

# Asia-Pacific Telecom Uplift at Fast Clip

What is needed are engineers who thoroughly understand existing and emerging technologies, as well as modern management techniques

It may be that the days of the friendly postman are over as telecommunications takes a quantum leap into the future.

Well, not really in predominantly rural Asia. But the Philippines has just introduced an innovation in its otherwise staid — and slow — postal service.

The Postal Service calls it "fax mail", otherwise known in other countries as electronic mail. Local telephone companies have long offered the services of facsimile machines but this is new for the post office.

Initially, fax machines will be installed in post offices in seven major cities, including Manila and Makati (the country's financial centre). But the ultimate goal is to create highly reliable telecommunications exchanges.

This will include electronic remittance, electronic bulk mail, electronic data interchange, and so on — both for domestic and international services.

Technical assistance will be provided by the Universal Postal Union (UPU) and the United Nations Development Programme (UNDP).

At the same time, a bright future is also predicted for the country's dismal telephone system. The Philippines has one of the lowest telephone densities in Asia — with only 1 connection for every 100 people.

Only Indonesia has a lower telephone density (0.4 per 100 people). But then it is the largest archipelago in the world and one of the most populous. In comparison, Japan has 39 telephones per 100 people.

Hong Kong has 34 telephones per 100 people; Singapore, 31; Taiwan, 24; South Korea, 18; Brunei, 9; Malaysia, 6; and Thailand, 1.

Transportation and Communications Secretary Pete Prado says that by the year 2000, the telephone density in the Philippines will increase to almost four per 100 people, with 2.37 million telephones serving the country.

In 1988, the government invested about US\$20 million to develop local telecommunications. But this is still low compared, for example, with the almost US\$1 billion invested by Thailand and US\$1.8 billion by South Korea to upgrade their telecommunications facilities.

There are 44 independent telephone companies in the Philippines. But only a few have electronic or digital capabilities. Most companies still use manual equipment. Some of these companies operate only about 200 lines while a few — like the Philippine Long Distance Telephone Co. and the Philippine Telephone Co. have 1,000 to 10,000 lines.

Mr Prado estimates that for the Philippines to attain a telephone density of 3.8 per

100 people, it will need to spend US\$ 315 million a year over the next 10 years. He says this may not be shouldered by the government alone; privatisation will have to play a role.

Privatisation is the trend in several countries, as in the Philippines. Malaysia's Syarikat Telekom is moving towards privatisation, with 20 to 30 per cent of its stocks to be sold. Singapore Telecom is also in the early stages of privatisation.

In Japan National Telegraph and Telephone has 35 per cent of its shares privatised. South Korea plans to sell 15 per cent of Korea Telecommunications Authority. New Zealand has completely privatised its Telecom Corporation. The UN International Telecommunications Union says the number of outgoing international telephone calls in the region has increased 12 times in the last ten years. The average annual growth rate of telephone traffic is about 33 per cent.

It is estimated that the region is adding per capita access line at a rate of 6 per cent which is almost double the rate in North America,

says Chao Thongma, executive director of Asia-Pacific Telecommunity. "Several countries in the region are increasing their capacity at a much higher rate."

Southeast Asia is the region with the fastest growth in the export of telecommunications products. The fastest growth are in South Korea (US\$ 460 million) and Taiwan (US\$ 400 million).

The United States has a trade deficit in telecommunications equipment of over US\$1 billion. Telephone hand sets are provided by Southeast Asian countries while satellite equipment come from Japan.

Mr Thongma says "telecommunications grows faster than the economy and its impact on the economy is a differentially accelerated one. The strong correlation between the per capita GDP and telephone densities of the countries clearly demonstrates the impact of telecommunications on the development of national economies."

Still, "there is a widespread lack of efficient telecommunications networks in the region, not to mention the massive disparity between rural and metropolitan areas,"

says prof. Dr A. B. Sharma, chairman of the Asian Institute of Technology's Division of Telecommunications. "New technologies are appearing faster than they can be absorbed by developing countries."

AIT's Division of Telecommunications itself is new — it opened only in 1990 — and designed specifically for the region. "Our job is to train engineers who can plan, administer and manage with the latest telecommunications systems and network," says Dr Sharma. "They must have sufficient know-how to be able to integrate new technologies into existing networks."

The Division of Telecommunications Master degree courses will emphasise modern communications and management skills like systems planning and engineering, management of telecommunications technologies, software development, administrative and financial management as well as management of telecommunication resources.

There are five specialisations: transmission system; switching technology; telematics, network planning; and telecommunications management.

"We are here to provide a world-class education, with a distinctly Asian focus, for the countries of the Asia-Pacific region," Dr Sharma says. "What is needed are engineers who thoroughly understand existing and emerging technologies, as well as modern management techniques applied to telecommunications." — Depthnews Asia

# THE RIES MYTH UNFOUNDED?

Amongst the many theories regarding the extinction of dinosaurs 65 million years ago, two are of particular interest. One theory is that a huge meteorite collided with the earth, the other is that there was an enormous volcanic catastrophe, both of which may have led to abrupt climatic and environmental changes. Biological evidence of the consequences of a meteorite catastrophe which occurred "only" 15 million years ago has led to renewed speculation regarding this subject.

The location of the investigations being carried out by Professor Kurt Haeig and colleagues at the Universitat Munchen, is the Nordlinger Ries in the south of the Federal Republic of Germany. The Nordlinger Ries is a crater of 24 kilometers diameter which was stamped out of the ground 15 million years ago by a meteorite of approx. One kilometer diameter. This meteorite released more energy than the world's combined nuclear weapons could. The Munich paleontologists have been researching the effects of this catastrophe on plant and animal life since 1984.

Outside the immediate surroundings of the crater, the Ries impact has left the so-called Breckhorizont: layers of limestone breccia in normal river-lake sediments of the fresh water molasse of the Miocene. Now, after a series of

new discoveries, traces of this horizon can be found scattered across a stretch of land almost 100 kilometers in length and ranging from just south of Ulm in the west to Landshut in the east — between 50 and 100 kilometers away from the Nordlinger Ries.

The sites of this breccia horizon give us a good impression of what happened during this catastrophe. Rock dislocations in the area are proof of a devastating earthquake, which caused steep slopes to collapse. The blast following the impact completely flattened the forest surrounding the area, shredding and deforming the trees to such an extent that the wood was not only pressed into pellets, it was also externally carbonized by the pressure. Remnants such as these have survived wherever they landed in water filled basins. Breccia horizon sites with red burnt clay debris and scorched bones show that the forest was probably incinerated in a fire storm. In addition to this chaos, chunks of limestone, originating from the center of impact, must have rained down on the area for minutes. How far from the center of impact this devastation of the environment reached is not yet clear. According to the researchers in Munich, however, the biological effects of the catastrophe outside the core area of the impact are negli-

ble. This conclusion was drawn from newly found fossils and their classification according to era. Shortly following the aftermath of the impact, river pearl oysters settled on newly formed clay sediments, and the forest completely regenerated with the same types of trees that had grown there before. The catastrophe did not result in the extinction of any of the more than 30 mammals detected, thus showing that it had no effect on vertebrates either. It seems evident that evolution continued normally in the wider surroundings of the catastrophe. Even several primeval species, such as the last European opossum or the miniature deer *Cainotherium*, survived the Ries catastrophe by a million years.

The researchers have ascertained that "the radius of absolute devastation was most definitely smaller than the radius of distribution of any one species". This conclusion has also been drawn, because after the Ries catastrophe, the locally endemic hamster species *Eumyarion bifidus*, and a local species of primeval horse *Anchitherium* repopulated their old habitat rather than being replaced by related or ecologically adapted species.

Crocodiles periodically increased in numbers in the area, possibly because the large remnants falling to the earth created numerous additional pools and ponds. Despite being rare before the catastrophe, the giant turtle did not vanish entirely from the area until later. — Dr. Harald Steinert

# Scanning Tunneling Microscope

By T. V. Padma

INDIA is keeping pace with one of the most exciting developments in microscopy in recent times — the incredible scanning tunneling microscope that gives images in resolutions never thought of before.

Under an Indo-US project, researchers at the Central Scientific Instruments Organisation (CSIO), Chandigarh, have completed the first phase of development of a scanning tunneling microscope (STM) and are all set to venture into the second phase.

Scanning tunneling microscopy promises to be an exciting tool since it shows what atoms, the smallest bits of everyday matter, look like and reveals their configuration.

While surface structures have been studied in the past by conventional electron microscopes, diffraction measurements and ion scattering experiments, direct imaging of geometric and electronic structures at the atomic level has proved elusive.

It remained only a dream

until the invention of the scanning tunneling microscope by Gerd Binnig and Heinrich Rohrer at the IBM Research Laboratory in Zurich in 1981. The microscope is based on the fact that electrons, because of their wave-like nature, can tunnel through a potential barrier between the sample and source of electrons brought as close as a nanometre away from each other.

During the operation of an STM, a fine metal tip or stylus, typically tungsten, is brought to within a few tenths of a nanometre of the surface of material to be studied.

This is accomplished with the help of orthogonally arranged piezoelectric transducers. One transducer is used to

move the tip in and out above the sample, and the other two are used to translate the tip laterally over the sample surface.

As the tip approaches a high or low spot in the specimen surface, the tunneling current begins to increase or decrease in response to the change in distance between the tip and the surface. The image is formed by recording the height of the tip as it moves.

It is, however, possible to maintain a constant tunneling current by keeping a constant distance between the tip and surface, which can be done by adjusting the position of the tip through a simple electronic feedback circuit.

A cousin to traditional electron microscopes such as transmission and scanning electron microscopes, the tunneling microscope eliminates the high energies and electron lenses of both those devices by bringing the electron source so close to the sample that the electrons can be induced to effectively tunnel through the vacuum barrier between the source and the sample.

The STM is unique in avoiding the wavelength limitations to which conventional microscopes are subject. No free particles — photons or electrons — need to be focused to form the scanning tunneling image and so the wavelength limitations do not apply.

The entire device is a few centimeters in size. The tremendous power of the STM comes from its very high specificity: it does not depend on a large number of repeated structures as do different diffraction methods for determining atomic configurations.

# Exploiting Bioresources

NEW DELHI : Where do hi-tech radio tracers and fluorescence microscopes fit in amidst the remote hills and streams of Kangra in Himachal Pradesh?

The answer is the Council of Scientific and Industrial Research (CSIR) Complex at Palampur which was set up five years ago to explore and exploit the vast potential of bioresources of the northwest Himalayan region in India.

In the short span since it was established, the complex has emerged as a major plant-based research laboratory that is already reviving the local Kangra tea industry and trying to help India gain a foothold in the world flower market.

Armed with other ambitious programmes to exploit the economically important plants of the region, the complex, which was originally envisaged as some sort of a multi-organisational unit, is all set to develop into a full-fledged institute.

One of the major thrust areas of the Palampur complex is the revival of the local Kangra tea industry. Prof V S Rama Das, director of the CSIR complex, said,

Kangra tea, grown widely by British settlers in the region, was very popular till 1905. An earthquake that year killed many men and plantations, causing the British survivors to flee and abandon the tea gardens. Thus began the decline of the Kangra flavour which nearly passed into oblivion.

"We have succeeded in converting the dilapidated tea gardens into a respectable tea production area through appropriate agri-techniques, culture practices and pruning methods," Prof Rama Das said taking journalists around the 227-acre campus.

Using tissue culture techniques, the Palampur scientists grew small pieces of tea

shoot tips in a special nutrient medium: Numerous somatic embryos were formed in just 30-35 days compared to normal sexual embryos which develop in one to two years after seedling formation.

The scientists have encapsulated the somatic embryos in a gelatine-like substance, sodium alginate, to form bead-like structures called synthetic seeds.

The synthetic seeds have successfully regenerated under controlled conditions, Prof Rama Das said.

Efforts are now underway to chemically treat or harden the somatic embryos so that they can be directly sown in the fields.

The package of agricultural techniques to improve tea production include sprinkler irrigation which has increased tea yield by 9 per cent, and the use of mulch for soil conservation on the hilly slopes.

By the end of last year, 23 CSIR-run tea Technology Demonstration Plots (TDP) in Kangra produced a perceptible impact on the local tea industry.

Production in TDP-holders' estates rose by 86 per cent and that of the Kangra tea industry by 69 per cent over that of the pre-demonstration year 1984.

"Production has increased from 884 kg of green leaves per hectare to 2000 kg of green leaves per hectare," said Dr D N Chakrabarty, a senior tea scientist.

A new concept that is proposed to be introduced is "organic tea farming" — growing tea without using any chemicals such as fertilisers and pesticides.

In their efforts to improve the tea manufacturing process the Palampur team has succeeded in reducing the withering time from 16 to three to four hours only, and

enhanced the rate of fermentation by purifying the enzyme involved, thearubigin.

Other high-priority ventures of the scientists include micro-propagation techniques for flowers, as well as aromatic, industrial and medicinal crops.

"Himachal Pradesh is naturally blessed with the right conditions — an even temperate climate that is ideal for flower growing," Prof Rama Das said. "So we are trying to commercialise floriculture."

Two major constraints faced by scientists in this task are inducing the local people to grow flowers on a commercial scale, and marketing the flowers, he said. The nearest markets for the Himachal flowers are Chandigarh and Delhi.

The scientists recently organised an awareness workshop for progressive farmers to expose them to the potentialities of flower growing.

A related field of research to be undertaken by the Palampur group is post-harvest treatment of flowers to keep them fresh for the market and improve their vase life.

In addition to perfecting agro-techniques for growing Gladiolus and tulips, the group is trying to introduce some exotic flowers such as *Godelia* (satin flower), *Ranunculus* (buttercup) and *Lisianthus* (prairie gentian) on a commercial scale.

The process for bud opening in Gladiolus has been hastened and the vase life of cut flowers was improved by applying weak electrical currents.

To further propagate flower growing, an international-standard fibre reinforced plastic (FRP) greenhouse with temperature cooling, drip irrigation and light facilities was inaugurated last December.

The greenhouse was put

into operation with an experiment on nine varieties of *Chrysanthemum* which were compared to those grown outside in the fields. The plants grown in the greenhouse showed 98.7 per cent increase in growth, while flower production rose by 2-14 times, with bigger and defect-free heads.

The scientists could also successfully regenerate whole plants of carnations (*Dianthus caryophyllus*) from single leaf cuttings. This offers high potential for rapid multiplication of carnations, a kilogram of which costs about 1000 US dollars.

In order to popularise greenhouse cultivation, cheaper types of polyhouses are being constructed using bamboo and polythene sheets.

In the field of aromatics and medicinal, the Palampur scientists are standardising techniques for the cultivation of the Bulgarian rose (*Rosa damascena*) and have established a pilot-scale plantation on a four-acre plot in the campus. The complex has also developed an improved indigenous technology for distillation of rose oil.

Mushroom cultivation is sought to be encouraged with the construction of a low-cost bulk pasteurisation unit for mushrooms.

Future proposed areas of research include new sources of rubber, new flowers such as geraniums, and new industrial crops such as *Oenothera biennis* (evening primrose) which is rich in gamma linolenic acid (an intermediate for prostaglandins), and plants yielding resins, paints and varnishes.

The institute also proposes to undertake energy forestry involving broad-leaved, short-duration, high-density trees such as poplars, willows and alders. — PTI.

# Advances in Lighting Technology

By G S Mudur

A light bulb that lasts for 30 years, lamps that switch themselves on and off as people enter and leave rooms, and village lanterns powered by energy from the sun — a century after the first incandescent bulbs sparked off the era of electric lighting, these are some of the advances that the world can look forward to in the coming decade.

Lighting technology is now moving in the direction of miniaturisation, higher efficiencies and tapping nonconventional sources of energy for lighting. The induction of electronics in lamp circuitry has helped lighting engineers develop lamps that last longer and consume less energy and make lighting controllable and flexible.

Innovations in lighting technology and their relevance to countries like India where the gap between the demand and available power is rising steeply came up for discussions at the International Conference on Lighting Technology organised in New Delhi in October this year.

"Countries like India cannot afford to miss energy efficiency," says Dr. Ashok Gadgil, an Indian energy economist currently at the University of California in the United States. "Energy efficient appliances have the potential to dramatically reduce national electricity demand."

According to Gadgil, one attractive measure is the replacement of incandescent light bulbs with compact fluorescent lamps (CFL), for which the cost of conserved energy is one-sixth the cost of generating electricity. A CFL is five times more energy efficient and has a lifetime eight to ten times longer than conventional incandescent lamps.

The cost of building manufacturing plants for CFLs is 170 times cheaper than the cost of

building a new power plant, in terms of energy saved or generated. A plan to introduce 20,000 CFLs in Bombay on an experimental basis is now awaiting approval.

The scheme envisages participation by the Bombay Suburban Electric Supply Limited (BSES) utility, a consortium of manufacturers and research scientists and is intended to demonstrate that CFLs will lead to profits for BSES and benefit residential and commercial consumers.

It promises to be the first utility-sponsored demand management programme in India with an objective of reducing demand, thus lowering investment requirements for new electricity power plants. Gadgil said in a paper presented at the conference.

Full scale replacement of incandescent by CFLs in all sectors would result in a demand savings of 4500 MW, according to R Ganesan, energy economist with the Energy Management Centre in New Delhi. Retrofitting fluorescent lamps with energy efficient lamps and electronic ballasts could save an additional 800 MW.

Lighting engineers say the induction of electronics in lighting has led to the development of a new breed of lamps called QL induction lamps, regarded as a milestone almost as important as the introduction of incandescent lamps some 100 years ago and gas discharge lamps early this century.

A QL lamp works on the basis of two well-known principles — electromagnetic induction and gas discharge. In a QL induction lamp, a high frequency electric current induces through a coil an electric current in the gas filling. The QL lamp has no filaments or electrodes. Instead, a high frequency energy flow is induced in a low-pressure gas inside the lamp bulb by means

of an induction coil. There are no breakable or consumable parts inside the lamp bulb.

The lifetime of the lamp is determined largely by the electronic components in the power supply and control unit, resulting in a spectacularly long lifetime of some 60,000 hours, far exceeding that of conventional lamps.

Philips Lighting of Netherlands earlier this year announced the launch of QL induction lighting. The first lamp system to be made available to luminaire manufacturers will be an 85 watts, 5500 lumen version in a choice of warm or cool white colours.

The conference also focussed on different aspects of light control. A paper by two Indian scientists from CMC in New Delhi proposed a time-based and occupancy-based light control technique for offices.

The scheme envisages the use of passive infrared sensors that detect the presence of humans in a limited area and activate lights. Whenever a person enters a detection area, a rapid change of temperature occurs that is picked up by the sensor. The sensors are installed at suitable locations on the walls or ceiling to cover the optimal area. When someone walks in, the sensor passes on the signal to an interface unit which commands the illumination control unit to switch on the light.

The illumination control unit is installed next to the switch board, controlling a number of circuits, each circuit in turn controls a number of light fittings. When a person walks away from the detection area, after a time lag, the lights are turned off. Besides in office rooms, such sensor-based lighting control could also be used in staircases and other areas of the building that have human traffic only rarely.

The CMC scientists said the scheme could help achieve a

saving of upto 30 per cent of energy. An added advantage would be the option of using the same sensors for detecting unauthorised people moving around the building. The initial cost of the equipment is the only disadvantage of the system, but with the saving in energy, the equipment cost could be recovered within a few years, the scientists said.

Two engineers from Jadavpur University in Calcutta proposed a rechargeable solar lantern as a viable option for Indian villages. Villagers will have their own solar photovoltaic lanterns with a built-in battery, but no photovoltaic modules. They will pay for recharging their batteries from a charge shop instead of paying for kerosene traditionally used for rural lanterns. The solar lantern will have a small 6 volt battery, a lamp and an electronic circuit, all housed in a box at the bottom of the lantern.

The special lamp used for the lantern will consume only 7 watts, but emits light equivalent to that of a 40-watt lamp. The battery capacity has been chosen to meet two days of storage requirement for four hours daily operation. A solar lantern would have to be recharged every alternate day at a solar charging shop.

In field trials, a dozen solar lanterns were made and distributed through a voluntary organisation to a primary school hostel in a village and were found to give nearly trouble-free service.

The solar lantern has an immense potential of generating self-employment in villages and reducing the consumption of kerosene. Dr. S R Bandopadhyay, professor of illumination engineering and Dr. M K Mukherjee, joint director of the school of energy studies at Jadavpur University, said in their conference paper. — PTI

# SCIENCE BRIEFS

## COLOUR MONITORING OF MICROBES IN LIQUIDS

The Nishihara Environmental Hygiene Research Institute has developed a new type of system capable of continuously colour-monitoring microorganisms in liquids, reports Techno Japan.

This system consists of an underwater camera having a microscope function with a motor unit used to provide automatic control in connection with image processing, light source adjustment, and image plant switching.

Because of the new mechanism in this underwater camera, it has been reduced to less than one-third the size and weight of a conventional monochromatic camera. In addition, microorganisms taken by this camera can easily be distinguished from one another because they are in colour.

Nishihara is looking to new markets in a variety of industrial fields. For example, the system may be applied to operational control in sewage treatment plants, production process control in beer and soya bean manufacturing, and also in biotechnological research for medicine and other

chemical and industrial products.

## NOVEL FABRICATION OF CERAMIC COMPOSITES

Researchers at the Advanced Ceramics Group at the Technical University of Hamburg-Harburg in Germany have produced ceramic composite materials and components with a novel fabrication technique, reports the American Ceramic Society Bulletin.

In the new process, called Active Filler Controlled Polymer Pyrolysis, the composites are fabricated from

an inorganic polymer and a carbide forming filler component such as transition metals, borides or silicides.

To meet the requirements of high ceramic yield, easy handling, reproducibility, low cost and rheological behaviour particularly useful for plastic shaping techniques, a polysiloxane was chosen as the polymer.

The active filler is used to control the microstructure formation and the dimensional change during polymer-ceramic transformation. A wide range of composite mi-

crostructures can be produced depending on the filler phase morphology and concentration.

The filler may be introduced as particles, colloidal suspension, organometallic solution, or a surface coating reinforcement components such as fibers. Well established plastic forming techniques can be applied to the non-abrasive systems, thus offering a broad versatility of complex shaping and machining. Full density and low shrinkage (down to zero) composite materials can be achieved with this process, including bulk components.

# More Safety for Flight Control Systems

When aligning a new television aerial, it can be demonstrated that electromagnetic waves sometimes follow "strange paths", when, in addition to the desired program, "ghost images" are also received. These result from signals from one and the same station, which are deflected, distorted and sometimes "diverted" in such a way by buildings and other obstacles that they arrive after a slight delay, thus producing double images on the television screen.

Since the signals from radio guidance systems at airports are exposed to a similar hazard, the Bundesministerium fur Forschung und Technologie, BMFT (Federal Ministry for Research and Technology) sponsored a project conducted by Deutsche Luftansa, which investigated the principles involved in such interference. A ground vehicle equipped with the necessary transmitting gear and a test aircraft from the Technical University of Braunschweig were used for this purpose from autumn 1986 until the

end of 1990. Exemplary measurements and trouble-shooting measures could be carried out flight control systems at the commercial airports in Hanover and Hamburg. The results of this project include an effective new measuring method and an efficient measuring system, which are now available for all such "electromagnetic problem areas" and can be implemented by the Bundesanstalt fur Flugsicherung (Federal Institute for Air Traffic Control).