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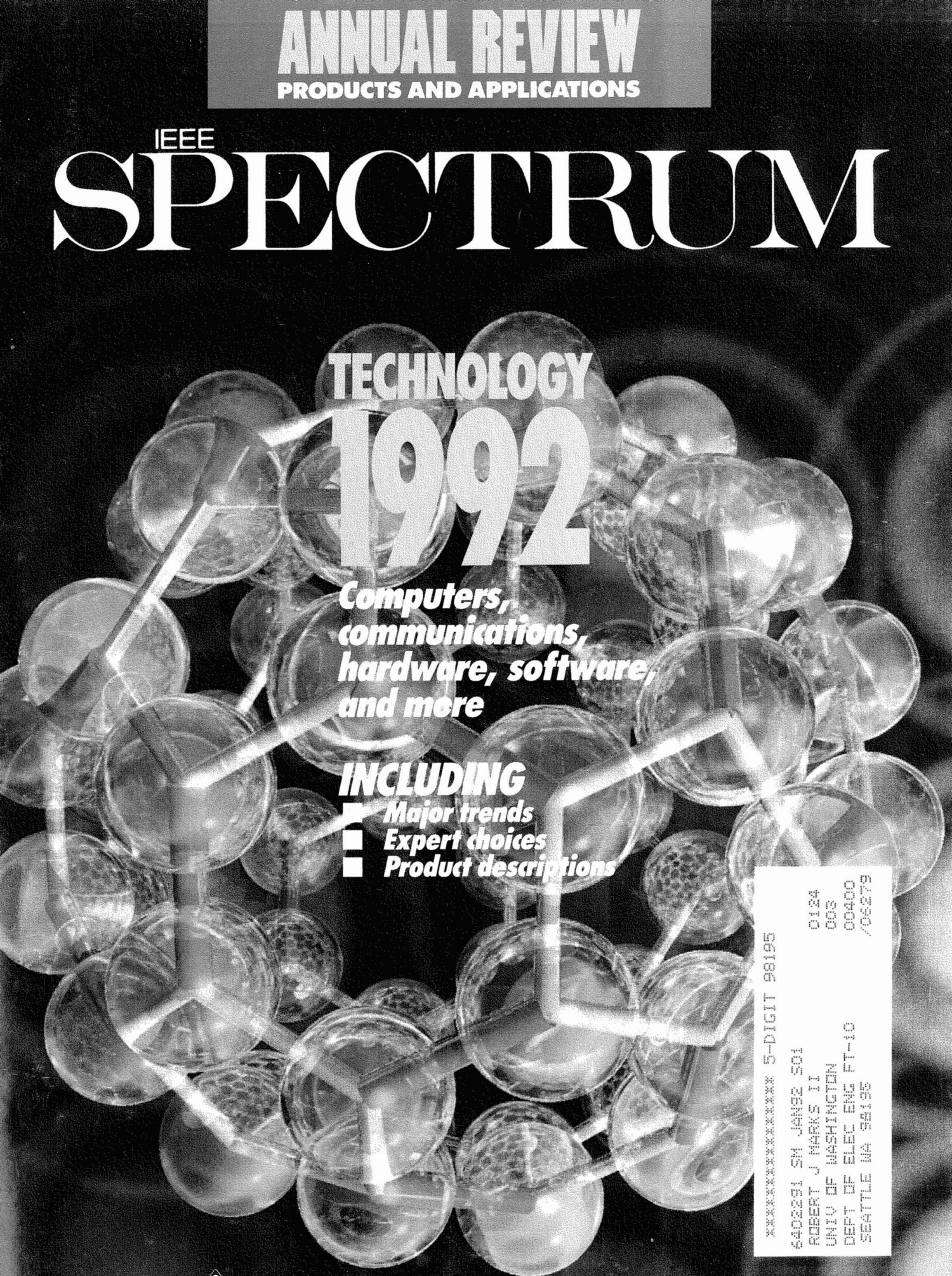

TECHNOLOGY 1992

Computers, communications, hardware, software, and more

INCLUDING
- *Major trends*
- *Expert choices*
- *Product descriptions*

JANUARY 1992 THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

The specialties

- ***Neural-network–fuzzy-logic nexus shows promise***
- ***Quality-color costs decline for word processing and publishing***
- ***Electromagnetic compatibility acquires a higher profile***
- ***Engineering education up for major changes***

Neural networks are being coupled to fuzzy systems...new publishing and word-processing software can work in full color...methods of measuring electromagnetic compatibility (EMC) have improved...important changes in undergraduate engineering education are imminent. These comments on some of the more specialized branches of electrical engineering come from the IEEE Neural Networks Council, the IEEE Professional Communication Society, the IEEE Electromagnetic Compatibility Society, and the IEEE Education Society.

Robert J. Marks II, president of the IEEE Council on Neural Networks, calls the networks an extraordinary engineering tool, which is here to stay. They are already currently viable in a number of applications and useful, dedicated hardware is available. A promising area, he said, is the coupling of neural networks to fuzzy systems. "Layered perceptrons [feedforward artificial neural networks] can be taught fuzzy membership functions from raw data. Rules are thereby empirically learned."

A related discipline, Marks pointed out, is the genetic algorithm and associated evolutionary programming. The terminology, he said, "relates only loosely to the biological counterpart, not unlike reference to 'rabbit ears' or an 'electronic eye.' Genetic algorithms perform a highly parallel search of use in, say, the design and optimization of neural network architectures." But, Marks emphasized, as a technology, genetic algorithms and fuzzy nets are where neural networks were about a decade ago.

COLOR TAKEOVER. Prices have dropped and quality has surged in color scanners, color printers, and film recorders, according to David L. McKown, a member of the administrative committee of the IEEE Professional Communication Society. "Publishing (and even word-processing) software capable of working either full or 'spot' color is becoming readily available," he said. Today self-publishers can "afford to collect peripherals for scanning images in 256 colors, displaying them on monitors capable of 2000-by-2000 resolution or more, editing them using the unbelievably rich palette of colors of 24-bit systems, and printing them, unfortunately, on relatively low-resolution (100-dot-per-inch) printers."

But these tools encounter patches of ignorance, McKown emphasized. Few self-publishers (as compared with publishing houses) are trained in the intricacies, principles, and effects of color on an audience, so the color piece produced is too often "the design equivalent of ransom note typography." For another, what will the self-publisher do with the printed output? The original will have to be sent to a professional printer for color separation and printing, in which case "300-dpi resolution is usually unacceptably low."

The professional publisher faces many of the same problems. "The professional designer who used to specify colors on a tissue overlay and had a trusted printer implement them," McKown said, "now may use the software to change the colors in as many ways as are imaginable." But, he asked, "how accurately does the system monitor portray printed colors? How true to ink is the proof printer? How dependent will the designer become on the world of color created by electrons impinging on phosphorus and how estranged from the real world of pigments on paper?"

TAMING EMC. Electromagnetic compatibility has matured as a technology over the past several years, reported H. R. Hofmann, newly elected president of the IEEE Electromagnetic Compatibility Society. "Methods of performing EMC measurements have been enhanced with the aid of more sophisticated receivers including improved spectrum analyzers and antennas. The importance of accurate antenna factors has hit home, and techniques for measuring antenna factors have been widely disseminated."

Hofmann also said that the ability to make more repeatable measurements has spread with the publication of IEEE and ANSI standards on EMC measurement techniques and procedures. And, he maintained, new Federal Communications Commission rules on emissions have forced designers to deal with EMC early in the design process or else provide expensive, last-minute Band-Aid types of fixes.

William E. Cory of the administrative committee of the Society, said that, as an aid to the deliberations of the International Special Committee on Radio Interference, several countries reported on the incidence and causes of their electromagnetic interference (EMI). A first look, he said, showed that the number of occurrences reported is approximately proportional to the country's population.

In Japan and Norway, broadband noise from electric power distribution and motor-based appliances were said to be the major sources of EMI. In the United States, radio transmissions formed over two-thirds of the EMI sources.

ENGINEERING EDUCATION TRENDS. We are on the threshold of innovative changes in undergraduate engineering education, maintained Chalmers F. Sechrist Jr., president of the IEEE Education Society. One reason, he said, is the recommendations prepared during the 1980s by six entities: the IEEE Centennial Forum, the National Science Board, the American Society for Engineering Education (ASEE) Quality of Engineering Education Project, plus the Accreditation Board for Engineering and Technology National Congress on Engineering Education, the ASEE Task Force on a National Action Agenda for Engineering Education, and the National Science Foundation (NSF) Disciplinary Workshops on Undergraduate Education. Another reason is the increased NSF funding for innovative courses and curricula in undergraduate education in science, engineering, and mathematics.

Specific trends pointed out by Sechrist include:

- Engineering courses for nonengineers and, for engineering students, more interdisciplinary courses.
- More emphasis on engineering design, manufacturing, and concurrent engineering.
- Computer and design experiences in the freshman year.
- More emphasis on computer-aided instruction, education at a distance over communications links, and laboratory simulations.
- More use of engineering workstations.
- Improved student retention and advising.

Innovative programs incorporating those trends are taking shape at several universities, Sechrist reported, including Drexel, Cornell, Texas A&M, Maryland, Pennsylvania State, Texas Tech, and Vanderbilt, as well as at Rose-Hulman Institute of Technology and New Jersey Institute of Technology. ◆

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