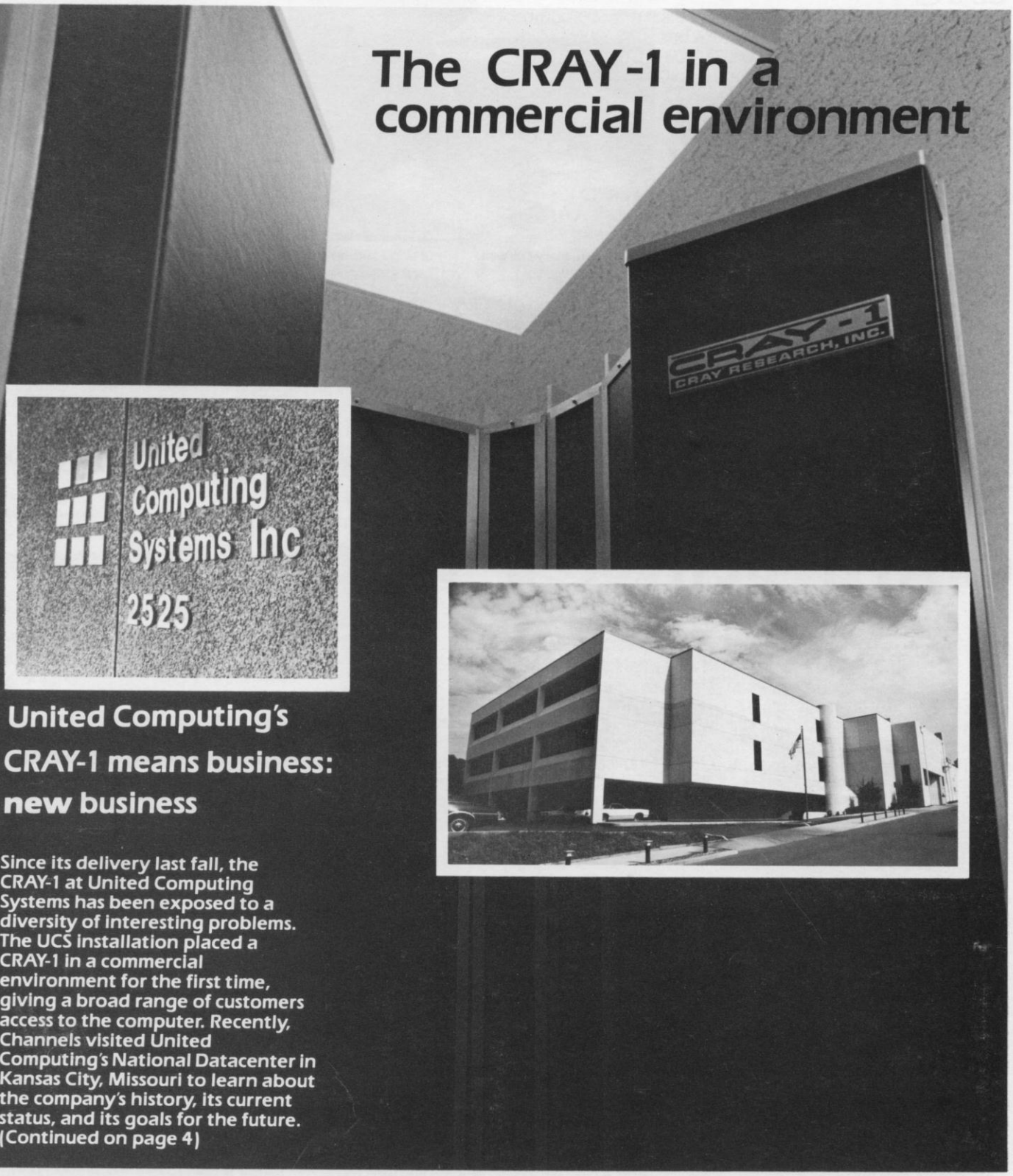
CHANNELS

A Publication of Cray Research, Inc.

Vol. 1 No. 2

The CRAY-1 in a commercial environment



United Computing's CRAY-1 means business: new business

Since its delivery last fall, the CRAY-1 at United Computing Systems has been exposed to a diversity of interesting problems. The UCS installation placed a CRAY-1 in a commercial environment for the first time, giving a broad range of customers access to the computer. Recently, Channels visited United Computing's National Datacenter in Kansas City, Missouri to learn about the company's history, its current status, and its goals for the future.
(Continued on page 4)

letter from the editor

Why do customers patronize a computer services company such as United Computing? The UCS corporate slogan provides an accurate answer: "people, systems and solutions United". In this spirit, UCS offers to its customers a large selection of sophisticated proven software, state-of-the-art hardware, technical expertise, responsive service, security and cost-effectiveness.

The UCS organization is impressive. The reason for their success in the rapidly-growing field of computer services is evident: they've consistently kept current with technological advances in a number of industries and have been there to offer the needed computer services.

Tina Bonetti, Mary Culligan

The acquisition of a CRAY-1 computer system is yet another step in UCS's development as a full-service computer services vendor. The CRAY acquisition is especially important, as it gives UCS a definite technological and competitive advantage. This issue of **Channels** details how United Computing has prepared for and seized that advantage.

With this issue, I am concluding my work as **Channels** editor. The new editor, Mary Culligan, comes to **Channels** with a B.A. in Journalism from the University of Minnesota. Ms. Culligan hopes to use reader input as a guide in structuring future issues of the **Channels** newsletter.

—T.M.B.

CRAY-1 delivered to Cray Research

On April 6, 1979 a one-half million word CRAY-1 arrived at the Cray Research Headquarters in Mendota Heights, Minnesota. As a result of this milestone event, the software development and benchmark groups at CRI now have their own dedicated CRAY-1. Prior to the CRAY-1 delivery, development and benchmark work was done on the CRAY-1 mainframes in production at CRI's Chippewa Falls manufacturing facility. This resulted in lost productivity to these groups due to the slow transmission of long distance telephone lines used in transmitting data files from Mendota Heights.

The CRAY-1 at Mendota Heights represents a first for CRI. The mainframe is composed of just 8 physical columns rather than the normal 12. This unique chassis design was chosen by CRI in order to retain low production costs while meeting the hardware requirements of the software development and benchmark groups.

The rapid installation and checkout of the CRAY-1 at Mendota Heights confirmed the reports of ease of installation experienced at other sites. Five days after receiving the CRAY-1, diagnostic tests were running. Within eleven days, user programs were executing in a multi-programming batch environment through the new M/600 front-end. This is a remarkable accomplishment for installation of a large-scale computer such as the CRAY-1.

The diagram **(right)** illustrates the layout of the CRAY-1 at CRI. The CRI configuration consists of a one-half million word CRAY-1, four DD-19 disk drives, three Data General Eclipse S/200s, one Data General M/600, and one Eclipse S/200 in Chippewa Falls connected to an Eclipse S/200 in Mendota Heights. The M/600 interactively supports 32 hardwired terminals and a multiplexer for remote dial-up capabilities. A programmer may now create and edit a batch job for the CRAY-1 from his or her office. This program can then be submitted to the CRAY-1 for execution. Upon completion, the output can be scanned, additions or corrections can be made, and the program can be resubmitted. The M/600 and the Eclipse S/200s also act as local batch entry stations into the CRAY-1.

No changes to the CRAY-1 software were required in making the new CRAY-1 operational. Software routines were added to the M/600 operating system to enable front-end communications with the CRAY-1.

There are a number of distinct advantages in CRI's acquisition of a CRAY-1 at Mendota Heights. First, with the addition of the M/600 as a front-end to the CRAY-1, CRI can interactively transmit batch programs to the CRAY-1 for execution. This will increase the quantity and quality of software development. Also, hardware error processing can be better tested on the Mendota Heights

input/output

Peter Appleton Jones, Vice president, Marketing

In his new position as vice president of Marketing, Peter Appleton Jones will be responsible for worldwide marketing involving, at present, the United States, Canada, France, West Germany, Japan, Australia, and the United Kingdom. His responsibilities will also cover customer engineering, product management, and software development. Appleton Jones most recently served as managing director of Cray's United Kingdom subsidiary. He came to Cray Research from IBM in 1977.

I am very pleased to have this opportunity to write an introduction for **Channels**, particularly as we are on the threshold of many new and exciting developments for Cray Research.

We find ourselves in the middle of 1979 having eleven CRAY-1s installed, all performing to exceptionally high standards of reliability, and each making a substantial contribution to a nationally important sphere of science. The number of CRAY installations will pass through the twenty mark during 1980, with sites in West Germany, the United Kingdom, and Japan, as well as the very significant installations in the United States. Of considerable interest is the wide variety of other mainframe computers which are being connected to the CRAY-1. These include IBM 360s and 370s, Control Data CYBER 70 and 170 machines and the 6000/7000 Series machines, and machines from Honeywell, Digital Equipment, Amdahl, and Siemens.

From discussions that I have had in most of the countries in which we operate, I perceive that it is Cray Research's high standards for both hardware and software plus the quality of support we have provided that has led to our success. This issue of **Channels** describes how UCS, one of the world's most advanced bureau operations, is obtaining major benefit from their use of the CRAY-1.

I referred earlier to exciting new developments within Cray Research. These stem from the demands being made on us by our existing customers and by our numerous prospects around the world. We see a continuing need for more and more memory, greater I/O capability, increased on-line mass storage, and more sophisticated applications and systems software. We are studying these and other areas, and you may expect to see advances by Cray Research on all these fronts during 1979.

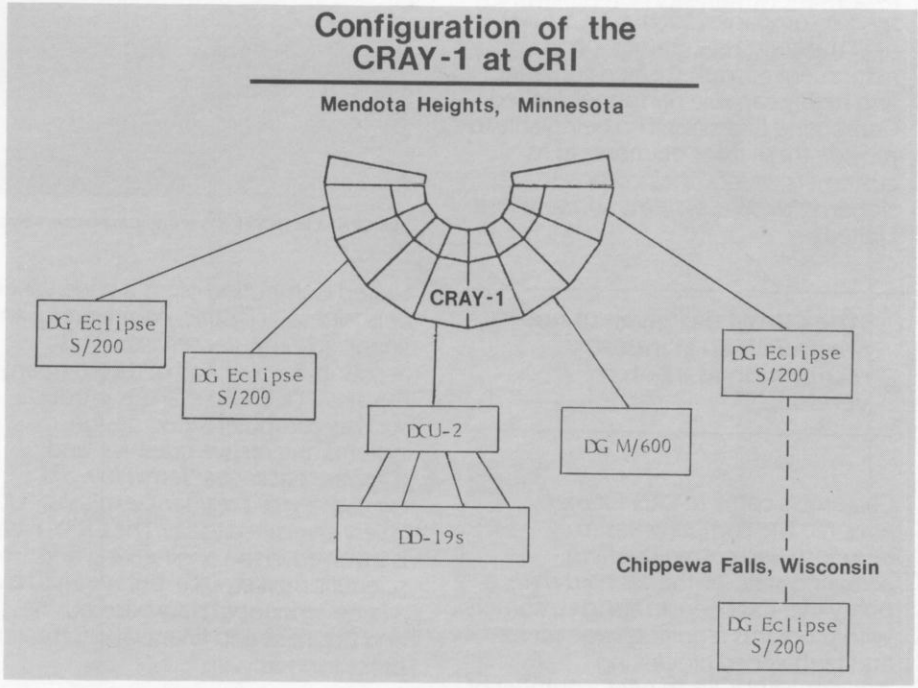
—P.A.J.

Headquarters

CRAY-1. Prior to its arrival, hardware error processing was difficult to perform on a remote CRAY-1 in Chippewa Falls.

Currently, the software and benchmark groups are averaging 300 programs per day through the CRAY-1 system. This total includes various test programs for analyzing the entire operating system under different job mixes and stresses. Utility programs are available for gathering logfile information and statistics, then summarizing this data over a period of days. This assists system programmers in analyzing the operating system performance relating to various workloads in an environment close to that of the customer. This was not possible when the software group ran remotely a few hours at a time on a production CRAY-1 in Chippewa Falls.

The ultimate result of the delivery of a CRAY-1 to Mendota Heights will be improved employee productivity at CRI. For the customer, this translates into timely, comprehensive software releases that have been thoroughly tested and greater responsiveness to customer needs. Additionally, benchmark conversions can be handled in a shorter period of time. The CRAY-1 at Mendota Heights represents CRI's continued dedication to superior software and responsive benchmark support. □



(continued from page 1)

The company

United Computing Systems, Inc. (UCS) was formed in 1967 when United Telecommunications, Inc. acquired Automated Data Service Company, a small organization pioneering computer information services. UCS became a subsidiary of United Telecom.

At its inception, United Computing offered only timesharing services to its customers. However, after acquiring several large Control Data CYBER computers, the company began to establish itself as a viable entity in the remote batch marketplace as well. With its recent acquisition of the CRAY-1, UCS is asserting itself as a leader in remote batch. According to Paul Distefano, executive vice president, Network Information Services Division, "The CRAY-1 has given us one quantum leap in industry recognition as a batch vendor. Now we're a major batch vendor, perhaps of the leading batch vendors in terms of capacity and commitment."

A remote computing services company can offer three basic elements: computer hardware, both applications and systems software, and support personnel. To remain competitive, service companies such as UCS must offer the latest mainframes, an assortment of sophisticated software, and highly capable personnel. United Computing prides itself on being able to provide these three elements to its customers; in fact, their corporate slogan is 'people, systems and solutions United'.

The CRAY-1 in UCS's Kansas City Datacenter computer room

"The CRAY-1 has given us one quantum leap in industry recognition as a batch vendor..."

Customers come to UCS for many reasons. The company has a demonstrated commitment to acquiring state-of-the-art hardware, a policy that has been an aid to customers with programs requiring large memory and high-speed processing. Additionally, UCS can offer a number of software packages to meet specific customer needs. They are often able to provide the most cost-effective processing available for a program. Perhaps most importantly, the company can provide the technical expertise to pull it all together.

United Computing offers a wide variety of business, scientific, engineering, and financial computer services. This accounts for over half of the company's business. UCS also markets products such as computer-aided design systems, interactive graphics, and software packages. Jerry Howard, executive vice president, explains: "UCS is very diversified today. The CRAY-1 itself is involved in the engineering and scientific marketplace, but we also have a large amount of data base business and business and financial information processing as well."

The company's greatest strength, however, is in its orientation towards the engineering/scientific and data base areas of computing. Says UCS president Jack Lorenz, "What we've done is specialized in fairly specific industries in the market, areas that are mainly of a technical nature. We're oriented towards the engineer, the designer, the scientist, and towards the data bases that are used in conjunction with this type of work."

A decision is made

United Computing has always had at least one forefront machine—a machine that is the fastest and the best available for high-volume calculations. After acquiring the CDC 175, the company began looking for the next step in the progression. The mainframes considered by UCS included the CDC 7600, the CYBER 176, and the CRAY-1. The UCS decisionmakers addressed such factors as efficiency, cost, result cost/performance ratios, machine architecture, ease of hardware maintenance, delivery schedules,

software capabilities, and ease of use for the customer. The mainframe chosen was the CRAY-1.

"It's an exciting new service to offer to customers. The fact that we have a CRAY-1 has resulted in and will continue to result in our being able to interest customers in United Computing," said Steve Strohman, Director of Kansas City Operations, summing up the significance of the new CRAY-1 in the UCS computer room.

UCS executives are quick to caution that the CRAY-1 acquisition does not indicate a change in the company's direction. Paul Distefano explains: "The acquisition of the CRAY is not an indication that we want to broaden what we do, but rather that we want to supplement what we already do very well. The CRAY-1 fits our orientation."

Predelivery preparation

Preparation for the delivery of the UCS CRAY-1 was energetic. Once the selection was made, UCS personnel began working so that they'd be ready when the machine arrived. During the months prior to delivery of a CRAY-1, many things must be accomplished: preparation of the computer room, software conversion, training of technical and sales personnel, and, in the case of UCS, planning for an advertising and sales campaign. The UCS record of preparation for delivery is exemplary.

In anticipation of receiving a 4-ton CRAY-1 plus assorted peripheral devices, UCS personnel made room in the 14,500 square foot Kansas City computer room. Soon they'd be moving in the CRAY-1 CPU and its accessories: two motor-generators and control cabinets, a power distribution unit, a maintenance control unit (including a Data General Eclipse minicomputer, a card reader, a line printer, a tape unit, two display terminals, and a disk drive), two disk controllers and four disk storage units. The CRAY and its peripherals were allotted a modest amount of floor space in the computer room.

While United Computing's CRAY-1 was still in production and nearing completion, UCS analysts made several trips to the CRI manufacturing facility in Chippewa Falls, Wisconsin. It was the first opportunity for UCS systems personnel to operate their CRAY-1. The visiting analysts ran preliminary performance tests and became familiar with the hardware and system software. The first trip confirmed

(continued on page 7)

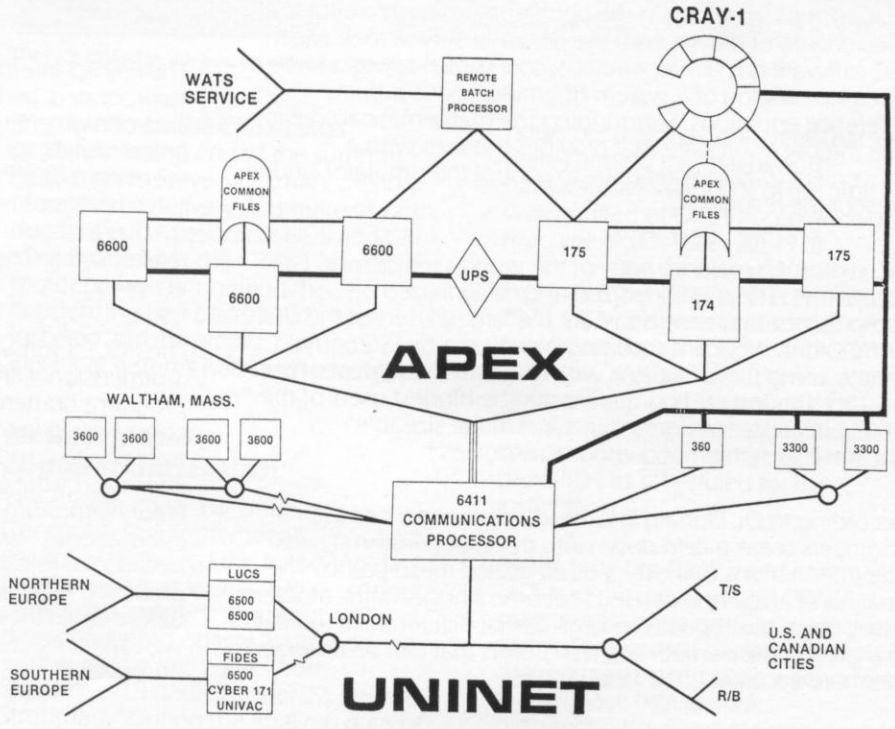
The systems at UCS

UNINET, the United Computing Systems data communications network, is accessed by customers in over 200 cities across the United States and in Canada and Europe. Access to the UCS computer centers through UNINET via toll-free telephone lines. A large-scale CDC-6000 Series computer serves as the Interactive Communications Processor for UNINET.

The National Datacenter in Kansas City, Missouri is the UCS central computer facility. Additional computational support is provided by computer complexes in Boston, London and Zurich. Data concentrators or high-speed multiplexers transmit data from remote terminals to UCS computers.

The company's main delivery system is APEX/SL. APEX consists of two clusters of computers: the A cluster, composed of three CDC 6600s, and the B cluster, composed of two CYBER 175s and a CYBER 174. The UCS CRAY-1 is accessed through the B cluster of APEX. A job may be submitted to the CRAY-1 via a timesharing terminal or through a card reader at a local or a remote batch station. The two CYBER 175s act as front-ends to the CRAY-1, transferring all data to and from the CRAY according to APEX conventions.

The customer interface to the CRAY-1 is APEX-oriented. Thus, a customer familiar with APEX will be able to access the CRAY-1 without having to learn many new commands. The CRAY-1 user keeps permanent file data on APEX disk hardware. A job going to the CRAY is sent through a CRAY-1/CDC CYBER interface. Then, as needed, permanent files are transmitted from the APEX permanent file system across the interface to the CRAY-1. Four DD-19 disk storage units attached to the CRAY-1 are used during job processing for temporary storage. Once the job has been completed, results are shipped back across the interface to the APEX permanent file hardware. The files may then be accessed through APEX. A user may obtain a printout of the results from the Datacenter, may have the data transmitted over UNINET to a remote batch terminal, or may simply keep the file(s) on APEX until the next log-in. □



The activities of two UCS CRAY-1 users

Even a brief look at two UCS CRAY-1 customers gives one an idea of the complexity, the variety, and the importance of the work being done on United Computing's powerful new resource.

SCIENTIFIC SOFTWARE CORPORATION

One of United Computing's larger customers on the CRAY-1 is the Scientific Software Company (SSC) of Denver, Colorado. SSC is primarily a petroleum consulting firm that conducts geological and petroleum engineering studies to find and develop oil reserves. The company also offers its software for sale to SSC clients on a proprietary basis and allows access to it by users of the UCS CRAY-1.

SSC's software aids petroleum engineers in developing ways to predict the underground movement of oil, water, and gas. Thus, engineers can analyze a number of development alternatives for existing fields in order to maximize the ultimate recovery of oil or gas.

The SSC software packages simulate the pressure and volume relationships occurring in the petroleum reservoir as fluids are injected into or drawn from the porous reservoir rock. Most SSC software has a mathematical core which solves a finite difference analog of a system of simultaneous partial difference equations. Surrounding the mathematical core is user interface software that provides the user with a convenient way to enter data, to control the simulator, and to present the results.

SSC customers include many of the world's major oil companies. The medium-sized and nationalized oil companies, mainly overseas, are the largest users of the UCS CRAY, either through consulting work done by SSC or by directly using the UCS CRAY with SSC software. (Most of the industry's largest companies are not the biggest users of the CRAY-1 because they generally have made sizeable investments in internal computer resources.)

According to Dr. Donald Thurnau, vice president of SSC, engineers break a field down into three-dimensional grids. The intersections of these grids are called mesh points. The analysis of an oil field can thus become a huge matrix problem using these mesh points in large partial differential equations. The greater the number of mesh points that can be analyzed, the more accurate is the field analysis.

On the UCS CRAY-1, SSC is able to analyze up to 10,000 mesh points, nearly half again as many as they were able to analyze running on UCS's CYBER 175. Dr. Thurnau says the CRAY-1 has allowed SSC to analyze larger oil fields and analyze larger portions of very large oil fields. SSC has been pleased to find that they can run their software on the CRAY-1 more economically because of the computer's speed and memory size. Due to the improved turnaround time on the CRAY, the company has been able to look at more alternatives to a given problem, thus providing a more thoroughly researched solution.

Soon the CRAY-1 will be involved with problems in tertiary oil recovery. Tertiary engineering involves using various stimuli such as steam or injection of chemicals to aid in extraction of oil from a reservoir. Without outside stimulus, 20 to 30 percent of the oil in a field can be extracted. Using tertiary engineering, an additional 5 to 10 percent more oil may be recovered. In an oil field, this amounts to a sizeable increase in production. This is just one of the many exciting ways the CRAY will be used by UCS customers in the future.

Physics International

A Subsidiary of ROCKCOR

The Physics International Company, a subsidiary of ROCKCOR Incorporated, performs research and development work in the area of high energy physics (fusion research and electron beam studies, for example) as well as in the development and licensing of the PISCES computer codes. PISCES is used to solve problems relating to high speed transient phenomena such as explosions, impacts, shock dynamics, and nuclear reactor safety. The UCS CRAY-1 is used strictly in the PISCES activities.

The PISCES software package consists of 1-, 2-, and 3-dimensional finite difference programs. The finite difference programs numerically solve equations expressing the physical conservation laws of mass, momentum, and energy. PISCES is available to customers of UCS on a royalty basis and is used internally by the company for their own consulting work. Says Naury Birnbaum, manager of applied mechanics at Physics International, "We became interested in the CRAY-1 at UCS because of its capability to extend analysis to very large problems including fully three-dimensional models. Never before could these problems be run at economical cost. Now, we expect PISCES to be heavily utilized on the CRAY-1 by ourselves as well as by our outside customers." □

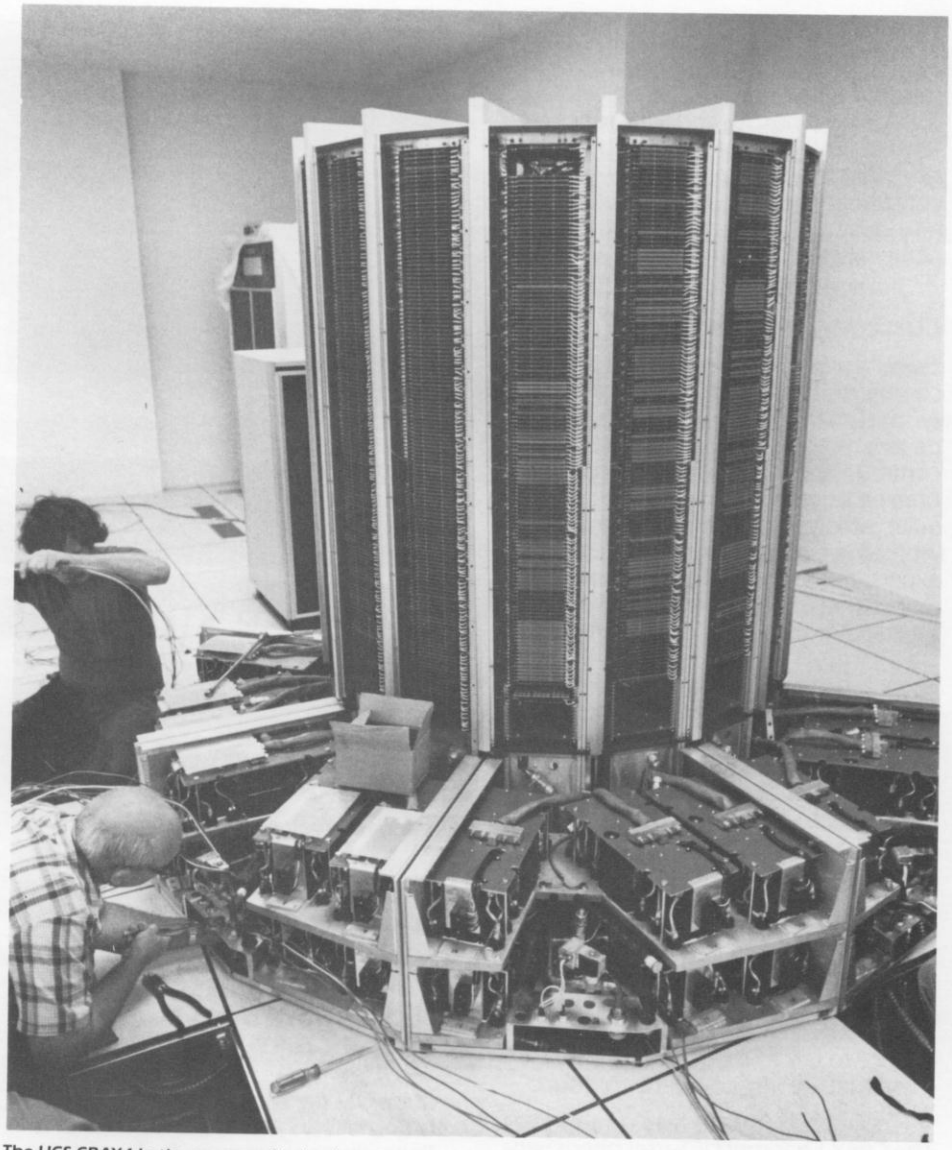
original UCS projections about the relatively minimal amount of software modification involved in integrating the CRAY-1 into the UCS network. Subsequent test trips allowed systems staff to conduct much of the software modification necessary prior to installation of the computer.

Nate Losapio, manager of system support, said that although there were a few things to work out on the APEX side, the communications between the CRAY-1 and the two CYBER 175s turned out to be one of the easier software modifications. The principal component of the UCS front-end software is a new Executive program that runs on the CYBER 175s, interfacing the APEX and CRAY software. The UCS computer systems development staff also modified some timesharing and remote batch commands so that users would be able to direct their jobs to the CRAY-1 for processing.

Prior to delivery of the CRAY-1, UCS began planning training sessions for its personnel. The first sessions, held in September 1978 for the company's senior technical people, focused on vector processing techniques. UCS and CRI representatives then travelled to five key UCS sales offices to conduct local training, covering the CRAY-1 architecture, speed, access procedures, and so on. After the CRAY-1 became commercially available, UCS held a seminar for marketing and technical people. The purpose of the seminar was to present vector processing concepts, the CRAY-1 and its access mechanics and procedures, and marketing strategies for the machine.

Getting ready for the delivery was quite smooth, due to the joint efforts of UCS and CRI staff.

Meanwhile, the UCS marketing effort was gearing up for delivery of the new hardware offering. The company anticipated attracting customers having the largest, most complex problems for the amount of computer resources needed. Says Sherwin Chasen, director of marketing services, "Our approach was to take a broad-brush look at the major industries that we felt the CRAY-1 would be appropriate for. The industries we listed were: structural engineering, petrochemical research, electrical utility work, the chemical industry, and electronics. These are all high-technology industries that we feel have the requirements for the CRAY-1 compute capacity."



The UCS CRAY-1 in the process of being installed

Preparation for the CRAY-1 was complete by the end of the summer. According to Steve Strohman, getting ready for the delivery was quite smooth, due to the joint efforts of UCS and CRI staff. By the time the CRAY-1 arrived, the motor-generator unit and the condensing unit had already been installed and the piping, plumbing, and electrical systems had been tested out.

Delivery and commercialization

The system arrived at United Computing on September 5, 1978 and power was applied the following day. For the next two weeks, CRI personnel performed machine checkout. UCS then conducted quality assurance testing for the five weeks from September 18 until October 22. Reports Strohman, "During the final ten days of quality assurance testing, for the 21 hours per day, 7 days a week that we were running the machine, the hardware was up 100% of the time." CRI was notified of UCS's acceptance of the machine on October 22, 1978.

From October 23 until December 1, 1978, UCS personnel did some fine tuning on both the APEX and CRAY software, preparing for commercial service. Then on December 1, UCS successfully commercialized the CRAY. It is worth mentioning that UCS met all deadlines as scheduled for the installation.

By the time the CRAY went commercial, UCS had mounted a solid CRAY-1 marketing campaign. Glenn Hitchcock, director of product marketing, explains: "We earmarked ten cities, each a large marketplace that includes high-technology industry requiring the computing sophistication of the

CRAY-1." The cities targeted by UCS include Boston, Chicago, Dallas, Detroit, Houston, Los Angeles, New York, Oklahoma City, and San Francisco. The technologies represented by these cities include energy research, construction, engineering structure, the oil industry, oil well and oil processing plant construction, and more.

Customer response

How has response been to the first commercial CRAY-1? Al Klein, marketing product manager, summarized: "The degree of acceptance that the user community has given to it is most unexpected. Users have accepted it quite rapidly and have moved a lot of work to it. It has greatly exceeded our expectations." Indeed it has; Klein reports that CRAY-1 revenues are already several months ahead of budget.

Users on United Computing's CRAY-1 include a number of engineering consulting firms and four major computer manufacturers. According to Glenn Hitchcock, almost without exception, UCS CRAY-1 customers are new UCS customers. What's more, UCS has had a number of CRAY-1 inquiries turn into other business for APEX. Says Hitchcock, "The CRAY-1 has gotten us in the door on new accounts. Because of the reputation of the CRAY, people have been anxious to talk to us, if for nothing more than curiosity. Then, we get a chance to talk to them, to convince them that we've got a better product."

The CRAY-1 has met UCS user needs very well. Nate Losapio reports that several applications that could not run on the CYBERs were successfully run on the CRAY. "These applications couldn't run on the CYBERs because of the volume of disk and the amount of time they would take. We've kept several customers happy by providing them with the capability to run their jobs," Losapio says.

United Computing's CRAY-1 pioneering efforts in network communications will not be without reward. The UCS Technical Division recently announced the licensing of UCS software to Century Research Center (CRC) of Tokyo, Japan. CRC has placed an order with CRI for a one-half million word CRAY-1, to be delivered in the first quarter of 1980. According to Gary Shilling, UCS director of computer systems development, Century Research will gain the rights to use all UCS-developed front-end software, a CRAY-1 simulator package, a CRAY Assembly Language (CAL) cross-assembler, a batch job entry submittal program, and a character set conversion program.

A Calma mechanical drafting, design, and manufacturing system

UCS applications packages on the CRAY-1

Currently, the main software product UCS is offering on the CRAY is ANSYS, a finite element program for large-scale engineering analysis. Since 1970, ANSYS has been used for production analyses by the structural, nuclear, mining, chemical, and automotive industries as well as many consulting firms. Conversion of the approximately 120,000 lines of code comprising ANSYS took UCS programmers about ten weeks. Now, fine tuning of the program is underway. The ANSYS conversion was a relatively easy one, according to Ron Kogan, manager of engineering industry marketing.

Customers using the UCS CRAY-1 also have access to SAP, a structural analysis program for static and dynamic response of linear systems. Applications programs UCS plans on offering via the CRAY-1 include: SIMDA, a post-processor for thermo-analysis; SPICE, an integrated circuit simulator to aid in circuit design; several nuclear codes; some structural engineering programs; an advanced version of SAP; and piping analysis programs.

Future possibilities

In the near future, United Computing executives hope to look into a number of areas to expand their software package offerings. New areas in the structural analysis market are particularly attractive. Further investigations will definitely be done in the automotive, aerospace, airframe manufacture, ground transportation, and consumer products areas. There is also interest in larger, more sophisticated electrical engineering programs.

UCS will soon begin the conversion of NASTRAN, a structural finite analysis program. NASTRAN is larger than ANSYS (about 150,000 lines of code) and has its own loader and compiler. Converting NASTRAN to run on the CRAY-1 will be a major task, but it will be an important achievement. The CRAY-1 NASTRAN program will be the fastest and most efficient version available anywhere in the world, says Kogan.

United Telecommunications' recent acquisition of the Calma Company also provides interesting possibilities for the CRAY-1 at UCS. Calma is a leading supplier of computerized drafting systems that can be used in printed and integrated circuit design, mechanical

design, drafting, and mapping. The combination of the graphics capabilities of Calma with the computing power of the CRAY-1 will be a powerful tool for engineers and scientists in the future.

Says Jerry Howard, executive vice president, "I think that the CRAY-1 is a natural fit with customers using Calma systems. There is a considerable amount of data base handling, engineering mathematical calculations that are done by customers of Calma. The Calma system itself is not capable of doing many of these calculations. We'd like to interface the system directly with the APEX and CRAY complex and make it more automatic for the customer to be able to move the data back and forth. Results generated on the Calma system could be readily transferred to the CRAY for calculations."

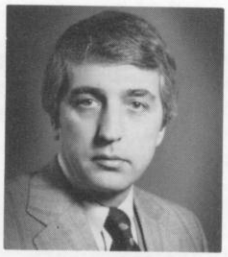
Ron Kogan feels that the addition of Calma capabilities on the CRAY-1 will give UCS a definite market advantage. Says Kogan, "Competitors will have a difficult time catching up to us, especially when something like Calma, which relates to other thiings we're doing, is added."

In the coming months, systems operations people at UCS will be focusing their attention on measuring resource consumption and how it relates to the CRAY-1 and APEX. For the present, APEX front-ends the CRAY-1 well, but as the machine nears its saturation point, it is anticipated that additional methods may be needed. Before that point, UCS must look at new ways of front-ending the CRAY. The company also plans to continue talks with CRI about CRAY-1/CRAY-1 communications and ways in which multiple systems could share files.

The future holds exciting promise for United Computing's CRAY-1. Its continued exposure to new and vital problems will test not only the CRAY-1, but the two companies, UCS and CRI, as well. Significant technical advancement for both Cray Research and United Computing will undoubtedly result from their joint effort. Both companies will grow as a result of working together, each learning from the other.

Paul Distefano predicts: "The CRAY-1 will create a market for remote computing that doesn't exist today. There is a certain market of computation, or at least certain levels of accuracy in computation, that people just wouldn't achieve without the CRAY-1." □

A view from the top ...



G.J. Lorenz, President, United Computing Systems

(**Channels** recently spoke with G.J. Lorenz, president of United Computing Systems, Inc. Lorenz shared with us some of his opinions and predictions about the future of computing in general and at UCS specifically. Here is an excerpt of that conversation.)

Mr. Lorenz, where do you see United Computing in the marketplace today? What is the company's orientation?

We're probably more technically oriented than most of our competitors. We've specialized in fairly specific industries in the market. We're oriented towards the engineer, the designer, the scientist, and to the data bases that work in conjunction with them from a technical standpoint.

If you look at our basic thrust, and at the large-scale processing computers that we have at UCS, you'll see a case of distributed processing. Too often, people say that distributed processing is sprinkling around a number of small computers and hooking them together with lines. To really attack distributed processing, you have to have a functional orientation. So you're really looking at compatible types of systems, with the work done at the remote locations of the distributed processing system being done in conjunction with the host system.

Did the acquisition of the CRAY-1 enhance your position in the marketplace?

When we acquired the CRAY-1, we were already in the marketplace in the heavy compute area, but the CRAY-1 has definitely given us a competitive advantage. We're in a very good position because there are many jobs that are not practical on a slower machine. The time involved to run some of these big jobs is a major consideration. There are always scientists and engineers wanting to use computers. We'll always find the types of analysis problems to fill up the large-scale machines.

How do people feel about the addition of the CRAY-1?

The interest in the CRAY-1 is growing. People who are really enamored with computers can get quite excited. It just sits there in the corner, the most unobtrusive thing you've ever seen. People who come in and look at it can't believe it; they say "That's it?" I like to pull off a side panel and look at the circuitry; it's a beautiful package.

What new uses do you plan for the CRAY-1?

Ultimately, we'd like to attach engineering devices to the CRAY. This would expand its usefulness, especially in the graphics area. There are a number of different applications requiring a high performance computer that could benefit from a computer graphics capability such as pipe design and structural design.

UCS's attention will be focused on trying to develop the engineer's design station. At this imaginary station, the engineer could design graphically, use the facilities of a large computer or minicomputer, direct a plotter to do drafting, and so on.

How far down the road do you feel this is?

Engineers are doing it today in part. If you go to an engineer's workspace today, you'll see perhaps a terminal hooked to some computer, either in-house or on a service basis. People are tuned in to the computer today; they understand and solve a great many of their problems with it.

The CRAY-1 is the computational facility with the ability to solve problems that are impossible to solve using any other means. There are people today, doing jobs, going through the kinds of calculations they were unable to do ever before. It's really exciting. And to me, the CRAY-1 is just the tip of the sword. □

software release summary

This article summarizes major changes made in the 1.06 version of Cray software. Cray software includes the Cray Operating System (COS), the Cray Assembly Language (CAL) Assembler, the Cray FORTRAN (CFT) Compiler, and the Data General Station software (DGS).

COS

The **UPDATE** system program has been completely rewritten. The new version is written primarily in FORTRAN to make it more portable. UPDATE provides the user with a means of maintaining programs and other data on permanent datasets rather than on punched cards. These permanent datasets are called program libraries. The UPDATE control statement has been changed to include parameters specifying an error listing dataset and a data width value. The formats for most of the UPDATE directives have been modified, and the following new directives have been introduced: CWEOF—conditional write end-of-file, WEOF—write end-of-file, MOVEDK—move deck, and PURGEDK—remove deck. The new version of UPDATE generates different logfile messages.

A new program, **STATS**, gathers and summarizes statistics about job activity in the system. Included in the summary are the number of jobs, the CPU time used, the number of disk blocks moved, and the dataset movement to and from the front-ends.

With the new release a second type of overlay is possible. The previously-available type of overlay is now referred to as the Type 1 overlay, and remains unchanged. The new **Type 2 overlay** allows 10 levels of overlays in addition to the root overlay, and each level is allowed calls to a maximum of 63 adjacent overlays. The Type 2 overlay generation directive **OVLL** defines the structure of the overlay within the directive format.

A new **overlay directive SBCA** can be used for either type of overlay to set blank common's starting address. Thus, the user can place blank common after all load modules in the current overlay structure.

AUDIT has been expanded. New parameters on the AUDIT control statement allow the user to specify a dataset to receive binary output and to specify listing of all permanent datasets created, unaccessed, and unmodified since a certain date and time.

A user may now specify on the LDR control statement how **loader error messages** are to be listed. The ABORT parameter on the **COMPARE** control statement may now be set to specify the number of discrepancies between two datasets that may occur before the job step aborts. The RELEASE and REWIND control statements can now specify multiple datasets.

The user may set a new parameter on the **DISPOSE** control statement or the PDD macro so that disposition of a dataset will be deferred until the dataset is released either by a RELEASE request or by termination.

CFT

A major change in CFT this quarter is that the compiler now handles **conditional block statements**, including **block IF, ELSE IF, END IF, and ELSE.** Conditional block statements introduce and delimit groups of executable statements called blocks. Their purpose is to control the execution sequence of the statements in a block.

A **new compiler option, O,** enables the printing of a message identifying any array references found during execution that have out-of-bounds subscripts. This option is OFF by default. Also, the new **BOUNDS directive** allows a user to specify which arrays should be checked for out-of-bounds subscripts.

A new utility procedure, SYMDEBUG, provides debugging aid. SYMDEBUG dumps the contents of specified program variables. Its arguments are identical to that of the COS control statement DEBUG.

DGS

The system may now be shut down and resumed via two new operator station commands. The **SHUTDOWN** command idles down job activity, normally in preparation for a system interruption. Jobs are rolled out, their memory is released, and the parameter specifying the maximum number of jobs that can be active (LIMIT) is set to zero. Station activity is not affected. The **RECOVER** command lifts the suspension from all jobs that have been suspended by a SHUTDOWN command or a system interruption; it will not, however, reschedule jobs suspended by a SUSPEND command (the RESUME command is used for this). The operator must reset the LIMIT parameter after a RECOVER.

SUSPEND and RESUME can now be used to suspend and resume processing for more than one job.

The new **SWITCH** command sets or clears a job sense switch. The **DEVICE** command sets or clears read-only mode for a CRAY-1 mass storage device, making that device available or unavailable to the system for writing.

CAL

No major changes were made to the Cray Assembler in the 1.06 release. □

the Corporate Register

Bill Scholer, Corporate Communications Coordinator

The first six months of 1979 have been particularly exciting and rewarding ones for Cray Research. Three system installations and two system sales during this half-year period provided the basis for a record financial performance. The formation in May of Cray Laboratories, Inc., reinforces the Company's commitment to innovation and will lead to a broadening of marketing possibilities for the CRAY-1.

First Quarter 1979

The Company had revenues during the first quarter of $11,604,000 and net earnings of $2,862,000 equal to 69 cents per share. That compared with revenues of $1,332,000 and a net loss of $211,000 equal to 6 cents per share for the first quarter of 1978.

The relatively high level of profits for the first quarter of this year resulted primarily from the sale in February of the CRAY-1 computer system which was installed last November at the European Centre for Medium Range Weather Forecasts in Reading, England.

In January, the Company delivered a CRAY-1 computer system to the University of California's Lawrence Livermore Laboratory in Livermore, California. This system began producing lease and maintenance revenue for the Company in March.

A CRAY-1 computer system was delivered to a United Kingdom Ministry of Defense user in February. That system was well into its acceptance period by the end of the first quarter.

Also in February, the Company received notification from Sandia Laboratories confirming its intent to order a CRAY-1 computer system for its scientific computer center in Livermore, California. This system is scheduled for delivery in the fourth quarter of 1979.

Late in March, the Company reached agreement with a major scientific research laboratory in the United Kingdom to provide significant usage of a half-million word CRAY-1 system to be located on the laboratory site. The system will also be made available on a nation-wide network to a limited number of other academic research facilities. In addition, blocks of time may be offered to other users in the United Kingdom and on the European continent.

Second Quarter 1979

On April 2, 1979, the U.K. Ministry of Defense customer purchased its full million-word system for approximately $9 million. This system sale insured profitability for the second quarter and helped push the Company's six months' net earnings figures well above the level recorded for the same period a year ago.

For the second quarter of 1979 the Company had revenues of $12,428,000 and net earnings of $2,893,000 equal to 70 cents per share. That compares with net earnings of $452,000 equal to 11 cents per share for the same period a year ago.

For the six months ended June 30, 1979, revenues were $24,032,000, up from $4,379,000 in 1978. Net earnings were $5,755,000, or $1.39 per share, compared with $241,000, or 6 cents per share, for the first six months of 1978.

At their annual meeting in May of this year, the shareholders of Cray Research voted to increased the authorized number of common shares to 10 million from 5 million. Shareholders also reelected six directors: Seymour R. Cray, chairman and chief executive officer of Cray Research; Francis X. Driscoll, senior vice president of New Court Securities Corp., New York; Thomas A. Longo, vice president of Fairchild Camera and Instrument Corp., Mountain View, Calif.; John A. Rollwagen, president of Cray Research; Andrew Scott, chairman of Andrew Scott, Ltd., Minneapolis; and Robert F. Zicarelli, president of Northwest Growth Fund, Inc., Minneapolis.

Shortly after the annual meeting, the Board of Directors elected Peter Appleton Jones to the position of vice president for marketing. In this position, Appleton Jones is responsible for worldwide marketing and system support involving, at present, the United States, Canada, France, Germany, and the United Kingdom.

In June the Company announced the formation of a sales and service subsidiary in Munich, Germany, headed by Jurgen Kesper, managing director. The task of Cray Research GmbH is to carry out sales, hardware maintenance, and software support in the Federal Republic of Germany and West Berlin.

On June 6 Cray Research announced that the Max Planck Institute for Plasma Physics (IPP) at Garching, Munich, West Germany, has ordered a CRAY-1 computing system. The system is valued at approximately $10 million and will be purchased. Installation is scheduled for the third quarter of 1979.

Also during the second quarter the Company established Cray Research Japan, Ltd., a wholly-owned sales and service subsidiary based in Tokyo. Hisayuki Handa is managing director. The delivery of a CRAY-1 computer system to Century Research Center Corporation, Tokyo, is scheduled for the first quarter of 1980.

On April 16, 1979, the Company completed its third installation of a CRAY-1 system this year. This was at the Company's headquarters in the St. Paul suburb of Mendota Heights, Minnesota. Acquisition of this system is providing significant operational advantages for the Company's software development and maintenance organization, which is housed in the headquarters building.

Cray Laboratories

In May 1979 the Company announced the formation of Cray Laboratories, Inc., a wholly owned research subsidiary. G. Stuart Patterson, former head of the scientific computing facility at the National Center for Atmospheric Research in Boulder, Colo., was appointed president and chief operating officer of the subsidiary.

Cray Laboratories will be headquartered in the Boulder/Denver area, but work on development of future hardware products will be continued at Chippewa Falls, Wis. Initial activities in Colorado will be in the systems software area and selected hardware development. □

CRAY RESEARCH, INC.

Sales Offices

Eastern Regional Sales Office
10750 Columbia Pike, Suite 602
Silver Spring, MD 20901

≈

Central Regional Sales Office
75 Manhattan Drive, Suite 3
Boulder, CO 80303

Houston Sales Office
3121 Buffalo Speedway, Suite 400
Houston, TX 77098

Austin Sales Office
3415 Greystone, Suite 201
Austin, TX 78731

≈

Western Regional Sales Office
101 Continental Blvd., Suite 456
El Segundo, CA 90245

Livermore Sales Office
1516 Cataline Ct.
Livermore, CA 94550

Seattle Sales Office
536A Medical Dental Building
2728 Colby Avenue
Everett, WA 98201

≈

International (Subsidiaries)

Cray Research (UK) Limited
David O'Brien - Managing Director
James Glaisher House
Grenville Place
Bracknell, UK

Cray Research GmbH
Wartburgplatz 7
8000 Munich 40
West Germany

Cray Research Japan, Limited
No. 201, 35-1 Okamota 2-Chrome
Setagaya-Ku, Tokyo 157 Japan

CHANNELS

Published quarterly by the
Technical Publications Department

Cray Research, Inc.
1440 Northland Drive
Mendota Heights, MN 55120

Editor	Tina Bonetti
Associate Editor	Joe Dohn
Photography	Chad Jewett

New prime number discovered at LLL

A Cray employee and a CRAY-1 computer have made news in the world of mathematics with their recent discovery of a new prime number. David Slowinski, using the recently-installed second CRAY-1 computer at Lawrence Livermore Laboratory (LLL), was aided in the discovery by Harry Nelson, an LLL computer scientist.

The new prime number is estimated to be larger than the number of atoms in the universe—13,395 digits long. It is about equal to the square of the previously largest-known prime number, the 6,987-digit prime discovered by California State University student Curt Knoll in February 1979. To give an idea of the sheer size of the number, consider this: a billion, billion, generally considered to be a large number, is just 19 digits long! If we were to print the Nelson-Slowinski prime in this issue of Channels, it would take up more than two full pages!

A prime number is one that can be divided only by itself and the number one. Very large prime numbers are few and far between. The search for larger and larger primes has occupied mathematicians for centuries. At one time the demanding calculation was done by hand. The search has long since become a challenge to computer experts.

The Nelson-Slowinski discovery has the additional distinction of being a Mersenne number. A Mersenne number can be expressed in the form 2^P-1, where P is a prime number. Mersenne numbers that are also prime are quite rare. In fact, this latest find is just the 27th known Mersenne prime.

It all started when Slowinski, a CRI analyst and part-time student at Stanford, needed a project for a graduate class in computer sciences. He decided to write a computer program that would search for prime numbers. Nelson, who develops accuracy and reliability tests for new LLL computers, agreed that Slowinski's program would give the lab's second new CRAY-1 a rigorous workout. Together, they modified Slowinski's code. The final record-breaking run took just 20 minutes on the CRAY.

The discovery, which is reported in the summer issue of the Journal of Recreational Math, will be entered in the Guinness Book of World Records. Experts agree that it will be quite a while before anyone is able to find a larger prime number, let alone the 28th Mersenne prime.□

ECMWF facility dedicated

Last month, the European Centre for Medium Range Weather Forecasts was arrayed with gifts from each of the organization's 17 Member States. The Occasion was the United Kingdom's dedication of the building and grounds to the Centre. England's Prince Charles was given a tour of the Centre's facilities on Friday, June 15, 1979. In return, he presented ECMWF with a plaque commemorating the day's events and attended a ceremonial luncheon held in a brightly decorated tent on the grounds.

In September, 1973, the United Kingdom offered to be the host Member State for the ECMWF organization and to provide the permanent headquarters and facilities for the Centre. ECMWF is now located in a lovely, rural setting at Shinfield Park, about 3 miles south of Reading in the Royal County of Berkshire. The 6300-square meter building, completed in May 1979, consists of an office block, a computer hall, and a conference block.

The CRAY-1 at ECMWF is used to help the Centre meet its main objective, to develop numerical simulations of the atmosphere with a view to preparing reliable medium-range (7-10 day) weather forecasts. The Centre leased CRAY-1 Serial 1 in November 1977 for the period prior to the installation of a full million memory word system. The current system, installed in October 1978, was purchased by the organization shortly after installation.□