In a challenging keynote address, Jay W. Forrester called upon computer people to direct their problem-solving capabilities beyond the industry toward the larger socio-economic issues facing the country today. Dr. Forrester, Germeshausen Professor at MIT’s Alfred P. Sloan School of Management and a world-renowned authority in the field of computer science and the dynamics of change, spoke at the opening session Monday, May 19, of the National Computer Conference in Anaheim, California.

According to Forrester, the institutions that served during our growth period are not necessarily serving us today. One of the underlying faults is the high degree of professional compartmentalization that we see all around us. Within the computer field, he said, “designers design machines, programmers program compilers, managers manage budgets. No one sees how it all goes together and sees where it leads.”

During our country’s growth period, the whole became better from sub-optimizing the parts. “But that independence of sub-goals ceases to exist,” he continued. “The goals become tightly interconnected and the sub-optimizing of the past no longer serves the purpose of the whole society. We have a new kind of system—a new kind of structure, and a new kind of underlying dynamic behavior which for the most part is very poorly understood.”

We are now paying the price for utilizing short-run advantages over the last 100 to 200 years, Forrester said. Since we have no methodology for understanding the long term, we’ve indulged in “quick fixes”—for example, in handling the energy shortage. In trying to solve problems without understanding them, the very actions taken frequently prove to be essential to the continued development of these problems.

Computer people are uniquely qualified to analyze the nature of our socio-economic system because of a background of capability that is now becoming available. The confluence of three major streams—practical management and politics, feedback control concepts, and electronic digital computers—have opened up possibilities in systems dynamics, which is Forrester’s field.

In addition to his current work at MIT, Forrester has been a leading figure in the Club of Rome. His book, World Dynamics, led the club to sponsor its “Project on the Predicament of Mankind,” which resulted in The Limits to Growth.

A major modeling of the socio-dynamics of the U.S., including demographic, agricultural, fiscal, social, and other factors, is being put together by Forrester and his students. So far, only fragments have been assembled, but enough to reveal that the business cycle emerges from the substructure and is not caused or corrected by governmental action.

Forrester outlined three cycles. A four- to seven-year cycle is caused by the interaction between employment and inventories; a 20-year cycle is related to capital investment. An additional cycle seems to occur about every 50 years—1810, 1860-70, 1920, and the current almost world-wide symptoms of the 70’s. Because of its unusual length, it has frequently been attributed to outside factors such as war, the discovery of gold, new technological developments, etc.; therefore, there is no hypothesis concerning its generation.

However, maintains Forrester, “Enough is known about the parts of our system to understand its whole. These parts can be put together.”

It is a challenge, he said, that “should lie within our capability that comes from the understanding of the dynamics of complex systems, from the availability of computers to carry out meaningful simulations of the regions that are too complicated to solve intuitively.”
User Orientation Signifies Maturing of Computer Industry, Gorchow Tells NCC

The needs of the customer are beginning to determine computer products "signifying a maturation of the computer industry," Neil Gorchow of Sperry Univac said Tuesday, May 20, at the 1975 NCC Conference Luncheon in Anaheim, California.

"At the beginning of the computer age," recalled the vice president of product strategy and requirements, "the main idea was to create a product and then search for applications or markets to which to apply these products." He went on to analyze current and projected user needs and the ability of the computer industry to meet user requirements.

"Today most users feel uncomfortable with current computer systems which are so complex they defy understanding and frustrate management. Our products must be less threatening, our software less complex and more flexible; in other words, our systems must be more forgiving," Gorchow said.

Corporate management wants better visibility—particularly regarding total costs of the data processing function. As a result, Gorchow sees the elevation of the DP function in the corporate hierarchy and a changing of the ground rules for performance evaluation.

As management elevates the DP function, the marriage between computers and communications services will be intensified, leading to communications networks and a strengthening of distributed processing systems—both the star networks pioneered by the airlines' passenger reservation systems and the ring distributed architecture exemplified by ARPA and McAUTO.

Because of the technological revolution, users have come to expect more from their computer systems. "This has a decisive impact on how we design our future computer systems," Gorchow said. "The traditional goals of cost/performance will not be placed in the background; however, other goals will be elevated."

Prime considerations in the design of future computer systems will be security and data integrity plus what Gorchow calls "ARM"—availability, reliability, and maintainability.

While continuing to supply the best products that technology is capable of creating, the industry's next challenge is to use new hardware and software technologies to increase programmer, operation, and end-user productivity in both application development and maintenance.

"We have, so far, only scratched the surface in terms of the exploitation of the use of computer systems," he said. "It is estimated by 'industry experts' that less than 5% of the possible applications have currently been implemented. Clearly, the limiting factor for applications development, which is directly related to the continued, unprecedented growth of this industry, is what has been called the 'software dinosaur.'"

Programming has made modest gains, according to Gorchow, through the use of high-level languages and better programmer-computer interaction via operating systems and terminals. But software productivity has not kept pace with the needs of the industry and with the technological explosion in hardware. There have been "many significant advances but very few breakthroughs."

"We must look at applications programming to give us additional productivity," Gorchow said. He expects two types of applications packages in future systems—inter-industry generalized packages that are useful across a wide variety of industries, and specialized intra-industry packages.

In concluding, he remarked, "Users must be willing to change in an evolutionary manner and convince their organizations that these programming tools are necessary—the tools of higher-level languages, applications packages and generators, standardized file/data management methods, and communications protocols in order to increase their own programmer productivity."

Science Fair Held at NCC

John Parsons, 17-year-old senior at Hawthorne High School, Hawthorne, California, won the grand prize at the high school science fair held in conjunction with NCC. Parson's entry, "Electronic Tic-Tac-Toe," also placed first in the category for Design and Construction of Computers and Components. Martin Hamano's "Binary Adder-Subtractor" was awarded second prize in that division.

First place in the Systems Programming division went to Jack Kohn's entry, "Cosmo/Custom Operating System." Second prize was awarded to John Dundee for his "Basic Compiler in PL/1."

First place in the Applications Programming category went to "Optimization of Solar Power Plant" by James P. Lux; second place to William Seaman's "CAI Spelling Test System."
Carter Calls for Involvement of Scientific Community in Government Decisions

The scientific and professional community must be actively involved in guiding governmental decisions. Jimmy Carter, former governor of Georgia and candidate for the Democratic presidential nomination, told NCC attendees in a special address Wednesday, May 21.

"This is a time in the evolution of our nation and world when there is really a searching for proper inter-relationships between scientists on the one hand and other decision makers, particularly political figures, on the other," he said.

Instrumental to the solution of the complex problems facing the modern world, according to Carter, is the involvement of scientific leaders to analyze interrelationships and provide information from which sound decisions can be made.

For an example, Carter described his experience as governor of Georgia. Following a series of public meetings throughout the state, written goals were delineated and then executed with the help of professionals. A streamlining and reorganization program reduced some 300 state agencies to 22.

"As a result of all this," Carter said, "we actually cut the administrative costs of the Georgia government for that period by more than 50%... despite inflation and a tremendous increase in services."

June 1975


Indicating that the computer industry stands "to fare better than most others," Walter E. Hoadley developed a generally optimistic picture of the economy's future in his address before the 1975 NCC Industry Luncheon on Thursday, May 22.

The executive vice president, chief economist, and coordinator of planning for the Bank of America said, "1976 looks like a year of modest recovery, becoming stronger by the end of the year. There is a very real prospect that sometime in 1976 we'll get back to where we were in 1973. Then we'll be on the verge of another potential boom greater than we've ever seen."

In spite of the depressed times, Hoadley maintains that the economy is basically strong. However, without some "real upsurge in confidence," he said, "we may lose another year."

"We still don't have any sign of a turn in general leadership in the industrial community because... they see themselves as a scapegoat. They've taken all sorts of risks in recent years providing more jobs for taxpayers, more income," he continued. "And the stock market, until recently, simply said it was all useless."

Because of a fear that the forecasts may be wrong, industry is caught in a "let's wait and see" period.

We must take time to think about the consequences, Hoadley said, and "explain to people what we are doing and why." This is particularly true in the computer field—a "constructive force" that is sometimes regarded as "leading the world in some unknown direction, perhaps in a sinister way."

"But as confidence returns," Hoadley concluded, "the great single danger is that we will all suddenly feel well at the same time. Then you and I will be kicking ourselves because we are not doing something right now that we should have done."

Dr. Morton Astrahan of IBM was presented the AFIPS Distinguished Service Award during NCC. "In recognition of his selfless contributions to the Federation and to the computer profession," Astrahan is a member of the IEEE Computer Society, an IEEE Fellow, and the organizer and first chairman of the IRE Professional Group on Electronic Computers, forerunner of the Computer Society.
Shown here, a few of the 801 booths by 278 exhibitors that drew record crowds to the Anaheim Convention Center. Over 34,000 people—5,000 more than anticipated—attended the four-day exhibit held in conjunction with the National Computer Conference, May 19-22.

A popular spot during NCC was the Computer Society's membership and publications booth, where a record 210 new members signed up. Above, barely visible between two customers, is Edith Hayman, who personally signed up the bulk of the new members.

by John Hiles

The first National Computer Conference on the west coast, NCC '75 was held in Anaheim from May 19 to 22. The conference's technical program was divided into three categories: Science and Technology, Methods and Applications, and Interaction with Society. Three of the program's 89 sessions are summarized below.

Session 2, PROGRAMMING AS AN ACT OF COMMUNICATION

Session chairman Robert Barton and other panel members attempted to clarify the nature of computers and computer programming by suggesting alternative viewpoints. Essentially, these viewpoints emphasized that computers and programs are passive—computers serve as communication channels and programs can be regarded as messages directed between persons. Charles Seitz pointed out that computers move information from place to place and time to time, that they allow messages (i.e., data and programs) to interact and form new messages.

Observing that people must have priority over computers, the panel was critical of the anthropomorphic concept of computers that underlies statements such as, "the computer says . . . ," or "the program decided to . . . ." People place messages and decisions in programs. In his presentation, Roger Merrell elaborated on the importance of this non-anthropomorphic view of computers. Roger Brown suggested that all programming was simulation. A correct program implies a good match between the programmer's mental analogy and the corresponding physical system.

The session also offered suggestions to system designers. Merrell pointed out that major DP system successes in the past have been associated with insight into the work habits of the people who were to use the systems. If one were persuaded by this session's view of computers, then he would probably agree that most computer systems move messages through a particularly narrow channel—sequential text. Lee Harrison illustrated some possibilities for widening this channel with a film from Computer Image Corporation, demonstrating a system in which computers that augmented the work of artists were used to produce visual images as fast as men could conceive of them.

Session 12, PROGRAMMING—ART, SCIENCE, OR ENGINEERING?

Session 12 concerned itself with the current status of programming, especially with the impact of two or three years of structured programming. Brian Kernighan, session chairman, established a context for the discussion with his statement that the difficulties of programming and design could be regarded as a problem of how to organize complexity. (Abstracts of the speaker's presentations can be found in the conference proceedings.)

Two speakers, Edward Yourdon and Peter Denning, addressed problems that have resulted from an abuse of structured programming. Yourdon described several common programming blunders that were made repeatedly by programmers who suffered from a superficial exposure to structured programming. He found that superficial structured programming had merely led to new forms of bad code—code that was obscure and unnecessarily complex. Bad program design, however, was labeled as a problem of greater magnitude than coding blunders. Yourdon referred to Larry Constantine's work on a design technique known as "Structured Design" and suggested that, although program design is not yet a science, many serious design flaws could be avoided by using Constantine's techniques. Yourdon's assessment of the status of programming and design was that they are both still art forms, whose practitioners need much more education and experience.

In a similar spirit, Peter Denning presented an energetic debunking of the dogmatic and mechanical application of structured programming, referring to that approach as "a snare and delusion." He emphasized that people abuse structured programming when they treat it as a set of explicit rules, which if followed exactly will necessarily lead to the construction of good programs. Examination of the original structured programming literature reveals that the concepts were used creatively in the construction of programs, not mechanically. Denning drew the analogy between writing English and writing programs. Rigid and restrictive rules of form hamper effective writing of both types. The successful writer of prose or programs must "find and cultivate" his own personal style. He emphasized his support of the movement toward better programming style but pointed out that "dogmatic insistence on a fixed set of rules" was not the way to achieve it.

Calling attention to the practice of continually reinventing the same tools, P. J. Plauger characterized programming as still at the level of a cottage industry. "Building on the work of others is the only way to make substantial progress in any field." He discussed the principles of good programming tools. Effective packaging was described as especially important. Software tools can be designed to fit together in various combinations with a minimum of manual intervention. Plauger illustrated this sort of packaging by referring to the UNIX operating system's pipeline facility, where "pipes" are provided to connect the output of one tool to the input of another. Combined in this manner, programming tools become a powerful way to organize complexity.

Even rigorous methods for constructing program modules through decomposition (i.e., the top down approach) require some adjustment. In his presentation on "Modularization Around a Suitable Abstraction," Stephen Zilles discussed the need for paying more attention to data considerations during the development of program designs. Two categories of data were identified, each associated with a particular type of design consideration. Depending on how the problem is viewed, data is either related to the problem or related to problem data representation. Within each module, exposure of representational data should be minimized in order to permit module flexibility and independence. Visibility of problem-related data should be limited to only those aspects of the problem that are manipulated by operations in each module. This close relationship between operations and data has led to the definition of a new type of data oriented module, which Zilles called an operation cluster, or data abstraction. The purpose of this new type of

Continued on page 14
A striking exhibition of paintings entitled “Sixteen on the Silicon Age” was featured during NCC by a young artist, Holly Ann Sweeney, of Mt. Holly Springs, Pa. Divided into three groups—“The Runes,” “The Folk Heroes,” and “The Longings”—the exhibition demonstrated a remarkable blend of technology, emotion, and fancy. A sample from the collection is presented at left, together with its accompanying commentary—also by Ms. Sweeney.

Introduction

As Man continues to modify his world with the utilization of the Earth’s raw materials, he classifies his history with names commemorating the substances he has used to build his technology: The Stone Age, The Iron Age, The Bronze Age.

Today’s world has been given many names. It is known as The Space Age, The Electronics Age, The Computer Age. Perhaps a more conclusive title would be The Silicon Age. This would encompass the other possibilities and also describe the Earth’s role in 20th century technology.

The Magician

Once upon a time, men tried with mumbles and curses and exotic substances to make gold. From this dark art sprang chemistry, a more sincere quest of knowledge. The new breed of alchemists convert the plentiful and humble material, sand, into something miraculous and beautiful: the silicon wafer.

NCC Sessions Summary, continued from page 13

Module, which includes both data objects and operations on those objects, is to encode dependencies within modules and reduce the connections between them. Although present widely used programming languages do not directly support these data-oriented modules, preprocessors and management techniques (e.g., data naming conventions) can be used to implement them.

During the open discussion at the conclusion of this session, one member of the audience warned against exaggerating the similarities between various art forms and programming when he observed that to his knowledge there had never been a Beethoven’s Fifth Symphony, Release 17.9. Perhaps programming is still so young that we have not yet realized that it is just as unique as art, science, and engineering. The answer to the question posed in this session’s title may be, “Programming is Programming!”

Session 23, Bipolar Microprocessors

Theodore Laliotis shaped this session to provide a forum for wider publicity and awareness of the advantages (compared to MOS) and availability of bipolar microprocessors. These devices have been developed to the point where they merit consideration as building blocks for large system designers.

The term “microprocessor,” though relatively new, has already undergone several changes of meaning. David Wyland began his presentation by tracing the history of this term from its original association with single chip MOS devices like the Intel 4004, to the slightly expanded sense that includes processors implemented with chip sets, such as National Semiconductor’s IMP-16. Currently, the term is used in an even broader sense to include “almost any combination of less than 20-40 integrated circuits which will implement the CPU function.” Today “microprocessor” simply means a very small processor, occupying a volume of one hundred cubic centimeters or less.

Wyland’s paper, “Bipolar Microprocessor Design Configurations,” discusses tradeoffs involved in implementing CPU functions with bipolar microprocessors. The bipolar microprocessor’s characteristic high performance (between that of MOS microprocessors and hardwired logic) can satisfy the real-time constraints of applications such as disk controllers and emulation of existing computers. He discussed the advantages and disadvantages of three microprocessor design configurations—single chip (which is not currently available for bipolar devices), multiple chip set with custom design chips (relatively fixed instruction sets, even when controlled by microprograms), and multiple chip sets with general-purpose design chips (which provide flexible system design at the expense of higher chip counts than the custom design.
configuration). Wyland also examined the pros and cons of dedicated control chips versus a combination of standard ROMs and TTL. He concluded by stating that multi-chip bipolar microprocessors can be built from off-the-shelf components and that their performance could be expected to range from 250 to 300 nanosecond system cycle times.

The next two speakers, Marcian E. Hoff, Jr. and Krishna Rallapalli, presented more detailed descriptions of the sort of bipolar building blocks mentioned by Laliotis and Wyland. Hoff emphasized that a primary advantage of the third-generation microprocessor products is that "by permitting microprograms in standard programmable ROMs, the bipolar microcomputer components offer much greater convenience for user microprogramming." Hoff's paper, "Designing Central Processors with Bipolar Microcomputer Components," illustrates the steps in designing CPUs with examples based on the Intel 3000 series of components. The process of CPU design with this type of component was broken into three interrelated steps: selection of the macro instruction set, hardware design, and writing and checkout of the microprogram. His discussion of hardware design included an example of "pipeline" operation, where the execution of each microinstruction overlaps the fetching of the next microinstruction. A standard micro assembly language was illustrated, as were special techniques for processor initialization and microinstruction interrupt handling. Hoff concluded his presentation by describing two contrasting machine designs that have been implemented with Intel 3000 series bipolar components.

Krishna Rallapalli described another family of bipolar microprocessor components—Fairchild Camera and Instruments' MACROLOGIC functions. All five MACROLOGIC parts that were discussed during the presentation share the following features (thus ensuring architectural compatibility): 1) optimized for microprogrammed control, 2) based on a 4-bit slice implementation, 3) provided with three state outputs for realizing bus organization, 4) operations clocked synchronously, and 5) all devices easily addressed as sources or destinations of data. Details of each MACROLOGIC function are contained in the paper by Rallapalli and Peter Verhofstadt, "MACROLOGIC—Versatile Functional Blocks for High Performance Digital Systems."

One of the intended applications of MACROLOGIC is CPU emulation, which was illustrated by Rallapalli as he described a 16-bit, four accumulator, fixed-word-length processor could be implemented with bipolar components. The components that he described are LSI building blocks for data path implementation; Rallapalli also noted that work on a compatible microprogram control unit is underway.

In addition to CPU emulation, a major area of application for bipolar microprocessor components is high speed peripheral controllers. Michael Luccardo, the last speaker in the session, underlined the availability of this technology by describing the Scientific Micro Systems Micro Controller, a microcomputer especially designed for switching, editing, and controlling applications. The processor's instruction set directly accesses variable length I/O and internal data fields—a facility that allows high performance in examining and transferring data. Details of the microcontroller's organization and instruction set are contained in Luccardo's paper, "Architecture of Microcontroller System."

Copies of the 1975 NCC Proceedings may be ordered directly from AFIPS, 210 Summit Ave., Montvale, NJ 07645.

Drs. Carl Hammer (left) and Stanley Winkler will serve as general chairman and program chairman, respectively, of the 1976 NCC to be held in New York City.

**Hammer and Winkler to Head 1976 NCC in New York City**

Dr. Carl Hammer and Dr. Stanley Winkler will head the steering committee for the 1976 National Computer Conference to be held June 7-10, 1976, in New York City. Dr. Hammer, Director of Computer Sciences for Sperry Univac in Washington, D.C., has accepted the position of conference chairman and will direct the steering committee in the planning and organization of the conference. Dr. Winkler, Manager of Applied Technology for the IBM Systems Development Division in Gaithersburg, Maryland, will serve as program chairman.

Both have previously held key positions on conference steering committees. Dr. Hammer served as program chairman for science and technology for the first National Computer Conference in June, 1973; Dr. Winkler served as vice chairman of the program committee for the 1971 Spring Joint Computer Conference.

Dr. Hammer is a member of the Board of Directors of AFIPS and serves as adjunct professor at the American University and as a visiting professor at the Industrial College of the Armed Forces, both in Washington, D.C. Honored in 1973 as the Computer Science Man-of-the-Year by DPMA, he is a member of numerous professional organizations and a senior member of the IEEE Computer Society.

Dr. Winkler is presently engaged in the solution of complex system problems for IBM. During 1972-73 he worked on the IBM Data Security Study. Prior to 1971, Dr. Winkler served in the Executive Office of the President of the United States, where he directed the Resource Evaluation Division and its Mathematics and Computation Laboratory.
Appointees Named to Major Editorial Posts

Two new appointments were announced by Computer Society President Stephen S. Yau following the meeting last month of the Society's Governing Board. Professor Warren L. Semon of Syracuse University was named Editor-in-Chief, and Dr. Richard L. Merwin was named Editor of the *IEEE Transactions on Computers*—both individuals succeeding Professor Robert A. Short of Oregon State University, who has filled both positions since 1971.

Semon, a professor of computer science and Director of the Systems and Information Science Program at Syracuse, has been on sabbatical leave for the past 6 months at the University of Edinburgh. His professional career spans more than 25 years in computer research and design.

Dr. Semon has been very active in the IEEE Computer Society. He served as an Associate Editor of the *IEEE Transactions on Computers* from 1967-70, Chairman of the Publications Committee in 1972-74, and a member of the Governing Board in 1968-69 and 1973-74. He has served as Boston Chapter Chairman and Chairman of Switching and Automata Theory Technical Committee. He has also served as IEEE Computer Society liaison on the AFIPS Publication Committee since 1973.

He received the S.B. in meteorology from the University of Chicago in 1944, the A.M. in mathematics in 1949, and the PhD in applied mathematics—both of the latter from Harvard University.

Richard E. Merwin is Assistant for Simulations and Data Processing in the Technology Directorate of the U. S. Army Ballistic Missile Defense Program Office located in Arlington, Virginia. He currently maintains surveillance of data processing activity on the SAFEGUARD BMD deployment, the Site Defense BMD System Prototype Development, and the Data Processing Technology Directorate of the BMD Advanced Technology Center.

He received his BSEE from the University of Pennsylvania, his MSEE from Syracuse, and his PhD from the University of Pennsylvania. His professional experience includes working on the ENIAC and EDVAC, and establishment of the engineering team for the MANIAC Computer Project. He was active in the development of the 702 and 705 computing systems and later was Engineering Manager of the STRETCH Project.

Dr. Merwin is an IEEE Fellow and member of ACM. He served as a guest editor of the special issue on microprogramming of *IEEE Transactions on Computers* (August, 1974). Other IEEE Computer Society activities include serving as Chairman of COMPON Fall 75, Vice Chairman of the Technical Committee on Microprogramming, Distinguished Lecturer from 1973 to the present, and participation in the organization of numerous conferences. His ACM activities include serving as Past Chairman of the Special Interest Group for Microprogramming and Editor of the SIGMICRO Newsletter, ACM National Lecturer for Microprogramming, and participation in the Committee for Professional Development.

The Computer Society’s Governing Board met Friday, May 23, the day following NCC. In addition to naming two editors for Society publications (see story above), the Board also selected ten Board member nominees and voted to participate in the IEEE Ocean Engineering Council (see President’s message, page 2).
The Queen Mary was the site of a tutorial on microprogramming last month given by J. Michael Galey of IBM (above), chairman of the Computer Society's Technical Committee on Microprogramming, and Richard Kleir of Browne & Ramamoorthy, Inc. Sponsored by the Society's Los Angeles and Orange County chapters, the one-day session was held May 17, the Saturday before NCC, and covered microprogram production and code generation, interpretive execution, the use of microprogramming to improve computer functions, and technologies that support microprogramming. The tutorial text is available from the Computer Society Publications Office (see insert opposite page 14).

Over 200 attended the International Conference on Computer Graphics, Pattern Recognition, and Data Structure held May 14-16 at the Ramada Inn in Beverly Hills. Above, Conference Chairman Allen Klinger of UCLA delivers welcoming remarks to the opening session. At right are Conference Vice Chairman Tosiyao L. Kunii of IBM and the University of Tokyo, and Technical Program Chairman King-Sun Fu of Purdue. Sponsored by UCLA Extension in cooperation with the IEEE Computer Society and ACM SIGGRAPH, the conference featured 18 sessions covering both the design and application aspects of computer graphics, pattern recognition, and data structure. The conference proceedings are available from the Computer Society Publications Office (see insert opposite page 14).

Comicon 75 Fall to Feature 25 Sessions in Three Tracks

Comicon 75 Fall Program Chairman Lynn Hope well announced that over twenty-five sessions have been scheduled for the two and one-half day conference, to be held Sept. 9-11 at the Mayflower Hotel in Washington, D.C. The two-hour sessions will run in three parallel tracks for each day of the conference. Track topics include hardware, computer architecture, software, communications, applications, and systems. The advance program will appear in the July issue of Computer.

Comicon week activities at the Mayflower Sept. 8-11 include two pre-conference tutorials, "Structured Programming" and "Protection of Information in Computing Systems," on Monday, Sept. 8; Comicon 75 Fall; and the First National Conference on Software Engineering, Sept. 11-12. Registration information for all events may be obtained from Harry Hayman, P.O. Box 639, Silver Spring, MD 20901.

Technical Program Completed for 2nd USA-Japan Conference

The technical program of the 2nd USA-Japan Computer Conference, August 26-28 in Tokyo has been finalized, according to Conference Program Chairman John D. Madden.

Consisting of more than 100 presentations on topics of high technical interest and originality, the papers will emphasize real-world applications of computer technology, Madden said.

The principal speakers of the opening plenary sessions will be Dr. Lewis M. Branscomb, vice president and chief scientist of IBM and former director of the NBS, and Dr. Bunichi Oguchi, managing director of the Research and Development Bureau, Nippon Telegraph & Telephone Public Corporation, and a member of the Science Council of Japan.

The program stresses three areas of growing interest in both the Japanese and American information sciences community: applications of pattern recognition and image processing, artificial intelligence and its usages, and computer graphics. All presentations will be translated simultaneously for both English and Japanese-speaking audiences, as appropriate.

The 2nd USA-Japan Computer Conference is sponsored by the Information Processing Society of Japan and the American Federation of Information Processing Societies. Information about registration and group fares can be obtained at AFIPS Headquarters, 210 Summit Ave., Montvale, NJ 07645.

DA Symposium Precedes USA-Japan Conference

Attendees of the U.S.A.-Japan Computer Conference (August 26-28) may also register for a one-day Design Automation Symposium which is being planned for the preceding Thursday, August 21, 1975, in Tokyo, Japan. Sessions on aircraft design, automation, and automatic testing with papers by U.S. authors have already been organized. According to preliminary plans, other aspects of design automation will be covered by Japanese authors.

Preregistration at a cost of $50.00 is recommended. A digest containing the papers presented will be available. Registration and conference details can be obtained from Dr. Richard Merwin, BMD Program Office, 1300 Wilson Blvd., Arlington, VA 22209.
1975 International Optical Computing Conference Stresses Recent Developments in Optical/Digital Systems

Scientists and engineers shared the problems and possibilities of a rapidly-evolving field at the 1975 International Optical Computing Conference, held April 23-25 at the Mayflower Hotel, Washington, D.C. Returning to the United States after being held in Zurich, Switzerland, in 1974, the conference drew an international attendance which included academics from Leningrad and Novosibirsk, USSR.

Sponsored by the IEEE Computer Society and the Naval Underwater Systems Center in cooperation with the Society of Photo-Optical Instrumentation Engineers (SPIE), the conference emphasized optical computing systems and the joint role of optical processing and digital processing. Prof. George W. Stroke, State University of New York at Stony Brook, presented the invited keynote address.

A conference highlight, noted General Chairman Samuel Horvitz of the Naval Underwater Systems Center, was the Thursday afternoon panel discussion on optical vs. digital computing, chaired by Prof. D. P. Casasent of Carnegie-Mellon University.

The consensus was that optical and digital methods are suited for their own specialized tasks: the state of the art favors digital methods for general purpose computations; optical methods have their place in special processors performing applications such as pattern recognition—for example, fingerprint identification. The panelists and audience agreed that at the present state of the art they prefer the hybrid optical/digital approach.

"Speaker after speaker emphasized the need to 'marry' the optical and digital methods," Horvitz commented.

The panel discussion identified areas for future development. Optical needs specified were better input/output transducers, greater flexibility in input signal parameters, and logical programmable operator/processor interaction. For digital methods, ways to prevent input/output bottlenecks from idling the central processor are needed to reduce the overhead of the operating system. It was also noted that, as serial devices, general purpose digital computers lack the advantage of parallel multichannel processing available in analog optical systems.

Developments in applied optics covered at the conference included a paper on optical/digital means of processing radar data by Prof. Casasent; a report on a currency sorting system for the Federal Reserve by W. Robert Carnes, Pitney-Bowes; a description of an automatic cell recognition system by Dr. P. H. Bartels, University of Arizona; and a review of optical and digital processing in radionuclide tomographic image reconstruction by David B. Kay, Institute of Optics, University of Rochester.

Foreign reports on the state of the art in optical computing included a paper on an iterative method for superresolution by Dr. F. Gori, University of Rome; a description of several optical correlation methods by Dr. A. W. Lohmann, University of Erlangen; a review of a method of linear processing with synthetic holograms using spatially incoherent light by Dr. P. Chavel, Institut d'Optique, Orsay; and a summary of analog optical computing using coded reflecting spheres application to scattering measurements by Drs. S. Lowenthal, B. Rossignol, and J. P. Hugonin, Institut d'Optique, Orsay.

The 169-page digest of the conference is available from the IEEE Computer Society Publications Office, 5855 Naples Plaza, Suite 301, Long Beach, CA 90803. Copies are $16 for non-members and $12 for members.

Technology Trends Available from TF&A Committee

The Technology Forecast and Assessment Committee presented sessions at INTERCON on the future of communications, computers, electric energy, electronic components, and instrumentation. The twenty-one papers were accompanied by a special issue of Spectrum which presented a survey of four of the five areas (Electric Energy forecasts appeared in the May issue).

The five INTERCON sessions have been brought together in a special Technology Trends volume which is available from the TF&A Project Office, 2029 K St., N.W., Washington, D.C. 20006. Cost to members is $6.00.
Contributions for The Open Channel can be submitted by any member of the Computer Society. To stimulate the maximum amount of free interchange, technical items (not to exceed one page, including illustrations, in the final magazine format) will not be reviewed but must be sponsored by one other member, whose name will be published along with the item. Contributions must be accompanied by the author’s mailing address and membership number, as well as that of the sponsor. Comments may be sent directly to the author or to the section editor: James H. Haynes, Applied Sciences, University of California, Santa Cruz, CA 94064.

More on Interrupts

In reference to Justin Rattner's communique on Interrupts in the Open Channel in Computer (March 1975, p. 19), I would like to echo the sentiments he expressed. We have designed and built a modular minicomputer multi-processor for use as a communications processor in the ARPA Network. There is heavy emphasis upon reliability (adaptability), speed, and responsiveness. To enhance reliability and load sharing capabilities we have made it possible for a processor to service any I/O device. For queuing tasks (those generated either by I/O unit completions or by software) we have built a card we call the PID (Pseudo Interrupt Device) which stores 128 task flags (bits) in priority order. To set a particular flag, the task requestor (I/O or program) stores the task number into the PID. Processors then fetch tasks by reading the PID. A single load instruction returns the number of the highest priority waiting task and erases that task from the queue. Task fetching overhead is thus reduced to a minimum and makes feasible the frequent checking necessary for high responsiveness.

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With the above letter, we received the following references:


3. A paper by Ornstein, et al, describing BBN’s new ARPANet processor, which uses non-interrupt architecture, has been submitted for the 1975 National Computer Conference.

J. H.