TELECOM RESEARCHER

A News Bulletin from the Telecom Australia Research Laboratories

MARCH 1988

Centres of Expertise plan to boost university research

Telecom Research Laboratories are offering to support the development of "Centres of Expertise" in higher education bodies to conduct leading-edge research in telecommunications-related topics.

"We hope these centres will provide a national network of resources and expertise which will serve and be supported by local industry," the Director of the Research Laboratories, Mr Harry Wragge said, in announcing the plan.

"This will help maintain Australia as a leading nation in the development of communications," he said.

It is envisaged that the Centres of Expertise will be modelled on the Teletraffic Research Centre being established at Adelaide University and funded by the Laboratories with more than $1 million over three years.

The aim is to develop the Teletraffic Centre to a level of national and international recognition for its research competence.

Mr Wragge said Telecom Research Laboratories had also devolved basic areas of research to the University, freeing some of its own resources for applying the results of the university's work. Other organisations were now adding their support to the centre and sharing the expertise available.

Mr Wragge said the agreement, in the form of a contract with the University of Adelaide, had been made to provide a lead for the development of high level focussed research in a particular topic – in this case, teletraffic.

"Following the success of this venture, we have now adopted a firm policy of supporting other such Centres of Expertise which are relevant to the telecommunications field," Mr Wragge said.

"We are looking to other organisations to support this initiative, which we believe will form an increasing range of national resources supporting the telecommunications research needs of local industry and existing public R and D establishments."

Mr Wragge said the basis of the Telecom plan for Centres of Expertise was the encouragement of a higher degree of specialisation in centres of education.

"The universities are currently spreading their research over a very wide range of topics in a somewhat fragmented manner," he said, which means they cannot benefit from the synergy resulting from a more narrowly-focussed approach.

"In addition, many current research efforts tend to be short-lived, without the benefits of growth which would result from greater continuity and concentration on fewer topics."

The Telecom Research Laboratories guidelines for establishing the centres of expertise are:

- The level of support will be commensurate with needs, the stage of development and the value of the topic to Telecom.
- Support will be provided through a contract between the University and Telecom.
- The University should already have some national recognition for its research in the focus topic.
- The topic should be supported by sufficient academics and students to ensure continuity.
- Research work by individuals on the topic should be mutually supportive, to allow expertise to be developed faster than would be achieved from individual contributions.
- There should be scope for support from other organisations.

Mr Wragge has outlined the plan to all Australian universities and has also sought industry support for the Centres of Expertise concept.

• *The Teletraffic Research Centre at Adelaide University provided a model for the proposed Centres of Expertise. Pictured in the University grounds after the opening of the centre are Dr Les Berry, Mr Peter Gerrand, Mr Brian Hammond, and Mr Harry Wragge.*

AN INTRODUCTION . . .

This is the first edition of Telecom Researcher, a publication through which Telecom Research Laboratories hope to communicate with audiences both within and outside Telecom Australia.

As part of the process of change taking place in Telecom, we have been established as a Shared Resource Unit and are now officially known as the Telecom Research Laboratories, or TRL.

A charter has recently been approved, the key element of which is that we will operate on a business plan basis. The initial business plan is currently circulating in other parts of Telecom for comment.

This new magazine is a result of some of the changes which are occurring in Telecom and the different operating environment for TRL.

I believe it will become increasingly important for us to present the value and relevance of TRL to our internal and external audiences. Much of our work is complex and highly-specialised, and an editorial aim of Telecom Researcher will be to make the important work of TRL understandable to both informed and lay readers.

We invite other media to use any of the material in Telecom Researcher, with suitable acknowledgement, and to seek more information on particular topics by contacting the editor, Brian Donovan, at 770 Blackburn Road, Clayton, Vic, 3186 or telephone (03) 541 6707.

Harry Wragge,
Director, Research

Telecom Fellowship winners

"Winners of Telecom Educational Fellowships would have the opportunity to contribute to the discoveries, the innovations and the technologies being developed for telecommunications in the 1990s and beyond," Telecom's Chief General Manager, Mr Bob McKinnon told the three Victorian fellowship winners for 1987 at a function at Telecom's Research Laboratories in October.

He said that graduates had demonstrated by being selected for these fellowships that they have outstanding ability and Telecom was delighted to give them the opportunity for development, so enabling them to contribute to the future prosperity of the nation.

Recipients of this year's Fellowships are:

Victoria: Lynette Cross, a computer science student at LaTrobe University; Katharine Fisher, who is studying engineering at Monash University; and Nigel Aylott, science and engineering student, also at Monash.

New South Wales: Andrew Jenkins, a science student at Sydney University.

Queensland: Barry Kitson, science, and Andrew Reilly, engineering and science, both at Queensland University.

Tasmania: Daniel Kirkham, science, University of Tasmania.

South Australia: Jan Kautsky, engineering, Adelaide University.

Telecom Education Fellowships are open to final year university students undertaking courses relevant to telecommunications science and engineering. Each award is valued at $6000, and the recipients will have the opportunity to work in Telecom's Research Laboratories during the university vacation.

The Director of the Research Laboratories, Mr Harry Wragge, said the students selected for the Fellowships were all outstanding.

The speed at which technology was advancing meant that the best brains and endeavour were needed to keep up with change, to teach and direct others and to explore further change, he said.

• *Pictured at the presentation of Telecom Fellowships to the Victorian winners at the Research Laboratories, from left: Research Director Harry Wragge, Lynette Cross, Katharine Fisher, Nigel Aylott, and Chief General Manager Bob McKinnon.*

Grant aids project linking Telecom, industry, university

A research program blending scientific skills from industry and university with those of Telecom has been awarded a grant of $806,000.

The grant will enable the research team to make significant advances in its work on new types of glass for optical fibre production.

The award, made under the GIRD (Grant for Industry Research and Development) scheme of the Department of Industry, Technology and Commerce will be applied to increasing the research team, and particularly in attracting industry participation.

The program, which for Telecom holds the promise of enabling optical fibre telecommunications to span even greater distances in the future, combines the skills of scientists from Telecom Research, Monash University, ICI Australia, Austral Standard Cables, BHP and KEL Aerospace.

Telecom's Research Laboratories have for the past three years, been researching new glasses for the next generation of optical fibres in collaboration with the Chemistry Department of Monash University working under an R & D contract. The Laboratories' in-house research has focussed on developing methods for drawing the new materials into fibres.

Progress in achieving stable drawing of fluoride glasses confirmed the need for the involvement of industry in the project. Telecom's Research Laboratories took the initiative in persuading a group of industrial organisations to join in an application for the GIRD grant, with Monash University nominated as the coordinators of the research project. **(See article, page 3.)**

Bank discusses IDS progress

Pictured at left during a recent visit to the Research Laboratories by ANZ Banking Group executives to discuss Integrated Digital Services are, from left: Ray Liggett, Executive General Manager, Telecom Corporate Customer Division; Derek Gall, ANZs General Manager, Electronic Network Services, and Peter Gerrand, Branch Head, Switching and Signalling, Telecom Research.

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New glasses promise big leap forward in communications

The transmission of light through glass fibres is already replacing electrical impulses along copper wires in modern communications technology, with much higher transmission capacities and longer distances between repeater stations, making fibre optics the obvious choice for future telecommunications networks.

Optical fibres are already being used in Australia to link telephone exchanges in the major cities and are now being installed on the trunk routes linking those cities.

Now, scientists and engineers are looking at new materials and new transmission techniques for optical fibre transmission over even greater distances, including transcontinental and transoceanic communications systems without intermediate repeaters.

Even on land, Australia, with its long distances and shortage of cheap power, has a special requirement for communications systems which don't require repeaters to amplify or "rejuvenate" the signal.

All optical fibres used in telecommunications have, up to now, been made from silica-based glass, and while remarkable progress has been made in refining the material to reduce transmission losses dramatically, the theoretical limits of the material in this respect have almost been reached.

In Australia, The Telecom Research Laboratories' scientists are at the leading edge of the worldwide search for glasses based on other materials which can set new standards for minimum transmission loss over long distances.

Currently, the focus of attention in this field is on materials based on fluoride – notably zirconium tetrafluoride. Preliminary work with fibres drawn from this material have shown a remarkable drop in transmission losses.

Overseas studies have shown that while silica fibres can transmit wide-band signals over 200 km without the need for signal boosting, it is likely that with the new glass materials, distances of up to 2000 km could be achieved.

The special properties of zirconium tetrafluoride were discovered accidentally by a science student in France, but the main thrust of early research into its potential for optical fibre transmission was undertaken in Japan, where progressive refinement of the material began to show its remarkable promise.

The Optical Technology Section of the Telecom Research Laboratories began preparatory work on fluoride glasses five years ago, and has since developed equipment and techniques for the difficult task of producing the experimental fibres.

In this project, Telecom has worked closely with AWA Research Laboratories, particularly in designing and building a fibre drawing tower, while Quentron Electronics developed, under contract, a tunable mid-infra red laser used in the experimental work.

Monash University Department of Chemistry has played a central role in the work by producing samples of fluoride glass under contract to Telecom.

This formal contract work has been strengthened by informal collaboration between researchers at Telecom and Monash University, with the cooperation being extended beyond the Chemistry Department alone into Materials Engineering, Chemical Engineering and Physics.

The introduction of fluoride glass fibres to the Telecom network is still very much a long-term prospect.

The Head of the Section, Dr. Geoff Stone, said the final stages in the work of producing a commercial ultra-low loss fibre would be unlikely to succeed before the mid-1990s. However such fluoride fibres would then offer significant performance advantages at the infra-red wavelengths of today's fibre systems, with the further potential for entirely new "repeaterless" systems at longer wavelengths in the mid-infra-red spectrum.

In the meantime, however, they could find an important role in remote sensing and spectroscopy, for such tasks as monitoring gas in coal mines.

He said, too, that while the price of fluoride fibres was still very high, a project being carried out jointly by CSIRO and ICI Australia for the local refining of zirconia made the production of a fluorizirconate fibre, using local technology and materials, a possibility for the future.

• ***Fibre drawing tower at Telecom Research Laboratories produces experimental fluoride glass fibres.***

How about an office that works without wires?

Anyone who has ever shifted an office, whether from one building to another, from one floor to another, or even from one room to another, will agree that the biggest headache has been – wires.

As electronics take over in the modern office, so the mass of wiring linking the various components increases – phones especially, but also computer terminals, intercom systems, word processors. All need a mass of "spaghetti" to link them together or to integrate them with central data systems as required.

But imagine an office *without* wires. Your telephone is carried in your pocket. It's about the size of a calculator, and you can use it as a versatile personal communicator.

No more will you miss important messages because the phone has rung ten seconds after you've left the office.

If you want to change offices, you just pick up your personal computer terminal and move. No trailing cords, no wires. In the basement of your office building, or in the service core of your particular floor, there's just one connection with the outside.

If you want a video conference, just move your terminals around and set it up.

All communications inside – voice, data, video – are transmitted by radio. That's the "wireless" office, and that's how it could be within a decade, with the possibility of less extensive systems in about five years.

That, at any rate, is the aim of a team of scientists and engineers at the Transmissions Systems Branch of the Telecom Research Laboratories at Clayton, Vic., where research at the leading edge of mobile communications is being carried out.

Their basic concept looks well beyond the latest developments in mobile radio telephones such as the cellular system recently launched in Sydney to provide for hand-held radio telephones as well as providing higher capacity for mobile phones in boats and cars.

In that system, the service area is divided into cells from 20 km to 2 km radius, each with its own relay station. To conserve radio spectrum resources, groups of UHF channels are served by using the smaller cells.

The next evolutionary step is the personal pocket radio telephone, with a few hundred metres range, served by small-cell relay stations in busy areas such as shopping and business centres and airports.

However, to provide everyone with this sort of phone service would require these small cells through entire metropolitan areas – not an economical proposition for the near future.

Looking further ahead, the Telecom Research Team focussed on the wireless office concept, using cells of only 10 to 50 metres radius, operating at radio wavelengths of about 10 mm in the microwave frequencies, which could have higher capacities than mobile radio cells because larger bandwidths can be allocated.

That means that wireless offices can provide every desk with enhanced personal communications, such as personal computer facilities, mainframe access, facsimile, graphics, text and electronic mail, as well as comprehensive telephone facilities. Limited videophone access would also be possible.

Radio propagation in a complex location such as a set of offices has its difficulties. Simple line-of-sight transmission would not be very practicable, so the team is placing heavy emphasis on multipath techniques for getting the signal from transmitter to receiver.

There are still plenty of problems to overcome – interference from one cell to another in a multi-storey building is a major one. Another important requirement is for some kind of safeguard against terminal faults, which could immobilise an entire communications system.

But the groundwork is being laid, and in fact, first-generation developments of wireless office equipment could be available within the next five years.

• ***Pictures at left show, from left: the portable car phone, the Walkabout hand-held phone, and finally, the size of phones to come – a pocket calculator.***

Geographers help map out future communications

A demand for geographers isn't shown up too often in the employment advertisements, but Telecom has found a very useful role for people in this discipline – finding out the "where, what, who and why" of future telecommunications needs, as exciting new developments in technology rapidly become a reality.

The Human Communications Section of Telecom Research Laboratories is currently exploring the application of "geographical information systems" (GIS) to help Telecom get a getter grasp of the likely future needs of its customers for telecommunications services.

The project started when geographer Marina Cavill joined Telecom to map customers or the population within existing telephone exchange areas. With the help of Telecom's Information Systems Decision Support Centre, computer-generated maps, based on exchange areas, demonstrated the value of Telecom's stored data as a means of getting at where customers and their demand for telecommunications services are located.

From there, the research has progressed to:

- Looking at the way in which Telecom-held data, combined with "public domain" data such as Australian Bureau of Statistics information, could be organised geographically, using the rapidly-developing geographical system technology.
- Developing methods for analysing the geographically-organised data to identify potential demand for telecommunications.

Early in the project, Professor Jim Whitelaw, head of the Department of Geography at Monash University, spent part of his sabbatical leave by joining the project team – attracted, as he said, by "the idea of academics getting back into the real world".

Section Head Des Clark said the decision to take a geographer on board was prompted by the realisation that while communications technology was advancing very rapidly, there was a need to know where, and what sort of, new services should be delivered.

This called for people skilled at dealing with large masses of data and relating the information to places and functions, and geographers appeared to fill the bill in this respect.

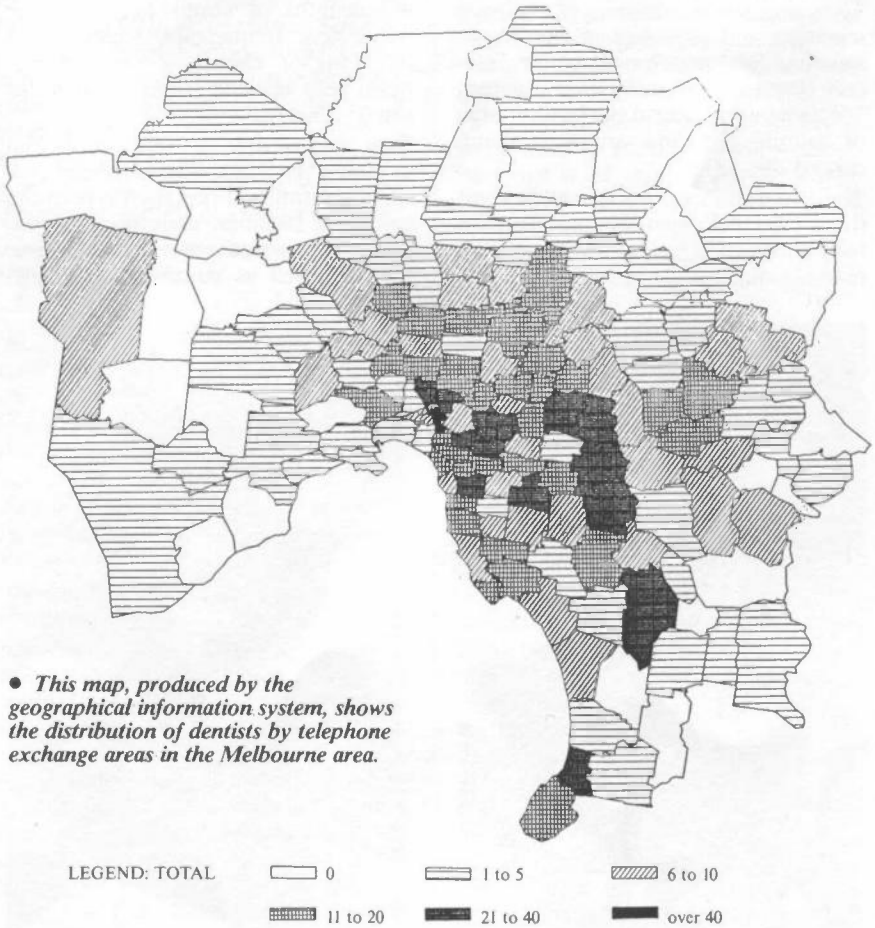
Eventually, Telecom hopes to be able to use GIS to identify trends and meet the changing needs of customers throughout Australia. They'll be addressing such questions as:

- Decentralisation of industry – high-technology undertakings, perhaps using computer-aided design and manufacture, moving to country centres, with a demand for digital communications where none existed previously.
- The movement of businesses away from the Central Business District to outer suburbs. Can this trend, already in evidence, be expected to continue, and what will be the consequent changes in demand for telecommunications services?
- The trend towards individuals working at home through personal computers, with link-up to a central data processing point or other computerised plant or office, and the corresponding need for electronic data transmission.
- The spread of computerised banking and financial services, and electronic funds transfer. Where is this happening, where is it likely to happen, what Telecom installations will be needed and where should they be located to service it?
- The increasing use of mobile telephones as the advantages of the new cellular system of transmission greatly increase the practicality, security and versatility of this form of communication.

As Des Clark pointed out: "What we are doing is simply drawing on the huge bank of information we have in the form of the telephone directory, and classifying it in a way that reveals patterns which will help us to determine the sort of products and services Telecom should be providing to which locations in the future."

MELBOURNE

COUNT OF DENTISTS BY TELEPHONE EXCHANGE AREA



• ***This map, produced by the geographical information system, shows the distribution of dentists by telephone exchange areas in the Melbourne area.***

Harry Wragge

Peter Gerrand

Hector Ruddell

Dr Alan Gibbs

Colleagues award Professional honours for research people

Professional honours received by Telecom's Research Laboratories' people are not only a recognition of individual attainment, but also a reflection of the calibre of staff engaged in research work for Telecom. These are some who have been recently recognised in this way by their professional colleagues.

Harry Wragge, Director of the Telecom Research Laboratories, was invested in October as a **Fellow of the Australian Academy of Technological Sciences**.

The citation to the fellowship mentioned Harry's "distinguished contributions to telecommunications, especially in the development of the experimental digital telephone exchange which was in the vanguard of world developments" and his "leadership within Telecom's Research Laboratories".

The only other current fellows in Telecom are the Managing Director, Mel Ward and Executive Director, Corporate Strategy, Roger Banks.

Also honoured, late last year, was **Peter Gerrand**, Head of Switching and Signalling Branch, Telecom Research Laboratories, who was named a fellow of the Institution of Engineers, Australia (I.E. Aust.).

The award was made in recognition of Peter's high achievements and the level of responsibility he has assumed over a long period for important engineering decisions, activities and programs.

In making the award, the I.E. Aust. noted that the approval process involves selection by peers, which therefore confirmed Peter's eminence and high standing in the engineering profession.

Hector ("Hec") Ruddell, former Head of Polymer Section, Applied Science Branch of the Laboratories who recently retired, was one of three scientists to receive the first **Polymer Division Citations** awarded recently by the Royal Australian Chemical Institute.

Hec joined the Laboratories in 1955, and he's since been closely associated with the introduction of plastics materials in many parts of the Telecom network. He was made a Fellow of the Plastics Institute of Australia in 1982.

Dr. Alan Gibbs, Head of the Transmission Systems Branch was nominated Engineer of the Year in 1987 by the Institution of Radio and Electronics Engineers Australia (IREE) of which he is a senior member.

Alan joined the Laboratories in 1961 and has since worked on many pioneering projects, including taking part in the NASA voice-data network for Project Apollo, which first put man on the moon.

Overseas assignments

Tom Stephens of the Transmissions Systems Branch and **Bryan McGlade** of Customer Services and Systems have been awarded 12-month fellowships by Rockwell International to work at Rockwell's Dallas, Texas complex. They will be heading off soon to work on optical fibre-related projects.

Tony Bundrock, Transmission Systems, was nominated by Telecom and accepted by the International Telecommunications Union to undertake a two-part mission in New Delhi, India. He has completed the first part – lecturing and training staff in satellite communications – and will undertake the second part in another year or so.

. . . and for a trouble-shooter

The PROTEAN (communications protocol-testing system) developed by Telecom's Research Laboratories (pictured at left) recently won a Highly Commended award in the Engineering Excellence Awards presented by the Institution of Engineers Australia, Victorian Division.

PROTEAN is a world-class breakthrough in the analysis of telecommunications protocols – the agreed computer languages which allow one communications system to interwork with another.

It has been widely acclaimed internationally, and is already earning export dollars as well as being used by a number of Australian educational and industrial organisations.

The PROTEAN program enables errors in the design of a protocol to be found quickly and cheaply before the system is implemented – a highly important advance, as new telecommunications services, many of which must interwork with one another, are rapidly being introduced into the ever expanding switched network.