Computer Astrology Puts The Stars on Screen

It has long been debated whether astrology — looking to the configuration of the stars and planets for hints of things to come — is a science. In Sri Lanka, where astrology is traditionally taken most seriously, a former schoolteacher has embraced modern science by using a computer to make his astrological predictions more accurate. Gemini News Service reports on the tremendous potential of computerised astrology in a star-struck nation. by Dr Sanjiva Wijesinha

TALL and scholarly-looking Sumethrananda appears very much the retired village schoolmaster that he is. In retirement, the scholar's mind is busier than ever as he develops a fascinating hobby into a potentially lucrative enterprise.

He is rapidly gaining fame not only in his small town of Gampaha, in Sri Lanka's Western Province, but also in the rest of the country, as the man who has modernised astrology by reading the stars with the aid of a computer.

His improvised system links a 48-kilobyte home computer to a portable audio cassette player, using audio tapes instead of the more expensive floppy discs, and has an ordinary 14-inch black and white television set as the visual display unit.

A lifetime of studying astrology as a hobby has made Sumethrananda quite an expert. However, because the scientific application of astrology requires detailed mathematical calculations, he could not during his teaching days devote as much time as he liked to this intriguing hobby.

"The first time I saw a computer at an exhibition, I was fascinated by it," he says. "The more I studied computers, the more I realised they could be utilised with efficacy in astrological calculations."

After getting his computer in 1979, Sumethrananda wrote several programmes on various aspects of astrology.

Sri Lanka is by tradition a star-struck nation. Most people neither make major decisions nor begin important ventures without first consulting the planets. So Sumethrananda's modernisation of the astrological art has tremendous potential.

Taking the date, time and place of birth to an individual, he makes the necessary calculations to ascertain that person's lagna, or zodiacal sign.

Under the Western system of astrology, everyone born during a particular month has the same astrological sign. For example, everybody born between March 14 and April 13 would be classified under Aries, while those born between April 14 May 14 would come under the sign of of Taurus.

The Eastern system of astrology is much more complicated — and therefore, claim its followers, more scientific and accurate. While the year is divided into twelve signs, each day is in turn divided into twelve two-hour periods, each governed by one of the twelve signs.

So a person born at 8.15 am on July 1 would have a lagna entirely different from somebody born at 10.15 on the same day, and different from somebody born at 8.15 am on, say, July 21.

For an astrologer armed with only pencil and paper, the precise calculation of a person's lagna takes considerable time, but for a computerised stargazer, all the paperwork can be done in a matter of seconds.

Once the zodiacal sign is accurately determined, Sumethrananda's computer programme means that pressing a further couple of keys will bring on to the screen a "general reading" — a broad prediction of events within that person's life.

Although astrology is Sumethrananda's first love, it is not his main source of income. He depends for his daily bread on his teacher's pension and the earnings from a horticultural business he started after he retired. The 25 to 30 people who come to him each month for astrological readings pay 50 rupees each (about US$1).

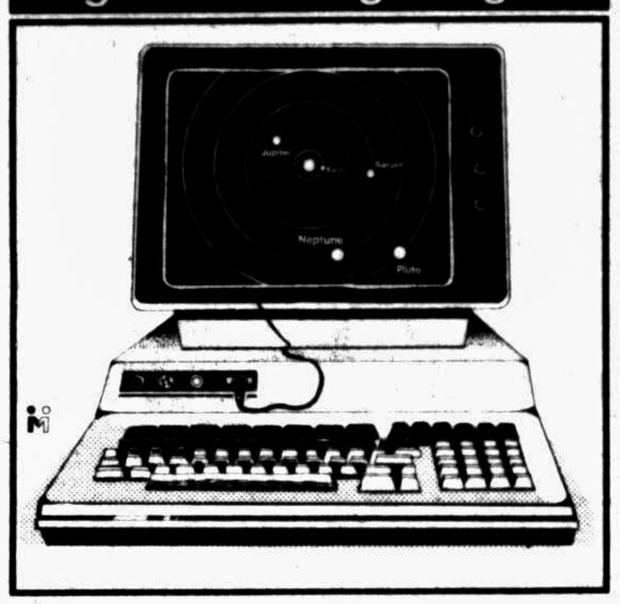
Astrology, claims Sumethrananda, is not a matter of guesswork or hocus-pocus; it is a science based on logic. He says: "I have observed that if something happens to me at a particular time, it will happen again the next time the planets are in the same position.

"For example, if I buy a lottery ticket that wins me a prize, I should note down the time I bought it and calculate the planetary configurations at the time. If I buy another ticket the next time the planets are in the same position, I would be sure to win."

— GEMINI NEWS

Exchange Rate : $1 = 41.7 Rupees

High-tech stargazing



Virtual Reality : Journeys Into Computer-generated Worlds

A revolution is brewing in the field of human-computer interfacing. Now a frontier research are in computer applications, virtual reality technology, is a new form of realistic simulation. It promises to transform approaches to architecture, engineering design, medicine and even entertainment.

Virtual reality allows humans to journey into computer-generated three-dimensional environments, called a virtual environment, created with the help of computers and special electronics.

To move into a virtual environment, a user has to wear a headset that looks like a helmet equipped with goggles, and a handglove. Both are linked to the computer that creates the virtual environment.

The computer calculates and creates the images of the virtual environment and presents them on two miniature television screens located within the goggles. The computer-generated images that appear on the two screens are presented slightly different from one another. This is done to reproduce the stereoscopic, three-dimensional effect of normal vision which results from the fact that neither of the two eyes perceives the same thing from exactly the same perspective.

As the head is turned with the goggles on, the viewer sees scenes in the virtual environment from different angles all around — a 360 degree effect that gives the viewer the impression of being completely enveloped by the computer-generated environment. This is achieved through electromagnetic sensors on the headset that monitor the changes in the orientation of the head and the viewer's gaze and transmits this information to the computer. The computer instantly recalculates the images that must be presented on the two screens.

Virtual reality technology when fully refined with allow a user to actually manipulate objects in the virtual environment, instead of remaining a passive observer.

American researchers are working on a handglove that will enable a user to pick up or grasp objects in the virtual environment. The glove could also be used to move real things through remote controlled robots linked through virtual reality. In pioneering research, scientists at NASA's Ames Research Centre have developed what is called a virtual 'interface environment workstation (VIEW), a wide-angle, head mounted, stereoscopic display system that presents an image very similar to human binocular vision, according to a report in the journal Byte.

Scientists believe virtual reality has wide and diverse range of potential applications. It will provide realistic simulation for pilots and doctors, in industrial design it will be a new and relatively inexpensive mode of studying models in three dimensions.

Architects are expected to be among the first users of virtual reality. With this technology, architects would be able to design buildings on a computer and then "enter" them to see how they look from the inside. To enter the computer-generated environment, the architect would have to wear a data suit, a full body outfit covered with optic fibre sensors that would monitor the motions of the wearer and send signal them to the computer. The computer would then send back images of the building from inside through the screens on the goggles.

The technology is also expected to find a place in medicine. Initially it would only be a training tool for medical students. A surgeon wanting to practice a delicate and complicated operation could don the headset and handglove begin operating on a virtual patient in a virtual operating theatre. Virtual reality also opens up the possibilities of surgery through remote-controlled robots.

In education, it could be used to make difficult concepts like theories of quantum physics easier to understand for students. Visual representations of such complex concepts could increase comprehension among students.

— GSM.

Intelligent Materials

By Dr K S Jayaraman

AN aircraft begins to lose height as sudden ice formation increases the load on its wings. An in-built sensor on the wings signals a microcomputer to change the configuration of the aircraft for more lift.

Walls of an office building begin to develop stress due to a hurricane but the in-built sensors immediately activate braces to prevent the walls from swaying.

A room gets overheated by sunlight and immediately the window glass changes colour to reflect sunlight bringing the room temperature down.

These are the intelligent or smart materials that respond to their environment just as a chameleon's skin adapts to its surroundings or like a tree leaf curling protectively in a drought.

Man's increasing ability to create new materials by manipulating the atoms of molecules of existing ones is revolutionizing our world. But todays materials — natural and man-made — have one drawback : they are unable to warn of problems or impending failure of the structure built with those materials.

All over the world scientists are trying to produce "Smart" materials that have in-built intelligence not only to sense the impending failure but also to take corrective action.

Photochromatic glass is one such smart material. It darkens in bright sunlight to lessen the glare in spectacle lense than clears quickly when the wearer moves out of the sun.

Another class of intelligent materials is the shape memory alloy (SMA) so called because it can be deformed or distorted in any fashion but remembers its original shape to which it reverts when heated to a right temperature.

The Japanese have invented a brassiere reinforced with frame of shape memory alloy that would collapse while the garment was being laundered but regain its precise shape and size before it was worn again.

Already in market are heat shrinkable plastic sleeves made through the process of irradiation. These sleeves are ideal for insulating electrical and telephone cables because they shrink when exposed to heat tightening the grip on the wires and providing an excellent seal.

A nickel-titanium alloy called NITINOL is the most commercially important SMA. The ability of this alloy to revert to original shape when heated to right temperature is exploited to create a variety of products like nails, suture clips, splints (used in bone surgery) and self-spreading satellite antenna.

The shape memory effect remained a curiosity since 1932 until 1969 when an American company under a military contract developed the pipe connectors for F-14 combat aircraft using SMA containing nickel and titanium.

A Japanese company has introduced heat detection springs made of SMA. These springs installed in air conditioning ducts are designed to detect heat and to shut off ducts to prevent smoke, flame, and poisonous gases from reaching other rooms.

Applications of SMA are several. Clamps made of SMA can open and close without any mechanical strains. Plane surface could be covered with bumps and indentations. Straight wires can take spiral shapes.

In the biomedical sector, especially in orthodental field, the super elastic effect of SMA is already in use for making arches.

The SMAs are also expected to bring about radical changes in the field of constructions, aeronautics, space and optics. Even the art world is taking an interest in these remarkable materials.

The French firm "Sourian" which has been actively concerned with SMA since 1983 in now trying to develop copper based memory alloys. Another firm "Cezus" which makes 20 kg to 50 kg ingots of SMA is now planning to manufacture semi-finished goods : bars, wires, sections, plates, sheets and pipes.

Of late the shape memory effect has been discovered in resins and rubber.

Four Japanese companies have developed a shape memory resin called "ASMER". At room temperature it behaves like a resin while at temperatures above 60 degree (C) it behaves as a rubber.

The companies anticipate a wide range of commercial applications for asmer from acoustic insulation and vibration control to shoe padding and artificial flowers.

In India the Surana Udyog group of industries has established a new unit in Hyderabad for indigenous manufacture of heat shrinkable cable jointing kits and plastic wire connectors.

Other SMAs are yet to attract Indian industry but they have already been developed at the Bhabha Atomic Research Centre (BARC) and the National Metallurgical Laboratory in Calcutta.

At BARC work is going on to develop Nitinol SMA hydraulic pipe coupling and fasteners using SMA. BARC scientists have also produced a rotary shape memory heat engine generating up to 70 rotations per minute.

Scientist have also developed a line of intelligent polymers or gels that could prove useful in a range of applications from self focusing contact lenses to miniature systems for delivering drugs to specific parts of the body.

The latest gel developed at the Massachusetts Institute of Technology in the United States is unique. It shrinks to one thousandth of its original size when exposed to visible light from a laser and then swells back once the light is removed. Scientists say the gel could contribute to the field of electro-optics in novel switching or memory devices or might form the basis of artificial muscle.

Scientists are talking about next generation of materials that will have built in "software". These intelligent materials will be able to detect changes in their environmental conditions (sensor function) make their own judgments (processor function) and give instructions or take actions themselves (effector function).

For example, an intelligent structural material will self diagnose a defect, indicate the defect by a colour change or noise emission before a serious accident occurs, and may even attempt self recovery by rectifying the defect itself.

If such materials can be produced, it is expected that epoch- making technical innovations will occur in the fields of electronics, medical treatment, biotechnology and safety engineering.

Japan has established the Intelligent Material Forum and launched a five-year research programme aimed at "the creation and production of structural materials with intelligent functions."

In Britain, a Smart Structures Research Institute has been set up at Strathclyde University in Glasgow. It is expected that all new bridges to be built in Europe and the United States will incorporate smart structure techniques making it possible to monitor them remotely and receive automatic warning of impending structural failure. The smart structure technology also has promising applications in the field of pipelines for water, oil and gas.

Dr K S Jayaraman is PTI Science Editor based in New Delhi.

Cells Aid In Vitro Fertilization

Despite more than a decade of experience, the success rate of in vitro fertilization (IVF) in the United States, Britain, France, Australia and other major centres remains stubbornly low.

The initial birth in Singapore from fertilization outside the human body was in 1983, four years after the world's first IVF baby was born in Britain.

Using the standard IVF technique of mixing sperm and eggs in the laboratory before implanting the embryo in the human womb, nearly 29 per cent of the women treated by the Singapore General Hospital's centre for assisted reproduction were able to conceive and successfully carry their pregnancy to full term.

But although this was one of the highest rates of any country, it still means that an average of less than one in three of the women unable to conceive naturally can have a child with the aid of modern reproductive technology.

Research being carried out at the National University Hospital in Singapore suggests that a promising avenue for increasing the rate of test-tube fertilization, and then carrying it through the full cycle of pregnancy to healthy live birth, is to replicate a key part of the human womb in the laboratory.

In a series of experiments since 1988 that were reported in the British mediel journal Human Reproduction, a National University Hospital research team headed by Arif Bongso, associate professor in the hospital's department of obstetrics and gynecology, has succeeded in cultivating cells of the fallopian tube and using them as a bed for producing successful IVF pregnancies.

Under natural conditions of human reproduction, eggs released by the ovaries into two fallopian tubes on either side of the uterus are fertilized by sperm deep inside the tubes.

Five days later, a fertilized egg in embryo form emerges from one of the tubes and attaches itself to the wall of the uterus to grow into a baby.

Dr. Bongso said it appeared from research carried out by his team that standard IVF techniques enjoyed less than optimal success because they failed to replicate at least some of the conditions of the natural environment of the fallopian tube.

Within the tube, long hair like cells called cilia aid fertization by helping to bring sperm up to the point where they meet and penetrate eggs. The cilia then assist the embryo to travel down the tube and enter the uterus.

The shorter hairs in the fallopian tubes, known as microvilli, release nourishment for the growing embryo on the downward journey as it multiplies rapidly into a more complex cell structure.

A majority of women who turn to IVF for conception have fallopian tubes that do not function properly. In the standard technology, sperm and eggs are mixed in a tiny dish containing a culture made up of a nourishing cocktail of salts, proteins, glucose, carbohydrates and sometimes hormones.

To prevent possible premature death, the fertilized eggs are removed from the dish after only two days and placed in the uterus.

Dr. Bongso said that on average only about 25 per cent of the two-day-old fertilized eggs produced in this way survive to reach the five- day stage when, under natural conditions, an embryo travelling down the fallopian tube would attach itself to the wall of the uterus.

"We are trying to develop an environment outside the womb in which an embryo will grow very well to five days old and then be placed in the uterus so that it will implant immediately," he explained.

Dr. Bongso said that there had been a marked improvement in the longevity and quality of fertilized eggs when they were placed on beds of fallopian tube cells. Using embryos from the same women, 69 per cent had reached the five-day stage of tube cell linings, compared with only 33 per cent in a traditional IVF culture medium.

Bonding with Hi-Tech Adhesives

By T V Padma

THE world of adhesives is undergoing a sea change. From glues, gums and pastes, it has given way to hi-tech chemical sealants and adhesives that are fixing vital electronic, automotive and aerospace components.

Both adhesives and sealants are essentially substances that adhere to one or more surfaces, though sealants must remain flexible and also prevent the passage of liquid or gas between surfaces. This holding together of materials by surface attachment is very ancient, but advances in the past few years are leading to hi-tech adherents and sealants of use in the automotive, aerospace and electronic industries.

Originally, adhesive bonding was achieved through naturally occurring materials such as coal and pine tars, animal protein, blood albumin, glue, mucilage and paste. The oldest type of adhesives are those of natural origin, such as starch, asphalt, gelatinised collagen, vegetable proteins, plants saps and resins, rubber and shellac.

Modified natural products such as portland cement, dextrins, nitrated and acetylated celluloses or starches, and fatty amides came next. In the mid-1930s, advances in organic chemistry led to the development of phenolic resins, urethanes, polyvinyl esters and epoxy resins.

Now new hit-tech chemical adhesives are finding a wide range of applications in wood bonding, packaging, tapes and labels, industrial assembly, and biomedical and dental equipment. They are also rendering services in transportation and electronic industries, according to a report in the journal "Chemical and Engineering News". Although these new synthetic adhesives resemble modified natural products, they perform better.

For an adhesive to have practical application, it must be at some point be a liquid during the formation of bond in order to wet, spread and form a continuous film.

Once the adhesive has been brought into intimate, continuous contact with the substrate, the adhesive must pass through a transition into a tough, non-flowing, non-liquid, load-bearing interlayer in the bonded assembly.

Other necessary features include a measurable shelf-life reasonable cure time and temperatures, relatively non-toxic and non-polluting constituents and an ability to tolerate the bonding of imperfect, mating surfaces.

The use of adhesives in the automotive, aerospace and electronic markets has been growing in recent times, having almost doubled in the past eight years.

Across the globe, the automotive industry is replacing its metal components with engineering plastics, and more plastic parts means fewer nuts, bolts, screws or welds, and more adhesive bonds. Chemical or adhesive bonds extend across continuous seams instead of concentrating stress at bond points as metal fasterners do.

In new models of cars the rear deck, hood, and roof sections are all bonded assemblies of flat exterior sheet to plastic reinforced section beams. Almost 5 per cent of all exterior panels are plastics today, and experts estimate the figure to shoot to 50 per cent by 1995. Besides, bonded composite leaf springs, thermoplastic head lamps and plastic lift gates are in use now.

In acrospace, chemical bonds provide the best way to bond metal and plastic components is the construction of military and commercial aircraft. Chemical bonds also offer a light weight alternative to metal fasteners, besides making possible the construction of high technology radar transparent aircraft like stealth bombers.

In the field of electronics, new conductive adhesives are increasingly substituting solder attachment of electronic components, while new "snap cure" adhesives that cure almost instantaneously on exposure to heat are providing quick attachments of electronic components on higher assembly lines. Chemical bonds also make possible circuits that utilise materials with different coefficients of expansion.

The world wide food packaging industry is also accelerating the process of replacing metal and glass rigid food containers with flexible multilayer laminated plastic containers. Some examples of these include the flexible adhesive-bonded fruit juice packages, the flexible, vacuum-sealed plastic containers for fresh-ground coffee, and multiple applications of laminated lid stock for rigid plastic containers.

Research and development in the major areas of automotives, aerospace and electronics is aiming at eliminating or substantially reducing volatile organic components is solvent systems to reduce their contribution to atmospheric pollution. This is especially important in auto and truck assembly operations which use large volumes of adhesives.

New adhesives being used by leading US manufacturers in automotives cure without giving off volatile organic compounds, and form gas and water-proof seals. These adhesives form a tough flexible bond with a 50 per cent elongation rate.

Another system designed in the US includes machinery and a proprietary solventless ferromagnetic chemical material which delivers a structural, leak-proof and pressure-tight seal via an induction process. The system is essentially used to form filters.

New acrylic pressure-sensitive adhesive coatings allow automakers to fix dash components, emblems, pin stripes and other decorative trim to the car. Acrylic adhesives are clear, and ultra-violet light-resistant, besides being resistant to gasoline, airborne chemical contaminants and heat. These adhesives make possible new backlit dashboard graphics, and body mouldings fixed to the side of a car with these adhesives replace rivets in drilled holes, thus eliminating rattles.

Some firms abroad are also making double-sized acrylic foam tapes not only to fix body side molding, but also for instrument, trim door panel, weather strip attachment. In addition to saving assembly time, the tapes also offer a durable assembly between the molding and the metal or plastic substrate to which it is fixed. These foam adhesives include modified epoxies, phenolics and polyimides.

Polyimides are finding use in aerospace engines as lightweight replacements for titanium fasterners, in engine cores, ducts and pipes.

Others in the market are paste adhesives used for hood, deck and door assemblies, and antiflutter adhesives based on neoprene which eliminates the need to drill holes to fasten the assemblies.

The use of structural adhesives is growing rapidly in automotive assemblies, particularly in the case of robotic installations. Experts are also designing silicone adhesives for bumper and headlamp assemblies, and their research and development efforts are concentrated on blending silicones with organics to form hybrids that have the strength of an organic and the flexibility of silicone.

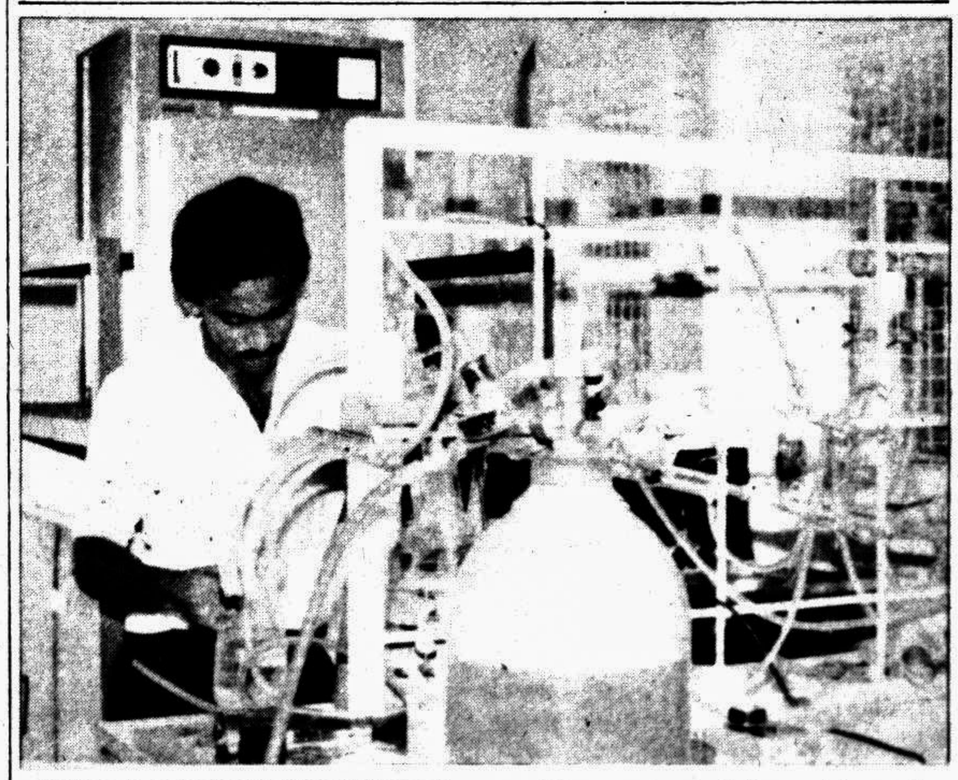
Because silicones can withstand thermal cycling well, they are ideal for automotive underhood adhesives and are in wide use in ignition modules where a ceramic thick film hybrid component is mounted to an aluminium back plate with a silicone adhesive.

Silicones' widespread use in electronic assemblies will continue to rely on their low modules, elastic properties and low toxicity to workers.

Polyurethane adhesives are another category of adhesives that are emerging in the forefront of adhesive research, along with hot-melt adhesives and electronic adhesives.

Electronic adhesives offer several overriding advantages : they are pure, and the volatile organic compounds are lowered or eliminated.

The drive is one to come out with adhesives with improved purity, lower volatile organic and choloride contents to reduce corrosion potential and worker exposure, and incorporate safer chemical such as diamines as the industry gears itself to meet hi-tech requirements. — *PTI Feature.*



Isotopes in everyday life : Distillation units are used for ground water before enrichment for natural tritium.