objective of the *Phoenix* mission is to see whether the frigid polar region of the Red Planet has had the conditions to support microbial life – the presence of water in its liquid form, and key elements like carbon, nitrogen, phosphorus and hydrogen. A second key

goal of the *Phoenix* mission is to study the present and past climate of the Martian polar region, never before visited by a probe from Earth, to better understand how wind, temperatures and water in all its forms have shaped the planet's geology.

During its 90-Martian day mission (about 92 Earth days) the *Phoenix* will deploy a robotic digger to burrow beneath the Martian permafrost at the northern polar region to look for evidence of the building blocks of life. The *Phoenix* lander is designed not only to study the northern permafrost region, but also to take the next step in Mars exploration by determining whether this frosty region, which may encompass as much as 25 percent of the Martian surface, is habitable.

The solar-powered robotic lander will manipulate a 2.4-metre-long arm to dig trenches in the soil to get to ice that is believed to be buried up to 50 centimetres deep. Onboard laboratory instruments will then analyse the dirt and ice samples for traces of organic compounds, the chemical building blocks of life. Cameras and a Canadian-supplied weather station will send back to Earth other information about the site's environment. The daily weather reports from the *Phoenix* will include temperature, atmospheric pressure, cloud height, humidity and wind speeds.

Months after landing, the *Phoenix* would begin to shut down operations as

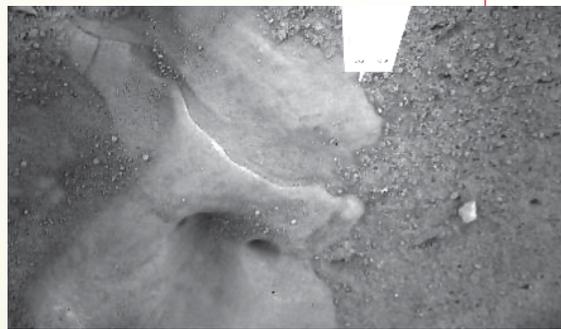


Fig. 2. Ice on Mars? This image, captured by the robotic arm camera aboard NASA's *Phoenix* Mars lander on 31 May 2008, shows an area with smooth surface and several smooth and rounded cavities that look remarkably like water ice.

winter sets in. Far-northern latitudes on Mars experience no sunlight during winter, depriving the solar-powered lander of electricity. Frost covering the region as the atmosphere cools will eventually bury the *Phoenix* in ice. But before that, scientists hope to get enough data from the probe to have new insights into the Red Planet's hitherto unexplored territory.

Hydroxyl molecule detected in Venusian atmosphere

The NASA probe *Venus Express* (launched on 9 November 2005) has detected the presence of hydroxyl (OH) molecule in the atmosphere of Venus. This is the first time that this reactive radical has been detected on another planet. The detection was made by the space probe's Visible and Infrared Thermal Imaging Spectrometer, VIRTIS (*Astronomy & Astrophysics Letters*, 15 May 2008). The hydroxyl radical is a very special and reactive molecule, which is difficult to detect. *Venus Express* detected these radicals in the upper reaches of the Venusian atmosphere, some 100 km above the surface. Scientists believe this detection will give

them an important new tool to unlock the workings of Venus's dense atmosphere.

Hydroxyl is thought to be important for any planet's atmosphere because it is highly reactive. On Earth it plays a key role in purging pollutants from the atmosphere. On Mars it is thought to help stabilise the carbon dioxide in the Martian atmosphere, preventing it from converting to carbon monoxide. On Mars it is also believed to play a vital role in sterilising the soil, making the top layers hostile to microbial life.

Detection of hydroxyl on Venus is also significant on another count. On Earth, a phenomenon of weak emission of light from the upper atmosphere caused by emissions from atoms and molecules ionised by solar radiation was discovered in 1868. Commonly known as airglow, it is also referred to as 'nightglow' because it is very faint and can only be seen during the night. In Earth's atmosphere, the glow of hydroxyl in the atmosphere has been shown to be closely linked to the abundance of ozone. Ozone is an important molecule for any atmosphere, because it is a strong absorber of ultraviolet radiation from the Sun. From the present observation by *Venus Express*, the same is thought to be true on Venus. Now, scientists can set about estimating the amount of ozone in the planet's atmosphere.

Nanomaterials may cause cancer

It was K. Eric Drexler, who promoted the technological significance of nano-scale phenomena and devices through speeches and the books *Engines of Creation: The Coming Era of Nanotechnology* (1986) and *Nanosystems: Molecular Machinery, Manufacturing, and Computation*. Research in nanotechnology gathered speed especially after the discovery of fullerenes and carbon nanotubes in the late 1980s. Soon, nanotechnology was hailed as the technology of the future and industry was quick to invest to

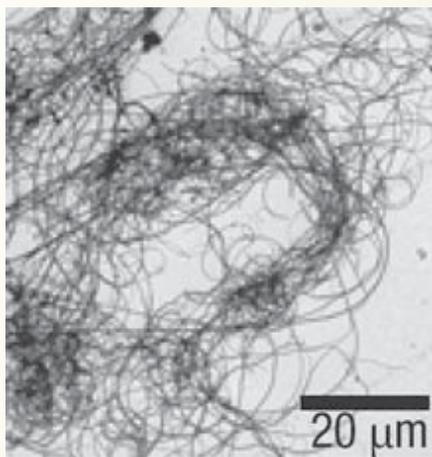


Fig. 3. Dangerous nanotubes: The long, multi-walled carbon nanotubes shown here can lead to inflammation, lesions, and cancer when they come in contact with mesothelial tissues that surround organs in the body, according to new studies performed on mice.

(Credit: Ken Donaldson, University of Edinburgh)

realise its potential. A wide range of nanomaterials are now available. They include personal care products, sunscreens, environmental catalysts, and antimicrobial products. Other applications include the use of carbon nanotubes in electronic gear, composite metal structures and consumer products. But now it appears not all is well with nanomaterials. Two recent reports suggest that carbon nanotubes – key ingredient of many nanotech products – may cause cancer. Both the studies were done on mice.

Carbon nanotubes – tube-shaped carbon molecules just tens of nanometres in diameter – have excellent electronic and mechanical properties that make them attractive for a number of applications. They have already been incorporated into products, such as tennis rackets and bicycles, and eventually they could be used in a wide variety of applications, including medical therapies, water purification, and ultrafast and compact computer chips.

But recent studies show that use of carbon nanotubes may not be totally safe. In one study, researchers with British institutes and the US-based Project on Emerging Nanotechnologies

found that commercial samples of carbon nanotubes behave like asbestos fibre, provoking inflammation and lesions (*Nature Nanotechnology*, 20 May 2008). The other study, done by a team of Japanese researchers, also showed that similar carbon nanotubes when ingested eventually led to cancerous tumours in mice (*Journal of Toxicological Study*, February 2008).

Fibres of asbestos, a fire-resistant material once widely used for insulation and fire-protection, has been known to cause mesothelioma, a cancer of a type of tissue surrounding the lungs. That is why the use of asbestos is banned in many countries. Carbon nanotubes that are straight and 20 micrometres or longer in length, which are well suited for composite materials used in sports equipment, resemble asbestos fibres. This has long led many experts to suggest that these carbon nanotubes might pose the same health risks as asbestos. But until now, strong scientific evidence for this theory was lacking. The recent studies now provide the evidence.

Matching genes to drugs

There has been much hype after the decoding of the human genome about personalised medicine – the concept that treatments could be tailored to a person's unique genetic makeup. But not much headway seems to have been made in making it a reality. Now new study led by Lecia Sequist, an instructor at Harvard Medical School and an oncologist at Massachusetts General Hospital Cancer Centre, offers an initial demonstration that cancer treatment can be tailored to the genetic profile of a patient's tumour. In a small clinical trial they treated patients with lung tumours after genetically screening them to identify those likely to respond to a targeted therapy. Those receiving a drug matched to their tumour genes fared better than is typically seen with standard chemotherapy (*Journal of Clinical Oncology*, 20 May 2008).

All drugs used for cancer chemotherapy today preferentially kill

cancer cells, but they can still be toxic to normal tissue and often have debilitating side-effects. Cancer researchers have been working toward the goal of developing drugs that could hit precise molecular targets in tumours, while being less toxic to normal cells. In recent years, new drugs for an aggressive form of cancer that affect the lungs have been developed that target a specific molecule in cancer cells, called the epidermal growth factor receptor (EGFR). But after a EGFR-inhibiting drug was released in the market in 2003,

larger trials showed that it did not lengthen survival for patients in the United States.

Increasingly, there is realisation that cancers arise from different genetic mutations and have different points of weakness that might vary from person to person. After further research it was found that there were specific EGFR mutations in the tumours of some patients that made them more susceptible to EGFR inhibitors. So, it was obvious that the drugs could provide a greater benefit to these

specific patients. In the reported study, researchers first screened patients with metastatic lung cancer for EGFR mutations and gave those with the mutations the option of receiving the EGFR inhibitor as a first treatment over chemotherapy. Among 31 patients who took the drug during the trial, 55 percent had their tumours shrink noticeably, as seen in a CAT scan, and all but two had tumours that either shrank or did not grow for at least a month. ■

Editorial (Contd. from page 35)

(31 May 2008) was "Tobacco-Free Youth". How about diabetes? While Type 1 diabetes is characterised by a lack of insulin production, Type 2 diabetes results from the body's ineffective use of insulin. Type 2 diabetes comprises 90% of people with diabetes around the world, and is largely the result of excess body weight and physical inactivity. Incidentally, India has the highest number of people with diabetes in the world – an estimated 19.3 million in 1995, projected to rise to 57.2 million by 2025.

Let us realise that chronic diseases do not affect only the high-income countries, and that chronic diseases need to be treated on equal footing with infectious diseases. Chronic diseases do not affect only the rich people. In low-income countries, the middle-aged adults are equally vulnerable to chronic diseases. Further, chronic diseases, including heart diseases, affect men and women almost equally. Since children or poor people have little choice in choosing their environment or healthy food, we all and the Government have a crucial role to play in improving the health and well-being of the people, and in providing special protection to vulnerable groups. Since the major causes of chronic diseases are known, at least 80 per cent of all heart disease, stroke and Type 2 diabetes and over 40% of cancer could be prevented.

In general, deaths from chronic diseases are projected to increase between 2005 and 2015. The projected increase in

the burden of chronic diseases worldwide is largely driven by ageing population and the large numbers of people who are now exposed to chronic disease risk factors. There will be a total of 64 million deaths in 2015, of which only 17 million people will die from infectious diseases, 41 million from chronic diseases; and the rest due to other factors. In particular, cardiovascular diseases will remain the single leading cause of death, with an estimated 20 million people dying, mainly from heart disease and stroke. By 2015, deaths from chronic diseases are expected to increase from 35 million to 41 million.

A recent report, *Preventing Non-communicable Diseases in the Workplace through Diet and Physical Activity* brought out jointly by WHO and the World Economic Forum says India will incur an accumulated loss of \$236.6 billion by 2015 on account of unhealthy lifestyles and faulty diet! There is no gainsaying the fact that the resultant chronic diseases will severely affect people's earnings. What would be the extent of income loss to our country? The income loss to Indians because of these diseases, which was \$8.7 billion in 2005, is projected to rise to \$54 billion in 2015. China, however, will be much worse off. While its accumulated loss will stand at \$557.7 billion, the loss of income of the Chinese will stand at \$131.8 billion, almost eight times what it was in 2005.

The report emphasises promotion and implementation of workplace health programmes globally. It says it is possible to influence the health behaviour of a large chunk of the population through

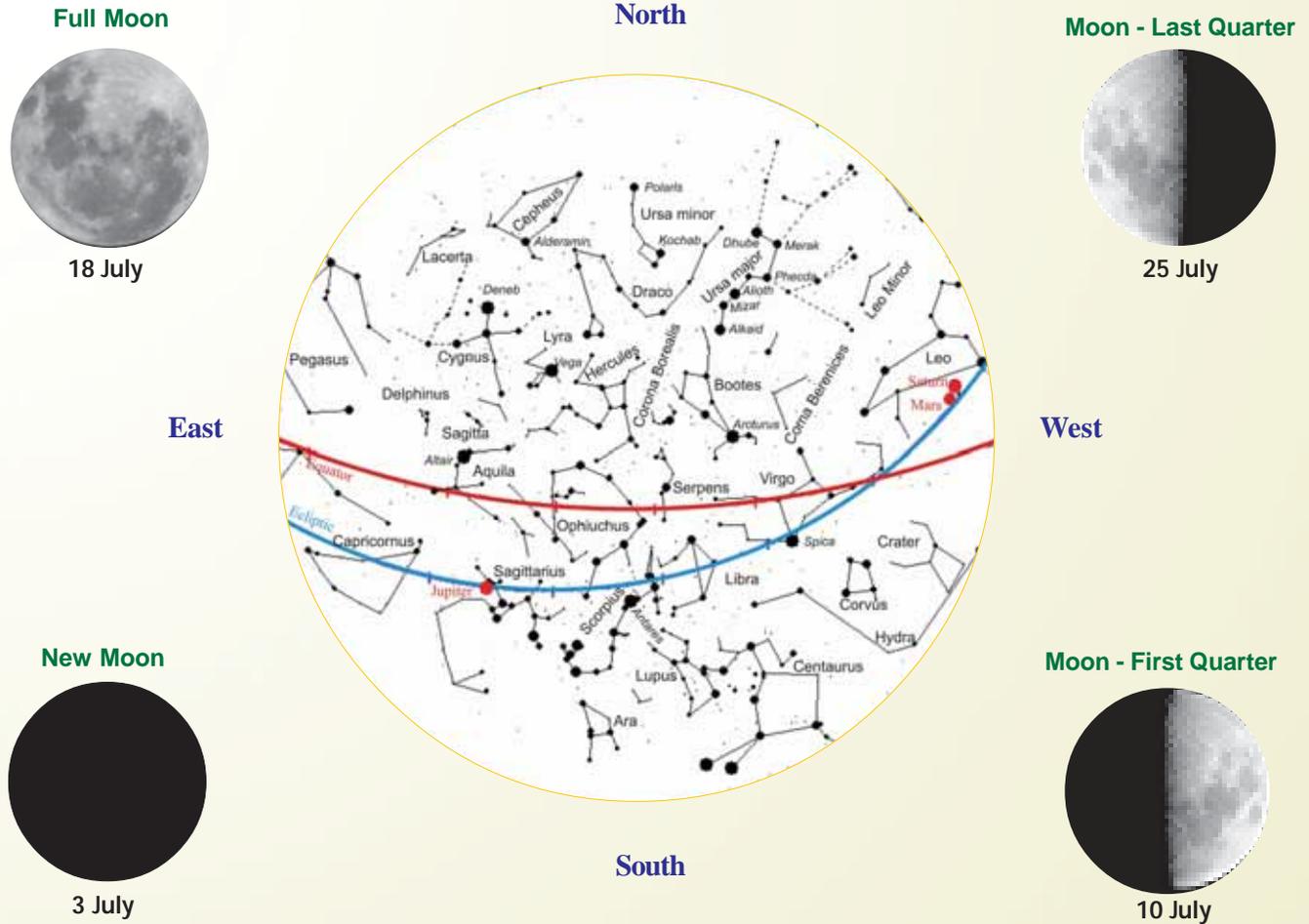
improvement of workplace environments. Workplaces should make possible healthy food choices and support physical activity, it says. The study cites scientific evidence that healthy diet and adequate physical activity – at least 30 minutes of moderate activity at least five days a week helps prevent non-communicable diseases.

India has already initiated a National Programme for Prevention and Control of Diabetes, cardiovascular diseases, and stroke through a pilot project launched in seven states. Ten per cent of adults in India suffer from hypertension while the country is home to 25-30 million diabetics. Three out of every 1,000 people suffer a stroke. The number of deaths due to heart attack is projected to increase from 1.2 million to 2 million in 2010! In view of the fact that lifestyles are equally important for infectious diseases, the health services need to integrate the response to chronic diseases along with the response to acute, infectious diseases.

What could we do to control the epidemics due to chronic diseases? Let us give up smoking and help our youth doing so. Let us avoid consuming high-calorie fast food and refrain from being a couch potato. And yes, regular health checkups – they are a must. Otherwise, it will only cut short our lifespan and cost the country dear. True, everyone has to die one day, and death is inevitable. But, a life of protracted ill-health is not. Chronic disease prevention and control could help us live longer and healthier lives.

□ Vinay B. Kamble

Sky Map for July 2008



The sky map is prepared for viewers in Nagpur (21.09° N, 79.09° E). It includes bright constellations and planets. 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 viewers 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 01 July, at 9:00 PM on 15 July and at 8 PM on 31 July.

Tips for watching the night sky :

- (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 constellations as shown in the map one by one.

Planet/Dwarf Planet Round Up:

- Mars:** In the constellation Leo (*Simha Rashi*) near Western horizon.
- Saturn:** In the constellation Leo (*Simha Rashi*) near Western horizon.
- Jupiter:** In the constellation Sagittarius (*Dhanu Rashi*) up in the South-Eastern sky.

Prominent Constellations: Given below are prominent constellations with brightest star therein (in the parenthesis). Also given are their Indian names.

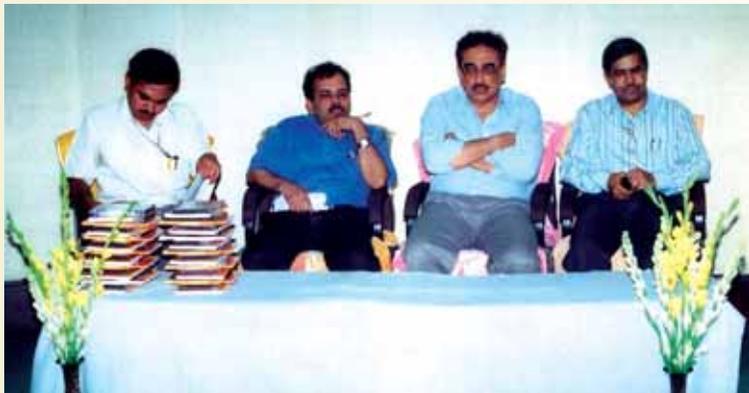
- Eastern Sky:** Aquila (Altair), Capricornus/*Makar Rashi*, Cygnus (Deneb), Delphinus, Lacerta, Sagitta.
- Western Sky:** Crater, Coma Berenices, Leo (Regulus) / *Simha Rashi (Magha)*, Leo Minor, Virgo (Spica) / *Kanya Rashi (Chitra)*.
- Southern Sky:** Ara, Centaurus, Corvus, Hydra, Libra / *Tula Rashi*, Lupus, Sagittarius / *Dhanu Rashi*, Scorpius / *Vraschik Rashi*.
- Northern Sky:** Cepheus (Alderamin) / *Vrashaparva*, Draco, Lynx, Ursa Major (Dhube) / *Saptarishi (Krutu)*, Ursa Minor (Polaris) / *Dhruvamatsya (Dhruvataraka)*.
- Zenith:** Bootes (Arcturus) / *Bhutaap (Swati)*, Corona Borealis, Hercules, Lyra (Vega) / (*Abhijeet*), Ophiuchus, Serpens.

□ Arvind C. Ranade
E-mail : rac@vignyanprasar.gov.in

Radio Serial on Science Fiction Stories

The 13-episode radio serial based on science fiction stories came to a grand close with the prize giving ceremony on 29th May, Friday at Akshvani Bhavan, Kolkata. Jointly produced by Vigyan Prasar and AIR Kolkata, the serial was broadcast

listeners. About forty winners were selected by draw of lots from among the correct responses. Twenty-two winners were invited to receive their prize in person on 29th May because of their proximity of residence to the station.



(From L to R) P. B. Bhattacharya, Dr. Subodh Mahanti, Dr. Amit Chakraborty & Sri Pradip Mitra

between January and March 2008 from six All India Radio stations, namely Kolkata, Santiniketan, Murshidabad, Siliguri, Silchar and Agartala. A Nepali version of the programme was also broadcast from AIR Gangtok and AIR Kurseong. The stories selected for the serial were of well-known Bengali science fiction writers including Adrish Bardhan,

The idea behind organising the prize distribution was to bring together a section of listeners, producers of the programme and those who transformed the stories into scripts for the programmes. Sri Pradip Mitra, Station Director, AIR, Kolkata, Dr. Amit Chakraborty, Formerly Fellow, Vigyan Prasar, P. B. Bhattacharya, Superintending Engineer, AIR, Kolkata



A section of the audience

Bimalendu Mitra, Aneesh Deb, and Nirendranath Chakraborty. Production of the serial was done at AIR, Kolkata by Dr. Manas Pratim Das, Transmission Executive. Questions were asked at the end of each broadcast in response to which hundreds of replies were received from

and Dr. Subodh Mahanti, Scientist 'F', Vigyan Prasar were present on the occasion and they made brief comment of different aspects of the programme. Soumyadeb Bose and Roddur Samaddar, juvenile actor who were associated with the programme, shared their experiences with the audience.

Letters to the Editor

Suggestion for topics

The articles published in the *DREAM 2047* and *VIPNET* are very interesting. The astronomy page entitled 'Sky Map' is also very interesting and informative. It will be a great help to your readers if you could start a new series to explain the fallacy of astrology in terms of our present knowledge of astronomy. This will help prevent the exploitation of innocent people by unscrupulous individuals in the name of astrology. I would also request you publish an article on the Indian calendar.

Chetan Dass

Shalimar Bagh,
Delhi-110088.

I have been a regular reader of *DREAM 2047* since 2003. The May issue was very informative and innovative. The editorial has nicely portrayed the challenges facing modern physics. The other articles are also good. Your magazine has been playing a revolutionary role in the dissemination of scientific knowledge in our country.

Udai Kumar Shaw

(Received by e-mail)

I am very much pleased to get a copy of *DREAM 2047* every month. It helps me to generate knowledge and spread it among the students and members of Jalpaiguri Science & Nature Club. The features are up-to-date and informative.

Dr. Goutam Ghosh

Kamar para, Distt.
Jalpaiguri,
West Bengal

Interactive CD on Innovative Experiments in Physics



Topics Covered

- Mechanics
- Properties of Fluids
- Heat & Thermodynamics
- Oscillation & Waves
- Electricity
- Magnetic effects of Current
- Electromagnetic Induction
- Optics

Some of the features of the CD:

- Search
- Sitemap
- Manual
- Video Clippings

The objective of this interactive CD is to illustrate and demonstrate a series of novel activities that may help enhance interest in physics amongst students and teachers.

It is expected that students of class VIII to XII would be able to perform most of the experiments using commonly available objects/equipment.

The experiments were jointly developed by Department of Physics, Indian Institute of Technology, Kanpur and Vigyan Prasar.

Price: Rs. 100/-
Postal Charges: Rs. 30/-

CD is available in Hindi and English

Emergence of Modern Physics

AN ACTIVITY KIT



The activity kit contains simple activities that explain the underlying concepts of modern physics. Attempt has been made to explain some of the abstract concepts like relativistic length contraction and time dilation, curvature of space-time, deflection of light through gravitational fields, photoelectric effect and so on through 28 innovative activities in this kit. The kit has been brought out both in English and Hindi.

Some following activities of the kit are:

- Characteristic Light emitted by Elements
- CD Spectroscope
- X-ray Images
- Application of X-rays
- Fluorescence and Phosphorescence
- Discovery of Radioactivity
- Radioactive Decay
- Radioactive Decay and Transmutation of Elements
- Simple Electroscopes
- Emission and Absorption of Radiation
- Classical Mechanics and Quantum Mechanics : a ramp and a staircase
- Electron Orbits in an Atom
- How Atoms Absorb and Radiate Energy
- Photoelectric Effect
- Electromagnetic Spectrum

Price: Rs. 130/-
Postal Charges: Rs. 30/-

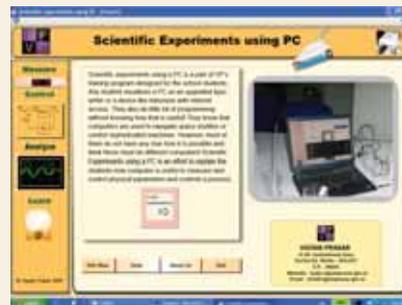
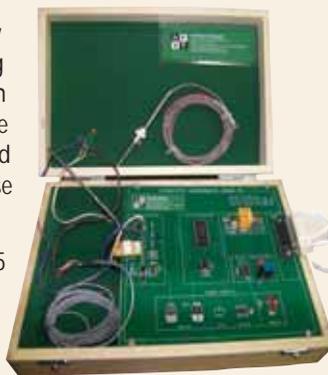
Kit is available in Hindi and English

Scientific Experiments using PC

Vigyan Prasar is engaged in the development of new training modules/ methodologies/ equipment/ devices for S&T communication. Scientific Experiments using Computer is a novel effort to explain to the students how computer is useful in measuring and controlling physical parameters and processes.

VP has developed a PC interface to do a number of experiments on temperature, light, sound, humidity, pH etc. Through this interface not only physical parameters can be measured, controlling the same within set value is also possible through closed loop feedback control mechanism. The interface provides real time plot of the measured parameter and data is stored in backend database for data analysis.

A kit is now available which include about 15 experiments.



Some of the experiments

1. Experiments on Temperature
2. Experiments on Light Intensity
3. Experiments on Humidity
4. Experiments on Sound Intensity
5. Experiment on pH
6. PC as Multimeter
7. Oscilloscope Limited Applications

To know more about the kit please write to:



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