rents

LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA 94720

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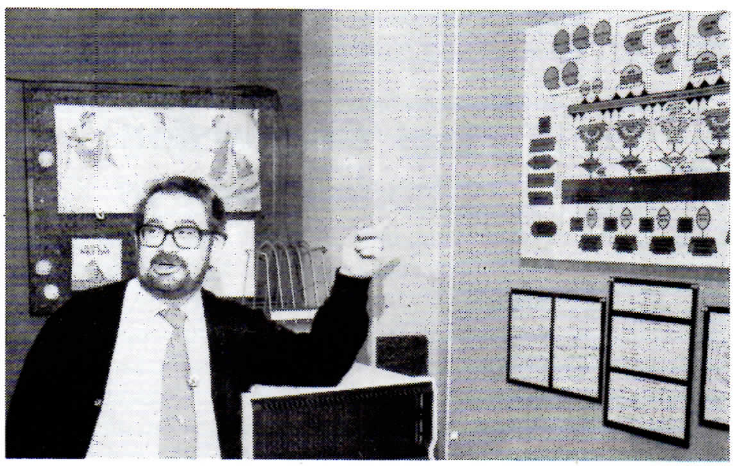
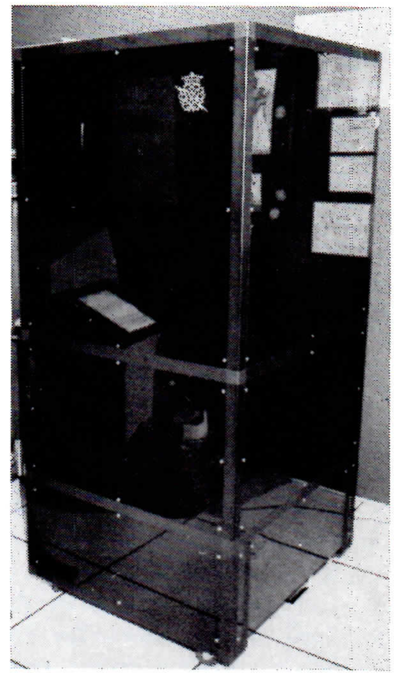
# MIDAS computer speeds up processing





**The MIDAS logo (top) was displayed on the cake at the celebration marking the successful completion of the prototype — the "Monolith" at right. As Creve Maples explains, the diagram (left) shows the array of computer processing units which will comprise the full system.**

A new computer dubbed MIDAS may not be able to turn objects into gold, but it has the potential to accomplish some other rather astounding feats.

Housed in a tall, shimmering, black Lucite box — nicknamed the "Monolith" after the black obelisk featured in the motion picture "2001, a Space Odyssey" — MIDAS looks more like an object from a science fiction fantasy than from a fable of yesteryear. Its futuristic appearance gives a clue to its true nature. MIDAS — an acronym for Modular Interactive Data Analysis System — is a prototype for an innovative, high-speed, computing facility.

This prototype was built to demonstrate the feasibility of using an array of processors operating concurrently (in parallel) to achieve a highly interactive, high-speed, graphics-oriented, computing system. "The parallel use of large processors on a single problem places MIDAS at the forefront of modern computing techniques," says project leader Creve Maples of the Nuclear Science Division.

Although MIDAS is not intended as a general-purpose computer, it has been designed to handle broad classes of problems, especially those involving the analysis and evaluation of scientific data. These types of problems frequently benefit from a very fast real-time response which allows the scientist to immediately make subjective decisions on the course of the analysis. Theoretical calculations and mathematical modeling, in which different simulations can be carried out simultaneously, could also benefit significantly from this "architecture," or organization of the computer elements.

Up to this time, most computers have been serial in operation, successively executing the commands given by a program. How fast such computers can go is ultimately determined by the velocity of light, which limits the speed with which electric signals can be transferred. The fastest existing serial computers are probably within a factor of ten of their theoretical limits, according to Maples. *Cont'd.*

## MIDAS computer, *cont'd.*

In order to achieve significantly greater processing speeds, it is necessary to utilize a parallel processing approach. The current supercomputers, such as the CRAY, achieve their speed by executing instructions in parallel; many additions, for example, may be carried out at one time. Problems which can be organized to take advantage of this capability, such as vector or matrix operations, can realize substantial increases in computational speeds on such machines.

MIDAS utilizes a different parallel architecture — multiple processors, really mid-range computers, operating simultaneously and asynchronously. These processors may either all run the same program and use different input data (such as for data analysis or Monte-Carlo simulations), or each may run separate programs which could represent different phases of the same calculation. In such cases, the computational speed that can be achieved is essentially limited only by the number of processors used. "The successful operation of the prototype demonstrates the principles underlying the MIDAS system and illustrates that this new type of computing can be used effectively," says Maples.

The need to rapidly transfer data and results between processors can, of course, also pose a bottleneck. This situation is very much like a subway system at rush hour — people in station A wish to get to station C. Conventionally, they get on at A, ride the train, and get off at C. The amount of time this requires depends on the number of people at station A, how fast the trains run, and how crowded the cars are. In the approach adopted by MIDAS, however, the people do not move; the stations are switched. In a single operation, station A simply becomes station C. Physically, this is accomplished by switching blocks of memory, containing information, between processors, rather than transmitting the information via a conventional input/output "bus."

There are currently three mid-range processors in operation and three more being tested. As designed, the full MIDAS system could handle 50 or 60 computers. One can commercially purchase the central processing unit (CPU), or heart, of an upper mid-range computer for about one-tenth the cost of a complete computer system utilizing this CPU. "Once a basic system is completed, we simply need to buy more processor boards and plug them in," says Maples, "making this type of computer architecture much less expensive. In addition, the design flexibility will permit adaptation to changing user needs and changing technology."

In comparison tests of a three-processor system, MIDAS took 159 seconds to execute an existing FORTRAN program that took a comparable standard computer 612 seconds (programs with a heavy calculational base required 673 seconds, as opposed to 2314 seconds). In all cases, the MIDAS prototype took less than one-third of the time. When the next set of three processors becomes active, the prototype speed will increase by an additional factor of two.

Development of the prototype represents completion of Phase 1 of the MIDAS project. Subsequent phases will involve building a fully interactive, single-user model and then the complete multi-user MIDAS facility. For the class of problems MIDAS was designed to handle, the complete facility will provide computational power significantly greater than that provided by the CDC7600.

Construction of the prototype was accomplished in the Nuclear Science Division, with support from the Department of Instrument Science and Engineering, E&TS. Project engineer John Meng of E&TS was responsible for hardware design, and Dan Weaver of NSD developed the system software.

## *Final 'Connections' episode to screen*

The last episode of Connections, entitled "Yesterday, Tomorrow and You," reviews highlights of the previous programs to illustrate the common factors that make for change at different times and places. Narrator James Burke reflects on the difficulty of comprehending the rapid changes occurring in the world at the present time and concludes with a plea for radical alteration in the availability and use of information in the future.

The film will be shown on Tuesday, January 26, at 12:05 p.m. in the building 50 auditorium. The 10-part BBC series has been sponsored by the Employee Development Office of the Personnel Department.

## Donner research, *cont'd.*

may be more heavily damaged than would be expected from the blood count.

Collaborating with Ebbe is senior research associate Elizabeth Phalen. In conjunction with her platelet research, Ebbe, a medical doctor, directs Donner Clinic, in which patients with blood disorders are diagnosed, treated and studied.

## flea market

### AUTOS & SUPPLIES

'67 PONTIAC Executive, a/t, p/b, p/s, gd cond., $400/b.o. Eddy Gamp, X5141, 841-3759

'72 CHEVY Kingwood Estate sta. wag., a/t, p/b, p/s, a/c, $850. Marjorie Hutchinson, X4727, 935-6694

'74 DATSUN sta. wag., a/t, AM/FM cass., 1 owner, well maint, incl. records,

### MISCELLANEOUS

IBM SELECTRIC I film/carbon cartridge ribbon, fully serviced Jan. '82, works great, buying correcting Selectric, $450. (Same mach. sells elsewhere for $685.95)(Installment plan avail.) Pam Atkinson, X6386 (9-1 p.m. MWF), 652-4083

PEONY bulbs, giant pink, heavy producers, for immed. planting, $1/ea. Richard DeMarco, X6056, 845-1723

ARM CHAIRS matching, early Am tweed w/wood trim, 1 match. o cond., $75/b.o. Judy, X5914

PALOMINO Gelding 12 yrs, 14-1 needs exp. rider, $600/b.o. 827-0875

HP 25 program. w/new batt. pa case, 2 rechrge transformer p manual/appl. handbook, $70/b. Lampel, X6372, 763-3348