AT&T INNOVATION BRIEFS

Garden Slugs Have A Code In Their Nodes

Bell Labs researchers at Murray Hill have discovered and measured a novel form of neural circuit dynamics—a propagating wave—in the olfactory region of garden slugs' central nervous system. By observing and measuring the waves both electrically and optically, the scientists found that the waves propagate at a predictable rate and in a predictable direction across a network of about 100,000 neurons. The neurons make up the slug's odor-identifying procerebral (PC) lobe. The scientists also learned that, when one of a slug's four noses senses a natural odor, the waves' timing changes substantially and a dramatic reduction in the phase difference takes place between opposite ends of the PC lobe. Studies of pattern recognition in biological neural networks such as the PC lobe may lead to a better understanding of ways to encode and decode "fuzzy" information in future communications systems.

Integrated Optoelectronic Amplifiers Come Closer To Reality

Erbium-doped fiber amplifiers (EDFAs) embedded in national and international high-speed digital optical networks improve their efficiency and cost-effectiveness. Now, silicon optical bench (SiOB) technology has attracted the attention of AT&T's lightwave communications network planners. With SiOB technology, optical waveguides can be produced in quantity on planar substrates such as silicon wafers. After an erbium-doped soda-lime glass film has been deposited on a wafer, waveguide structures are formed by standard photolithography. This is followed by ion milling, an atomic-scale sandblasting process. The waveguides, which can interface with optical fibers, connect discrete optical components to one another on the same substrate. Using this technology, Bell Labs researchers at Murray Hill have produced a planar optical waveguide amplifier (POWA) that should be comparatively easy to mass-produce, if and when designs progress to the manufacturing stage. Currently, the experimental amplifier's 3.3 dB/cm net gain and its 14,600 ppm doping level are believed to be the highest yet reported for erbium-doped POWAs. Work is continuing to reduce the required laser pumping power to practical levels. Combined with related Bell Labs research, this effort is directed toward creating a photonic analog to electronic integrated circuits.

Bell Labs Researcher Develops User-Friendly Computer File Protector

To protect them from intruders, sensitive files are often kept off network-connected computers, making legitimate access to them inconvenient. It also removes the files from useful system administration services such as restoration and periodic backups. Although cryptographic techniques exist to protect files, today's encrypting tools are too cumbersome for a lot of people to bother with. A Bell Labs researcher at Holmdel has developed a cryptographic file system (CFS) that protects data by "pushing" encryption into the file system. With the CFS, users can encrypt their UNIX® system files automatically with user-specified keys. They can issue a simple command to associate a cryptographic key with a directory. Subsequent

"reads" and "writes" to any files in the directory are encrypted and decrypted automatically whenever they are used. All standard system calls and application tools continue to work normally, as do routine system administration tasks; no modifications to the operating system, file serve, or application programs are needed. When it runs on a client workstation, the CFS ensures that clear text will not be stored on a disk or transmitted over a network. The Holmdel scientist sees the CFS not only as a useful tool in its own right, but also as part of a more general investigation of the best way to protect from unauthorized use information that resides on large-scale distributed systems.

Finding Information In A Tangle Of Nets

A research project carried out at Bell Labs in Murray Hill and the University of Wisconsin in Madison may someday help data network users conquer their greatest challenge: how to find resources, objects and people on the rapidly proliferating networks as easily as they can find people and services in phone directories. The project has given birth to "Nomenclator," an experimental names service system whose architecture lets users find the information they need simply by describing what they're looking for. A Nomenclator system responds quickly because it limits its search to data repositories where sought-after information is most likely to reside. The fast response of a machine's Nomenclator system would also be based on the fact that it will store, for a limited time, answers it may already have provided to similar queries from other users on the same machine.

Software Enhances Text Translators' Productivity

Precise translation of documents from one language to another becomes increasingly important as the world moves toward a global economy. Bell Labs researchers and their AT&T colleagues at the Language Line® Document Translation Service and the Forward Looking Work program of Consumer Services are developing a translation tool that makes it easier to use terminology correctly and consistently. One of the major areas being studied by participants in this collaborative effort—dubbed the TermWork platform project—is the reuse of terminology that had been translated correctly in previous documents. Using a "terminology reuse tool" that automatically collates documents with their translations, a translator can see how problematic words were handled in the past. For example, a translator who is not a computer specialist will quickly discover how "store" should be translated in a computer document and weed out an inappropriate meaning such as "grocery." Two other areas of inquiry by the TermWorks project team are retranslation tools to help translators deal more efficiently with documents that require continual revision; and, proofreading facilities that minimize the risk that a sentence or page has been positioned incorrectly in the text or left out of the translation entirely.