IBM Uses CMOS Process for Experimental DRAM

An experimental one-megabit dynamic random access memory (DRAM) chip that operates two to three times faster than the current generation of one-million bit chips has been produced at IBM's manufacturing plant in Yasu, Japan.

The chip, which retrieves a bit of information in 22 billionths of a second, was fabricated using a new complementary metal oxide semiconductor (CMOS) process jointly developed at IBM's T.J. Watson Research Center and the Yasu Laboratory.

Two layers of polycrystalline silicon and two layers of metal were used for the chip's wiring to allow greater density and higher speed. CMOS technology also allows substantially cooler operation of the circuits than other types of technology. According to an IBM report, the new DRAM chip dissipates only 500 mW of power during operation.

Los Alamos Sponsors Cold Fusion Workshop in Santa Fe

Under the auspices of the U.S. Department of Energy, Los Alamos National Laboratory sponsored a "Workshop on Cold Fusion Phenomena" May 23-25 at the Sweeney Convention Center in Santa Fe, New Mexico. More than 430 researchers from 14 countries gathered to hear 30 scientific presentations and numerous shorter presentations and poster papers. The events were broadcast live via satellite.

Though no consensus of opinion on cold fusion was reached, many results were reported for the first time, especially those from the U.S. national laboratories. A scientific collaboration involving Los Alamos and Brigham Young University reported detecting two different kinds of neutron events. Above-background low-level random neutron emissions, as well as bursts of neutrons, were detected during nuclear measurements of cylinders containing pressurized deuterium gas mixed with various forms of the metals titanium and palladium.

Four different detectors, which surrounded both active experiments and control cylinders, were used at an underground, shielded TA-35 site. Random neutron emissions were measured at about 100 counts every 1,000 seconds. Neutron bursts, at about the same count rate, were detected in events lasting one one-hundred-millionths of a second or less. Five of 12 test cylinders were reported to have produced neutrons. The neutron-generating mechanism has yet to be identified for either the random neutron emissions or the neutron-burst events.

These results were discussed by Howard Manlove representing a team that included Malcolm Fowler, Ed Garcia, Tony Mayer, Michael Miller and Robert Ryan from Los Alamos along with Steve Jones of Brigham Young University.

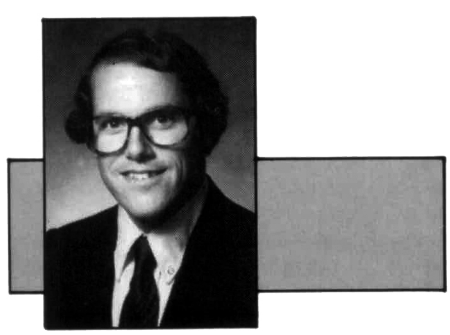
Los Alamos researchers also announced that a preliminary analysis of samples provided by Texas A&M confirmed the presence of tritium in solutions from the institution's electrochemical test cells.

The workshop was cochaired by Robert Schrieffer, a 1972 Nobel recipient and director of the Institute of Theoretical Physics at the University of California at Santa Barbara, and by Norman Hackerman, emeritus professor of chemistry at both the University of Texas at Austin and Rice University and president emeritus at Rice.

Information from Los Alamos Newsbulletin.

J.B. Roberto Named Associate Director of Oak Ridge Solid State Division

James B. Roberto has been appointed associate director of the Solid State Division at Oak Ridge National Laboratory. Roberto has served since 1986 as section head of ORNL's Particle-Solid Interactions Section, where he has been responsible for materials research groups in ion implantation, surface physics, semiconductor physics, x-ray diffraction, and electron microscopy. Succeeding him in that position is David M. Zehner, leader of the Surface Physics Group since 1980.



Roberto received a PhD in applied physics from Cornell University and then joined the ORNL staff in 1974. He has served in various research and research management capacities with emphasis on the interaction of plasmas and ion beams with surfaces. His own research has centered on solid state physics applied to energy technologies.

Roberto has served as manager of the Plasma-Materials Interactions Program at ORNL and as a guest scientist at Kernforschungsanlage Jülich and the Max-Planck-Institut für Plasmaphysik. He also served as technical assistant to the associate director for Physical Sciences at ORNL for eighteen months from 1984 to 1986.

He has served on numerous national and international committees in support of DOE materials programs and has chaired several international conferences and workshops. He has published more than 50 papers and edited two books in the general area of particle-solid interactions.

Currently second vice president of MRS, Roberto has served the Society in a variety of capacities, including co-chair of the 1986 MRS Fall Meeting and as an organizer of several symposia.

B.G. Streetman Receives IEEE Education Medal

Ben G. Streetman, professor and the Earnest F. Gloyna Regents Chair in Engineering at the University of Texas at Austin, is this year's recipient of the Education Medal of the Institute of Electrical and Electronics Engineers (IEEE). Streetman is being recognized for "leadership in engineering education at the undergraduate and graduate levels, for the contribution of a textbook used worldwide, and for creative research in solid state electronics."

In addition to his activities as professor of electrical and computer engineering, Streetman is director of the Microelectronics Research Center at the University of Texas at Austin. His current research centers on development of semiconductor materials and devices, including growth of multilayer semiconductor crystals in vacuum by molecular beam epitaxy. Streetman is a Fellow of IEEE and a member of the National Academy of Engineering and the Materials Research Society.

NSF Reports Record Number of Science and Engineering Doctoral Degrees in 1988

U.S. universities awarded a record 20,250 doctorates in science and engineering fields in 1988, according to the National Science Foundation's annual survey of earned doctorates. Although the the number of U.S. citizens earning doctorates increased in 1988, the record was primarily fueled by foreign citizens. The number of

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U.S. citizens receiving doctoral degrees in 1988 was 12,850, still far below the high of 15,000 in 1971.

Doctoral awards in engineering increased 13% over 1987 to reach 4,190 in 1988, with foreign citizens accounting for 54% of 1988 engineering doctorates. Electrical and chemical engineering doctorates showed the most substantial increases, 28% and 18%, respectively.

In the sciences, doctoral awards numbered 16,067—3% above the 1987 level, with foreign citizens accounting for 26% of the 1988 total. The most substantial increases were in biological science, computer science, and environmental science. The NSF survey attributes the overall increase in science doctorates entirely to an increasing number of women earning doctorates.

International Agreement Establishes U.S./USSR Scientific Research Programs

Two new international scientific research programs were established between the United States and the Soviet Union on May 6, 1989 with the signing of a basic scientific research agreement. The agreement and two previously signed memoranda of understanding address cooperation in basic rather than applied science and focus on investigator-initiated, competitively reviewed joint research projects.

The memorandum of understanding between the U.S. Geological Survey and the USSR Ministry of Geology fosters cooperation in the geosciences. The NSF-USSR Academy of Sciences memorandum of understanding enables scientific exchange activities in mathematics, theoretical physics, chemistry, life sciences, basic engineering research, Arctic and cold region research, and science policy.

The U.S. academic research community can submit research proposals through either program. Neither program will have a substantial dedicated budget, and any cooperative research projects will be considered and funded directly by NSF or U.S. Geological Survey discipline-oriented programs through their normal competitive process. Funding will be limited to topics where the greatest scientific results can be expected.

Laser Process Developed to Etch Chemically Resistant Substances

A laser-driven process for etching chemically resistant materials has been developed by Carol Ashby, Jerry Brannon, and Jim Gerardo of the Laser and Chemical Physics Research Department of Sandia National Laboratories. The process was developed with lithium niobate, a chemically inert substance used in optical waveguide switches, and could be adapted for other inert materials.

The process involves coating the substrate with powdered potassium fluoride and then directing laser pulses onto the area to be etched. The heat is sufficient to melt the lithium niobate. This permits the two substances to chemically react and form a nontoxic water-soluble solid containing niobium oxyfluoride anions. The untreated area of the lithium niobate remains insoluble, so etching is accomplished by simply rinsing the irradiated, soluble area from the substrate with water. Although lithium niobate sometimes cracks when heated rapidly, the researchers said they found no evidence of this problem.

The laser-driven method promises several advantages: faster etching rates, more than 10 microns per minute compared to about 0.01 to 0.05 microns per minute using other methods; an expected lateral resolution of the laser spot size (about 1 micrometer or slightly less); and flexibility in design.

The researchers compared their process with direct laser ablation and found that the ablated holes had debris around them that was 10-50% as high as the hole depth. They report that the chemically etched holes had no debris on their edges.

This smoothness would be advantageous in producing accurate lenses and grooves used in waveguides. The smooth surfaces were achieved at lower laser power. Higher power resulted in vaporization of the potassium fluoride before it could react with the lighium niobate, creating rougher surfaces.

Although the method has been successfully demonstrated, further development with a stable laser will be required before using it for full-scale device fabrication.

Texas Researchers Demonstrate Prototype High T_c Magnetic Field-Effect Transistor

Researchers at the Texas Center for Superconductivity at the University of Houston (TCSUH) announced the development and testing of a prototype superconducting microelectronic transistor called a high temperature superconducting magnetic field-effect transistor (HTS-MET).

As described by team leader Wei-Kan Chu, deputy director of TCSUH, the HTS-MET will have four terminals and be 10

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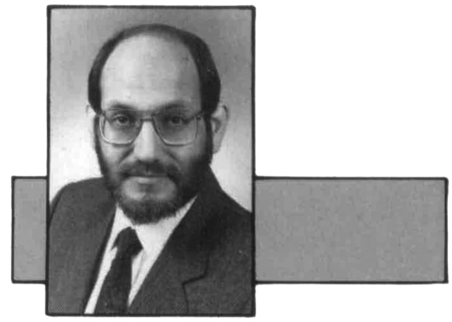
microns or less in size. The heart of the superconducting transistor will be a micron-sized electromagnet that can produce a magnetic field over 100 gauss, which is perpendicular to the surface of a superconducting thin film strip and switches the device on and off. Because the electromagnet can be controlled by nanosecond bursts of electricity, the total energy consumption of the transistor is reduced significantly (10^{-15} joule or less), according to Chu.

The prototype is currently 500 times larger than the envisioned product. Plans to scale-down the technology, including further research and development on interfacial stability and material compatibility during therman processing, are under way.

The inventors of the device, graduate student Yuan-Jun Zhao, visiting scholar Zu-Hua Zhang, and Wei-Kan Chu, have applied for a U.S. patent and have submitted a paper to *Applied Physics Letters*.

E.N. Kaufmann Named Director of Argonne's High T_c Superconductivity Center



Elton N. Kaufmann has been named director of the High Temperature Superconductivity Pilot Center at the Argonne National Laboratory, Chicago, Illinois. He replaces Brian R.T. Frost, who served as acting director of the Pilot Center since its inception and who is director of Argonne's Technology Transfer Center. Kaufmann, who assumed the new position on April 10, had been associate division leader of the Materials Division at the Lawrence Livermore National Laboratory, where he had been since 1981.

The High T Pilot Centers were instituted at Argonne as well as Oak Ridge and Los Alamos National Laboratories in order to advance commercialization of the new materials through U.S. industry by making the resources of the federal government available. The centers are supported through the Office of Energy Storage and Distribution of the U.S. Department of Energy.

Commenting on his new position, Kaufmann said, "the Pilot Centers are an exciting and bold thrust on the part of DOE toward finding new, more efficient means to make productive connections between the facilities and talents available in the national laboratory system and the private sector. All three centers are interfacing now with a wide variety of large and small corporations on a broad spectrum of high T-related technologies. Industrial interest has met our highest expectations and I fully expect that the Pilot Center concept will have noticeable impact on the U.S. position in the markets which will emerge in this area over the next decade."

Kaufmann, an active volunteer for MRS, has served in several capacities, including president in 1985. Currently he chairs the editorial boards for the *MRS BULLETIN* and the subcommittee of the MRS Publications Committee; he also chairs the subcommittee of public affairs of the MRS External Affairs Committee.

GE, Argonne to Study Bismuth-Based Superconductors

General Electric Company and Argonne National Laboratory's Superconductivity Pilot Center have signed a cooperative research contract to study the structure of bismuth-based, high temperature superconductors. General Electric and Argonne scientists will work jointly on the research at Argonne's Intense Pulsed Neutron Source.

Argonne's Superconductivity Pilot Center was one of three created at U.S. national laboratories last year by the Department of Energy to foster joint industry-government programs to speed the transfer of new superconducting technology to the marketplace. Other DOE pilot centers are at Oak Ridge National Laboratory and Los Alamos National Laboratory.

Argonne's pilot center has contributed to three other joint research projects by providing funding for pre-experiment preparation:

- American Air Liquide's research cen-

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ter (Countryside, IL) and Argonne have contributed $55,000 each for research aimed at developing commercial applications of high T_c superconductors.

- TRW, Inc. (Redondo Beach, CA) and Argonne have contributed $40,000 each for work on an Argonne-developed technology for examining superconducting thin films.
- Belden Wire (Geneva, IL) and Argonne are studying ways to use high T_c superconductors to shield high frequency cables from magnetic fields. Argonne is producing the materials, and Belden is testing their magnetic shielding ability.

U.S./Japan Mark 10 Years of Joint Fusion Energy Research

The United States and Japan commemorated 10 years of cooperation in magnetic fusion energy research in ceremonies held May 10-11, 1989 at the General Atomics Laboratory, San Diego, California. The ceremonies were part of a two-day annual meeting of the U.S.-Japan Coordinating Committee for Fusion Energy during which the committee discussed the 1989-1990 research program and future directions for cooperation.

The U.S.-Japan cooperative program on fusion energy started in 1979 with 26 exchanges of technical personnel, highlighted by collaboration on the Doublet III tokamak facility. In 1988, the program has grown to 115 exchanges encompassing all fusion areas and involving 300 individuals. The program involves the Department of Energy in the United States, and the Ministry of Education Science and Culture (Monbusho), Ministry of International Trade and Industry (MITI), and the Science and Technology Agency in Japan.

The cooperative program has spanned research in fusion science concepts, collaborations in technology, and test activities in both countries.

U.S.-Japan cooperation will continue as part of trilateral activities under International Energy Agency auspices, including agreements for collaborative work on large tokamak facilities, the advanced limiter test on Torus Experiment for Technical Oriented Research (TEXTOR) in West Ger-

Among the many fusion research activites shared by U.S. and Japanese investigators and now under way is the collaborative use and joint funding of the materials open test assembly (MOTA, shown above) for the U.S. Department of Energy's Fast Flux Test Reactor (FFTR) in Richland, Washington.

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many, and joint work in the stellarator/heliotron and reversed field pinch research.

The United States and Japan have also joined with the European Community and the USSR to develop a conceptual design and supporting R&D for an International Thermonuclear Experimental Reactor (ITER).

Editor's Note: For more information on the ITER, see "Materials Requirements for Experimental Fusion Reactors" by Dale L. Smith in this issue.

R. Buchanan Named President of International Scientific Instruments

Robert Buchanan was recently named president of International Scientific Instruments (Milpitas, CA), a manufacturer of scanning and transmission electron microscopes. Previously, Buchanan was president of ISI's Applied Beam Technology division. Prior to that he was general manager of ISI GmbH and research director of ISI. Buchanan received his PhD in electron optics from Cambridge University, England, and did postdoctorate work at Tubingen University, West Germany. He has more than 25 years of experience in the field of electron optics.

R.C. Dynes Elected to National Academy of Sciences

Robert C. Dynes, director of the Chemical Physics Laboratory, AT&T Bell Laboratories, Murray Hill, New Jersey, was among the 60 new members elected to the U.S. National Academy of Sciences in recognition of their distinguished and continuing achievements in original research.

Dynes is known for his work in low-temperature condensed matter physics. His contributions include the invention and use of superconducting tunnel junctions as a powerful probe of phonon and electron-phonon properties of various systems, the use of tunneling as a probe of strongly coupled superconductors, and his observation of weak localization in disordered material and exposition of the interaction between localization and superconductivity.

A member of many advisory boards and committees, Dynes is a Fellow of the American Physical Society and the Canadian Institute for Advanced Research, and a member of the Materials Research Society. He was co-organizer for the symposium on high temerature superconductors held at the 1987 MRS Fall Meeting. □

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