Motorola's Gary Daniels honored for R&D

Gary Daniels, the man who led the team that developed Motorola's MC68020 32-bit microprocessor, has been selected for Semiconductor International magazine's 84 Technology award in the R&D category. Each year, the magazine invites leading-edge companies to nominate people to receive awards for achievements in R&D, process engineering, assembly and packaging, and QC/QA and testing. From the nominations, the judging panel selects a winner in each area, based on the impact their contributions had on their own company and the semiconductor industry as a whole.

Readers who attended the 1984 International Test Conference will remember Daniels for his fascinating presentation about the development of Motorola's microprocessor family, reported in the November 1984 issue of Design & Test, page 99. Daniels is preparing an article, based on his ITC presentation, that will appear in the April 1985 issue of D&T.

In addition to the award to Daniels, Semiconductor International selected Ray Donald, Denis Griot, and Michael Shields of Signetics for an award in the process engineering category in recognition of their work in PROM fabrication. W. K. Boey of National Semiconductor received an award in the assembly and packaging category for his work in eliminating corrosion failure in DIPs. Mark Dahistrom of Gould/AMI was chosen to receive an award in the QC/QA and testing category for his work in contamination control.

Motorola's Gary Daniels received Semiconductor International's 84 Technology award for his work in developing the MC68020 microprocessor.

How soon gallium arsineide?

It seems that, as each month goes by, increasingly optimistic forecasts about gallium arsineide appear in the electronics press. If the future confirms the validity of these predictions, within the next five years gallium arsineide will probably have a significant impact on all of us involved with the design and test of devices and assemblies.

Some 25 companies in the US are reported to have GaAs development projects; about half of these are "captive"—companies designing GaAs devices for use in their own products. The other half consists of foundries and companies that offer, or plan to offer, commercial devices. In the last few months, Harris and Gigabit Logic have announced GaAs ICs for sale. European and Japanese semiconductor companies also have active GaAs programs; many have already announced prototype products. As far as is known, no European or Japanese company yet has announced commercially available GaAs ICs.

Optimistic predictions of the market for GaAs devices abound, but rarely agree. Some sources say that the 1984 market is just under $100 million, while others claim it is as high as $339 million. One forecast suggests a 1990 market of $10 billion for GaAs devices, while other more conservative seers say that the 1992 market will be in the $3 billion to $6 billion range.

Writing in the September 1984 issue of Engineering Manager, Mike Karnow comments on "the extremely broad spectrum of possibilities for what might be developed" in GaAs devices and applications. These unknowns might well account for the disparity in future estimates of GaAs device quantities and prices.

Clearly, the high speed, low power dissipation, and radiation resistance of GaAs devices are needed in certain military, computer, and even consumer applications. These needs will drive device development. As semiconductor companies follow the learning curve, the quality of GaAs materials will improve, the complexity and variety of devices will increase, prices will decrease, and applications will multiply. One estimate suggests that, within five years, the cost of GaAs ICs will fall to about twice as much as silicon devices of equivalent complexity, or even less.

Previously, the defect density of GaAs wafers has been much higher than that for silicon, causing severe fabrication yield problems. Now, Sumimoto has announced that mass production of 65mm GaAs wafers with no more than 200 defects per square centimeter will start in 1985—a defect density comparable to that of silicon wafers. GaAs materials and fabrication technology is advancing so rapidly that some researchers say GaAs may become easier to implement than silicon.

Despite all the optimism, GaAs development is hampered by the lack of design and test tools. Applications of GaAs devices are limited by chip packaging techniques and the extreme difficulty of system design to take advantage of device speed.

Quoting again from Engineering Manager, "The first complete systems to use GaAs ICs will almost certainly be high-speed test systems. These systems will employ GaAs technology to test more complex functions at much higher speeds than possible today."

There's no doubt that companies and individual engineers involved with design and test should be following GaAs closely. The future may well hold rewarding opportunities for those who prepare themselves for a time when GaAs devices are routinely designed, readily available, and often used.

1984 first year for ATE sales above $1 billion

A research report on the US ATE market from Frost & Sullivan says that 1984 will be the first year when commercial shipments of automatic test equipment hit the $1 billion mark. The report goes on to say that the ATE market has been on a growth binge surpassing that of the computer, telecommunications, and electronics industries it serves. Sales increased 48 percent in 1984 to $1.2 billion from $796 million in 1983. By 1988, the market is expected to jump to $2.7 billion.

Though dominated by Fairchild, Teradyne, and GenRad, new firms are making promising entries into the field, and mergers and acquisitions are also stirring the pot.

Frost & Sullivan sees significant impact from a merging of CAD and ATE over the next few years. “Integration of test software and IC design software has wide-ranging advantages in terms of more rapid device development and production as well as enhanced testability.”

The study predicts that analog LSI test systems will be the fastest growing equipment category, increasing from $70 million in 1983 to $269 million in 1988. However, in-circuit board test systems will remain the largest single category throughout the period, growing from $188 million in 1983 to $615 million in 1988. The market for memory IC, LSI/VLSI, functional board, and power supply test systems will also grow rapidly, as will ATE networking systems.

Computer and business machine manufacturers will be the biggest market for ATE systems, followed closely by semiconductor device manufacturers.


Japanese increase fifth generation funding to $40 million per year

The Japanese Institute of New Generation Computer Technology, or ICOT, will get about $40 million a year for the next 10 years to develop the software and hardware for a fifth generation computer with artificial intelligence. As recently as last spring, the project was funded at about $20 million a year, up from an original level of $10 million.

ICOT’s Second International Conference on Fifth Generation Computer Systems was held in Tokyo, Japan in November 1984, attracting 1100 participants from 28 countries. In the conference, a newly developed database machine called Delta was demonstrated. The machine had a storage capacity of five gigabytes that can be expanded to 20 gigabytes, and it contained four parallel processing paths, each of which can handle eight data items simultaneously.

The project’s near-term goal is to produce a computer capable of performing 64 instructions simultaneously. Also demonstrated was a parallel interface engine, or PIE, based on the Prolog programming language developed for ICOT by the University of Tokyo.

PC-based workstations reach low-end CAE market

The Technology Research Group, Boston, MA, projected that by 1987 PC-based and PC-related CAE products would significantly penetrate the market, with revenues approaching $300 million. Already the installed base of IBM PCs used for schematic capture is more than 75 percent greater than the installed base of Daisy Logicians or Apollo computers used for similar applications, and 70 percent as large as the entire installed base of supermicro-based CAE workstations. Installations of IBM PC-based systems were predicted to surpass those of large systems in 1985. One of the reasons quoted for CAE purchasers to choose IBM PC-based systems was a growth path to future-generation software tools.

Report forecasts IC packaging changes

A new report from Electronic Trend Publications forecasts a percentage decline in the use of dual in-line IC packages while the use of small-outline and chip-carrier packages will increase rapidly through 1989.

The report states that the total worldwide consumption of IC packages, 17.3 billion in 1984, will reach 39.6 billion by 1989. Plastic DIP packages, 81 percent of the total in 1984, will represent 49 percent in 1989. By then 22 percent of all packages will be small-outline and 19 percent will be chip-carrier.

The report, authored by Willard Booth, states, “With the advent of VLSI integrated circuits, DIP and chip-carrier packages with 68-pin through-board limitations are no longer practical. Higher speed functions and user demand for more function in less space are requiring pincount packages up to 300—thus mandating different package forms.”

Entitled “VLSI-Era Packaging,” the report examines various packaging technologies and the driving forces in packaging and assembly automation. It looks at packaging from the point of view of device manufacturers and users. A detailed forecast of the usage of various type of packages through 1989 is included.

The report may be purchased for $1500 from Electronic Trend Publications, 10080 North Wolfe Road, Suite 372, Cupertino, CA 95014; (408) 996-7416.

CAD market in architecture to reach 15 percent in 1989

In its recent report, Strategic Inc., Cupertino, CA, projected that the market penetration of architectural engineering CAD systems would increase to 15 percent by 1989. The architectural engineering firms that have CAD systems are presently larger companies with 50 or more employees and constitute only three percent of all architectural engineering firms. However, with the trend toward engineering workstations that cost less than $50,000, CAD technology will become available to smaller firms. This will increase penetration to 15 percent by 1989. For more information, contact Jay Prakash, Strategic Inc., PO Box 2150, Cupertino, CA 95015-2150; (408) 446-4500.
Phase II VHSIC contracts go to Honeywell, IBM, TRW

The Department of Defense has selected three contractors for design and production of microwcircuits with minimum feature sizes of 0.5 \( \mu \text{m} \) at clock rates of 100 MHz and circuit complexity of 100,000 logic gates per chip. IBM's Federal Systems Division, Manassas, VA, was awarded a $50 million contract by the US Army Electronics Research and Development Command. IBM will develop a set of CMOS chips to implement modular, high-speed systolic processors with architectures flexible to handle acoustic array beam forming, radar, electronic warfare, and image processing.

Honeywell's Solid State Electronics Division, Minneapolis, received a $65 million contract from the Air Force Wright Aeronautic Laboratory to design and fabricate ICs with bipolar current-mode logic technology for applications to electro-optical signal processors. Motorola's Bipolar Integrated Circuits Group, Phoenix, AZ, will second-source the Honeywell chips. Honeywell, General Electric’s Ceramics Division and the 3M's Electronics Division will jointly develop multichip packaging for the submicron chips.

TRW's Electronics Systems Group, Redondo Beach, CA, was awarded a $60 million contract by the Naval Electronic Systems Command. The contract calls for a minimum of three chip types: a 32-bit signal processor, a mass memory, and a convolver-convolver. The brassboard, in which the contract chip set will be demonstrated, will be based on the cruise missile's self-protection warfare requirements. TRW is teamed with Motorola's Semiconductor Product Sector, Phoenix, AZ, for chip design and fabrication. In addition, General Dynamics Corp., Convair Division, San Diego, CA, will participate as a system consultant.

CAE companies move into Europe

CAE Systems and ECAD have separately announced that they are establishing European offices.

CAE Systems has opened a regional European office in Munich, Germany. The new office will provide sales, service, and applications support to the company’s customers, and will have demonstration and training facilities.

The company has appointed Dr. Helmut Falser as managing director of the German office, a position in which he will be responsible for CAE operations in Germany, Austria, Belgium, Luxemburg, and the Netherlands. Before joining CAE, Falser was Apple Computer’s general manager for central Europe. He had also served in various marketing capacities with Motorola, Texas Instruments, Digital Equipment Corporation, and Control Data Corporation.

ECAD has opened a European sales and support center in Camberley, Surrey, England. The company also has plans to open similar offices in other European countries and in Asia. ECAD’s office in England is managed by Bill Wade.

New CAE, workstation, and graphics publications

Three new publications that claim to provide vital information on CAE, workstations, and computer graphics may be of interest to D&T readers.

Prime Data, a market research firm that specializes in high-technology markets, offers a new CAE market study that provides databases, forecasts, market trends, and market shares for companies in the CAE industry. The company is also planning to introduce a complete computer-integrated engineering (CIE) industry service that will include a database, inquiry privileges, newsletters, and an annual conference. The complete CIE service will be available for an annual fee of $8500. The CAE market study, free to CIE service subscribers, is available separately for $2500. For information, contact Prime Data, 4030 Moorpark Avenue, Suite 110, San Jose, CA 95117; (408) 240-7111.

CAE Workstation Alert is a monthly briefing service for engineers, manufacturers, and marketers. Each 12-page issue provides news about hardware and software products, applications, companies, and markets. You can get more information by calling the publisher, Management Roundtable, Inc., at (617) 232-8080, or by writing to the company at PO Box 404, Newton, MA 02161. A one-year charter subscription costs $187.

The 1985 Computer Graphics Directory contains comprehensive information on graphics hardware and software. While covering the entire field of computer graphics, from microcomputers to mainframes, from architecture to biomedical applications, the directory includes information on subjects such as workstations and engineering graphics. Information is available from Computer Graphics World, PO Box 21278, Tulsa, OK 74121. The price is $80 (US and Canada), $90 (export).

Axiom Technology expands

Axiom Technology, formed in April 1983 by engineers from GenRad, LTX, and Teradyne, is moving rapidly to establish a position in the mixed technology (analog/digital) test system market.

The company has recently announced completion of a $5 million second round of financing. The new capital will be used to increase production of its AT100 Production Test Workstation, announced at Semicon West last year, as well as to fund expanded R&D and marketing.

Axiom is in the process of establishing three regional support centers to provide local marketing, service, and applications support for its customers. The first center, already in operation in Santa Clara, California, is managed by Alfred Holman, who has recently joined Axiom as western regional sales manager. Holman previously held sales positions with Sentry/Schlumberger and LTX.

Motorola buys AOT isolation voltage testers

Applied Optoelectronic Technology has received a "major" order for automatic isolation voltage testers from Motorola. Motorola's optoelectronic division will use the testers in the production of 7500-volt optocoupler products.

AOT sales manager John Torok claims that his company's VISO-502 is the only isolation voltage tester that can test in excess of 8500-Vac peak isolation without damaging the optocoupler.

Specializing in automated equipment for the optoelectronic market, AOT has supplied equipment to AT&T Technology, Motorola, Siemens, TRW, NEC, Toshiba, Hewlett-Packard, Honeywell, and Texas Instruments.

Luctor plans expansion

Phoenix-based Luctor Corporation, a leading manufacturer of magnetic disk test equipment, is planning to expand its markets in the United States and overseas. The company already supplies test equipment to such well known rigid disk manufacturers as Ampex, Century Data, Memorex, and Advanced Information Memories.

The test equipment supplied by the company is microprocessor controlled, and is hardware and software configurable to suit specific applications. A typical system sells for approximately $100,000.
**SDA makes entrance into design automation market**

Solomon Design Automation plans to make its initial product announcement in the first quarter of 1985. SDA systems are expected to be fully integrated through use of a unified database and a human interface common to all software tools. Products will support both conventional design methods and tools for full-custom IC design and advanced design methods with new approaches to cell compilation and automatic layout and routing. Initial systems will be offered on the new generation of high-performance, general-purpose, Unix-based computers and workstations.

SDA was founded in August 1983 by a group of electronic design automation experts headed by James E. Solomon, the former director of MOS analog product development at National Semiconductor. The current management includes Donald L. Lucas, chairman of the board, James E. Solomon, president and CEO, Joseph Backer, vice president of marketing operations, Min-Yu Hsueh, chief technical officer, Steven W. Pekarth, vice president of finance and administration, Mike Tucker, director of software engineering, Joe Costello, director of technical operations, and K. Charles Janac, director of strategic marketing. The technical team includes Kenneth H. Keller, director of database and graphics, Mark Bales, manager of database, Paul Swartz, director of design verification, Jiri Soukup, director of physical design, Steve Law, director of design methods, James Kleckner, manager of simulation, and Larry Lai, manager of test methods. Two professors from the University of California at Berkeley, A. Richard Newton and Alberto Sangiovanni-Vincentelli, are consultants.

SDA has received a total of $9 million to date from several major industrial corporations. Each of the industrial sponsors will place up to three VLSI designers and CAD developers in SDA's R&D facilities to test and adapt software to meet their special needs. Industrial sponsors include Sand Hill Finance Company, Continental Capital Ventures, Alan Patricof Associates, Applied Technology Partners, L.P., and a number of private individuals.

**Siemens opens US R&D complex**

The new Research and Technology Laboratories of Siemens Corporate Research and Support, Inc. has been established at the Princeton Forrestal Center, New Jersey, as the US arm of the Siemens Corporate R&D complex.

Dr. Karl Zaininger who heads the division says, “RTL is an American enterprise, working as an adjunct of Siemens Corporate Research and Technology. The principal functions are to act as a window on US technology and as a two-way bridge between US and Siemens worldwide research and technologies.”

Projects to be pursued at the new facility include automation of the software development process, development of the factory of the future, and next-generation office communications systems. Other major disciplines to which RTL is dedicated include artificial intelligence, robotics, distributed computer systems, VLSI design automation, and microelectronics.

Siemens has also recently announced its intention to establish a strong base in the world IC market. The company plans to build a wafer fabrication plant in the US and may also build a semiconductor manufacturing plant in the Orient. It has previously announced joint projects with Philips to develop 1M and 4M DRAMs, and also ICs for use in digital television receivers.

**MCC opens packaging laboratory**

Microelectronics and Computer Technology Corporation has opened a new laboratory where semiconductor packaging and interconnection techniques will be developed. Research programs will focus on the high-performance and cost-effective packaging required by very dense chips that will be used in future systems.

The laboratory includes all the technological requirements of an advanced semiconductor facility, built to a small scale because the intention is not to produce commercial products.

The results of the research will be initially licensed exclusively to the MCC shareholders who fund the research. After three years, the technology will be available for licensing to other interested parties, with royalties going to MCC and its shareholders.

For a detailed account of MCC and its work, see the article by Tom Rhyne, “VLSI CAD Research at MCC,” in the November 1984 issue of Design & Test.
Upcoming workshops
Two upcoming workshops that deal with design and test topics are planned during the next couple of months.

The third annual Built-In Self-Test Workshop, sponsored by the IEEE Computer Society Test Technology Committee and the International Test Conference, is scheduled for March 27-29 at Kiawah Island, Charleston, South Carolina. The workshop deals with such topics as the relationship between BIST and reliability, BIST requirements and restraints, design issues and trade-offs, design approaches and implementation techniques, and BIST evaluation and validation. For additional information, contact Richard Sedmak, BITE, Inc., PO Box 133, Maple Glen, PA 19002; (215) 576-5650.

The 1985 IEEE VLSI Test Workshop, sponsored by the IEEE Computer Society and the IEEE Philadelphia Section, has the subtitle "Microsystem Challenges." It is planned for April 1-2 at Bally's Park Place Casino Hotel, Atlantic City, New Jersey. The workshop deals with LSSD, BIT, self-test, testability, economics, test equipment, knowledge-based systems, simulation, redundancy, logistics, fault-tolerance, etc. Contact Bob Tigue, IBM Dept. 69j/422, Neighborhood Road, Kingston, NY 12401; (914) 385-7440.

Two new publications available from Teradyne
Teradyne offers two new publications—a booklet dealing with the economics of VLSI testing and a 1985 calendar featuring the company's innovations in laser trimming.

After briefly describing the factors that contribute to the cost of testing VLSI devices, the 44-page booklet presents a sample economic model in which typical figures are assumed for each element of test cost. The figures are used in the booklet to calculate the cost per device tested and the payback period for a test system. Perhaps the most useful parts of the booklet are two worksheets, one designed for VLSI device manufacturers and the other for device users, which can be used to calculate test costs and payback periods for specific situations. Teradyne plans to offer computer versions of these worksheets so that the calculations can be made on personal computers. The booklet can be obtained from Kathy Amend, Teradyne, Inc., 2125 Califa Street, Woodland Hills, CA 91367.

The full-color 1985 calendar—33 inches long by 11 inches wide—shows Teradyne's history of applying laser techniques to electronics manufacturing, against a background of technological milestones that have shaped today's world. The calendar may be obtained from Teradyne, Inc., c/o Inquiry Systems and Analysis, 35 Morrissey Boulevard, Boston, MA 02125.

Dataquest conference draws over 200 attendees
Dataquest Inc., San Jose, CA, held its 1984 CAD/CAM Industry Conference at the Silverado Country Club, Napa, CA, from November 12 through November 14, 1984. According to Beth W. Tucker, manager of CAD/CAM industry service at Dataquest, more than 220 people from several countries attended the conference. The three-day program covered a variety of topics on electronic CAD/CAM, mechanical and architectural CAD/CAM, system architectures, applications of personal computers to CAD, network interconnection, and market survey. Dataquest projected that the worldwide market of electronic CAD, or ECAD, would grow to $3.6 billion from $765 million in 1984. The major market drivers include lower system prices, networking of workstations and systems, growing semiconductor and printed circuit board markets, and improved CAE. Computer vision, Calma, Racal-Redec, Scientific Calculations, Applicon, Daisy and Mentor were projected to be market leaders.

Transition to one-micron technology
During the last few months, Semiconductor International magazine has published a series of articles entitled, "Transition to One-Micron Technology." The entire series of ten articles, reprinted in full color, is now available as a booklet. Articles of particular interest include, "Making the Design Transition," "Packaging for Performance," and "Testing Challenges."

The booklet may be ordered from Cahners Reprint Services, 1350 East Touhy Avenue, Des Plaines, IL 60018. The price is $10.

SMC gets military order for PCB testers
Scientific Machines Corporation has been selected by E-Systems to provide board and module automatic test equipment in support of a recently awarded Department of Defense contract. SMC will provide five of its Model 2070 board testers at a price of approximately $1.4 million.

SMC, based in Dallas, is wholly owned by Elfab Corporation. The company offers functional test equipment and software services for hybrid microcircuits and printed circuit boards.