September, 1968

computers and automation

C.a *Takes A Look At*

JOBS AND CAREERS IN DATA PROCESSING

Susie Meyer meets PL/I

The story of how a single language answers the question, "Can a young girl with no previous programming experience find happiness handling both commercial and scientific applications, without resorting to an assembler language?" Let's face it. The cost of programming just keeps going up. So for some time to come, how well you do your job depends on how programmers like Susie Meyer do theirs.

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With PL/I, programmers don't have to learn other high-level languages. They can concentrate more on the job, less on the language.

So think about PL/I. Not just in terms of training, but in terms of the total impact it can have on your operation.

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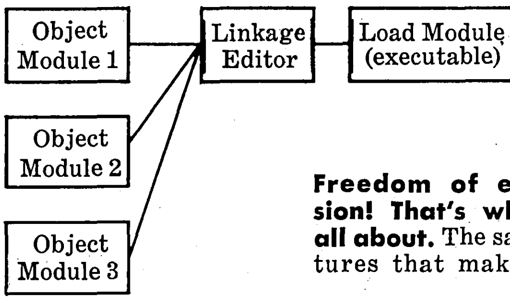

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Letters To The Editor

Course C12

I was a student in your Course C12 (see the announcement for this course, "Computing, Programming, and Systems Fundamentals for Supervisory Management — with 'Hands-On-The Computer' Orientation and Experience", on page 43 in this issue). May I say that I found the small group interaction to be most effective. Small groups of this type are definitely the answer to securing the maximum information in the minimum time permitted.

It was most gratifying to have so many hourly segments of "hands-on" time available on the PDP-9, and I must admit DDT is the first enjoyable machine language I've worked with!

Additionally, LISP, although it may not be the scientist's answer to a prayer, certainly can well take its place in the educational fields. Vocabulary analysis has always been somewhat of a hobby with me, and I'm happy to have the computer take on the burden of the leg work.

I hope your future editions of Course C12 are the success they deserve to be.

LYNN COBURN
Concord Commercial College
Computer Environments Center
Lebanon, N.H. 03766

Computers and Moral Questions — Comments

It is refreshing to see a magazine such as yours take a stand like you did in your editorial, "Computers and Moral Questions", in your March issue.

ERNEST D. CHU
CAI Group
IBM Thomas J. Watson Research Center
Yorktown Heights, N.Y. 10598

Timely Information

My present subscription to your magazine is expiring, and I should like to renew my subscription for one year. I would like to express my appreciation for the excellent and timely information that your publication contains.

D. B. HALLER
Manager of Data Processing
Norfolk and Western Railway Co.
Cleveland, Ohio

Linking Computers — Correction

I note in your May issue under the Research Frontier Section of the Newsletter, an item which indicates that Rensselaer Polytechnic Institute's linking of an IBM 1130 with New York University's CDC 6600 is "to our knowledge the first time a computer as large as the CDC 6600 has been linked directly by high-speed data phone to another computer of a different manufacturer."

I would just like to point out that in the October 1967 issue of your own magazine, the linking of a Honeywell 120 computer system to the Smithsonian Astrophysical Observatory CDC 6400 was discussed in some detail. The activity at the Smithsonian, however, has not been solely concerned with voice grade telephone line communication, but has also linked in a simultaneous operation a telpack service to a Honeywell computer. We have further linked our CDC 6400 to an SDS 940, and will shortly be adding a Honeywell 1200.

Being an R.P.I. graduate myself, I wouldn't want to minimize Drs. Moyer and Block's achievement, but I think we were there first.

ROBERT W. MARTIN, *Manager*
Data Processing Dept.
Smithsonian Institution
Astrophysical Observatory
Cambridge, Mass. 02138

(Ed. Note — *Thank you for the correction.*)

Valuable Reference Tool

We have found your annual directory issue (*The Computer Directory and Buyers' Guide* — the regular June issue) to be one of our most valuable tools for quick reference, and we keep a copy within grabbing distance of each telephone.

MRS. CIEL M. CARTER
ACM Information Center
New York, N.Y. 10017

Pardon Our Printer

Through a printer's error, the "Letters to the Editor" which were published in our July issue were repeated in the August issue. Some of the letters which were scheduled for the August issue are published here.

computers and automation

Vol. 17, No. 9 — September, 1968

Editorial Offices
BERKELEY ENTERPRISES, INC.
815 WASHINGTON STREET,
NEWTONVILLE, MASS. 02160

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AUDIT BUREAU OF CIRCULATIONS

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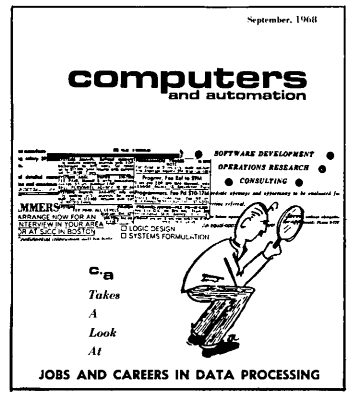
computers and automation

September, 1968, Vol. 17, No. 9 *The magazine of the design, applications, and implications of information processing systems.*

Special Feature:
Jobs and Careers in Data Processing



Regular Features

Departments

c·a

EDITORIAL

The Catching of Errors by Inspection —and Particularly Proofreading Errors

One of the areas which is a big problem for many human beings (and for computers) is the catching of errors by inspection. We mean by this that the context or surrounding of some word or some figure shows that it is very unlikely to be right. So we check further, discover an error, and correct it.

For example, here are three headlines: 15000 in Graduating Class of Somerville High School Receive Diplomas; 1500 in Graduating Class of Teterboro High School Receive Diplomas; 150 in Graduating Class of Underwood High School Receive Diplomas. Suppose we know that the population of each of these three residential communities is about 90,000 and there is only one high school in the town; which of these headlines is certainly wrong? Answer: the first and the third. Inspection to catch errors is often a fine art and sometimes a good science.

One of the areas in this general territory that is useful, entertaining, challenging, and instructive — is the catching of proofreading errors.

What is a proofreading error? It is an error not caught by professional proofreaders. *Proofreading* ordinarily consists of the following process: one person reads aloud copy which has been typeset (or typed), while a second person watches the printer's typeset proof (or the typist's final copy), and tries to catch all the errors which have occurred, whatever they may be; then he marks each error, and specifies the correction. The watcher is of course much more responsible than the reader; he has a much harder job. But the reader must read carefully, clearly, accurately, and quickly. Good proofreaders let very few errors go by. Poor proofreaders — and even good ones if they are in a hurry — let many errors go by. A *proofreading error* is an error which slips by this process and is published.

This problem has become interesting to us since by now we have read at least 2000 articles submitted to *Computers and Automation,* and more than 98 percent of these articles contain errors that have slipped by the proofreading efforts of the author and his associates. These must be corrected before the article is sent to the printer to be typeset. Also, a great many of these articles we have then read a second time in proof after typesetting and proofreading — in order to try to make doubly sure that errors have not crept in before we print the article in *Computers and Automation.* Even so, the standard of accuracy in our magazine is considerably lower than we would like, and unfortunately there are proofreading errors in *C&A*.

With such an experience, anyone's eyes would have been sharpened; and now on reading many kinds of interesting books published by many kinds of publishers, we have caught many proofreading errors which have slipped by professional proofreaders. For half a dozen years, as we have read books, we have noted proofreading errors. And we have begun to offer copies of these errors (embedded in context) to friends of ours, to see if they can detect the error, even when given no hint at all as to its nature. These real-life puzzles have proved to be entertaining and amusing.

For example, a number of times in various books, we have found "vocabularly" instead of "vocabulary"; it seems as if there is an attractive force producing this error, probably because of such words as "regularly" and "particularly". But this is a low-grade proofreading error, because it is simply an error in spelling.

A high-grade proofreading error occurs when a word that does not fit has for some reason slipped in instead of the right word; and the reader's mind must be really alert to detect the substitution of the wrong word, and to deduce what is the right word that should have been there — so as to get full sense out of the context. For example, "of," "on," and "or" fairly often take each other's place, when they should not. And recently in a book, "commended" occurred in a place where it made no sense, and the word that should have been there was undoubtedly "commanded." In this instance, probably the error was in the typed copy sent to the printer because the proofreaders probably would not have missed the difference in sound between "commended" and "commanded."

One of the reasons why such errors and their correction is interesting is that they shed light on the way that human minds work. Slips of the tongue and slips of the mind are revealing clues to the way we all function. How many secrets have been given away because somebody did not keep close enough guard on what he was saying? And what is the feature of our output communication channel which makes it hard for us to say very quickly:

She sells sea shells by the seashore.

Might it not be the same feature of overloading the channel which produces "vocabularly" out of "vocabulary"? The study of proofreading errors should help increase accuracy and precision in editing and in thinking.

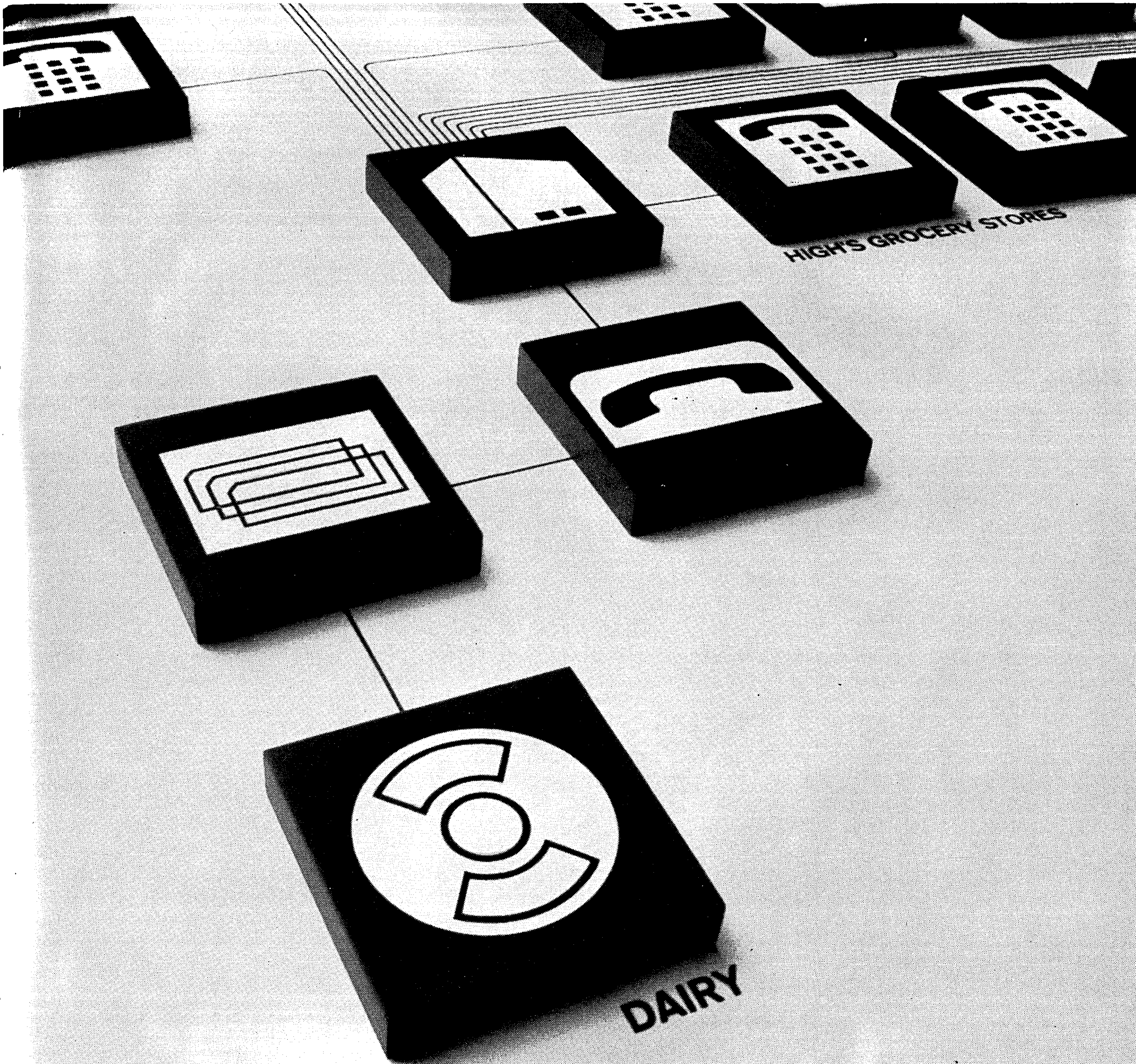
From a more basic viewpoint still, how can we program a computer to understand what we mean, and catch the errors in what we have said?

With this issue we start a new department in *Computers and Automation,* entitled Proof Goofs. Here we will print actual proofreading errors in context as found in actual books; we will print them concealed, as puzzles or problems, in order to challenge our readers. The correction that we think should have been made will be published in the next issue.

We invite our readers to send in actual proofreading errors found in actual books, with a context of at least twenty lines before the error and twenty lines after the error; see the instructions on page 53. We exclude newspapers; they are usually too carelessly proofread to be of value in getting to the bottom of proofreading errors.

We also invite our readers to discuss the problem of how the catching of proofreading errors could be successfully programmed on a computer. Maybe here is an area where the trained human being will be supreme for a long time!

Edmund C. Berkeley
Editor



High's Dairy uses this system to keep their products on the mooooove.

Maybe you never thought you'd find the manager of a retail dairy store involved in data communications.

But it's happening right now at the 160 retail stores operated by High's Dairy Products in the Washington, D.C. metropolitan area.

This system for ordering dairy products couples standard Touch-Tone® phone service at the store and the computer center at High's plant. Instead of writing out all the items he needs, the manager calls the computer center—through the regular telephone network—and transmits his order by tapping out code numbers. At the center five telephone lines terminate in Data-Phone® sets, which interface with five translators and their associated card punches.

High's has cut delivery time in half with this system. And it allows the manager to adjust his order at the last minute if there's a sudden change in the weather or customer demand.

Our Communications Consultant is the man to talk with when you're faced with communications problems. Large or pint-size.

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- Data-Phone data set
- Computer Center
- Card Punch
- Bell System Central Office

AT&T and Associated Companies

CALENDAR OF COMING EVENTS

Sept. 12-13, 1968: Fourth Annual Simulation Software Meeting, Leamington Hotel, Minneapolis, Minn.; sponsors: Central States Simulation Council and Midwestern States Simulation Council; contact Control Data Corp., 8100 34th Ave. South, Minneapolis, Minn. 55440

Sept. 19-21, 1968: Symposium on the Use of Computers in Clinical Medicine, School of Medicine, State University of New York, Buffalo, N.Y.; contact Dr. E. R. Gabrieli, Clinical Information Ctre., Edward J. Meyer Memorial Hospital, 462 Grider St., Buffalo, N.Y. 14215

Sept. 22-25, 1968: Fourth National Annual Meeting and Equipment Show of the Data Systems Div. of the Assoc. of American Railroads, Pick Congress Hotel, Chicago, Ill.; contact Frank Masters, Trade Assoc. Inc., 5151 Wisc. Ave., N.W., Washington, D.C. 20016

Sept. 23-25, 1968: Journées Internationales de l'Informatique et de l'Automatisme, Palace of Congress, Versailles, France; contact Commissariat Général, Dr. Jacques Paul Noel, 37, Avenue Paul Doumer, Paris 16ème, France

Oct. 3-4, 1968: Second Annual PL/I Forum, State University of New York at Buffalo Campus, Buffalo, N.Y.; contact R. F. Rosin, Computer Science Dept., SUNY, 4250 Ridge Lea Rd., Amherst, N.Y. 14226 **before Sept. 1, 1968**

Oct. 6-10, 1969: Second International Congress on Project Planning by Network Analysis, INTERNET 1969, International Congress Centre RAI, Amsterdam, the Netherlands; contact Local Secretariat, c/o Holland Organizing Centre, 16 Lange Voorhout, The Hague, the Netherlands

Oct. 7-8, 1968: Association for Computing Machinery (ACM) Workshop on Microprogramming, Bedford, Mass.; contact Thomas L. Connors, Mitre Corp., P.O. Box 208, Bedford, Mass. 01730

Oct. 10-12, 1968: Data Processing Management Association, Div. 4 Fall Conference, Glenwood Manor Motor Hotel, Overland Park, Kansas; contact DPMA, Kansas City Chapter, P.O. Box 2425, Kansas City, Mo. 64142

Oct. 14-16, 1968: ECHO (Electronic Computing Hospital Oriented), Fourth Anniversary Meeting, Jung Hotel, New Orleans, La.; contact William H. Isaacs, Asst. Sec'y., ECHO, 8153 North Kolmar Ave., Skokie, Ill. 60076

Oct. 14-16, 1968: System Science & Cybernetics Conference, Towne House, San Francisco, Calif.; contact Hugh Mays, Fairchild Semi-conductor R & D Labs., 4001 Junipero Serra Blvd., Palo Alto, Calif. 94304

Oct. 15-17, 1968: Switching & Automata Theory Symposium, Rensselaer Polytechnic Inst., Schenectady, N.Y.; contact S. B. Akers, Jr., Elec. Lab., General Electric Co., Syracuse, N.Y. 12301

Oct. 18, 1968: Annual ACM Symposium on "The Application of Computers to the Problems of Urban Society", New York Hilton Hotel, New York, N. Y.; contact Justin M. Spring, Computer Methods Corp., 866 Third Ave., New York, N. Y. 10022

Oct. 20-23, 1968: International Systems Meeting, Systems and Procedures Assoc., Chase-Park Plaza Hotel, St. Louis, Mo.; contact Richard L. Irwin, Systems and Procedures Assoc., 24587 Bagley Rd., Cleveland, O. 44138

October 20-24, 1968: American Society for Information Science (formerly American Documentation Institute), 31st Annual Meeting, Sheraton-Columbus Motor Hotel, Columbus, Ohio; contact Gerald O. Plateau, ASIS Convention Chairman, c/o Sheraton-Columbus Motor Hotel, Columbus, Ohio

Oct. 28-30: Seventh Computer Workshop for Civil Engineers, Purdue Univ. School of Civil Engineering, Lafayette, Ind.; contact Prof. A. D. M. Lewis, Purdue Univ., Lafayette, Ind. 47907

Oct. 28-31, 1968: Users of Automatic Information Display Equipment (UAIDE) Annual Meeting, Del Webb Townehouse, San Francisco, Calif.; contact Ellen Williams, NASA/ Marshall Space Flight Center, Huntsville, Ala. 35812

Oct. 28-Nov. 1, 1968: Business Equipment Manufacturers Assoc. (BEMA) Annual Business Equipment Exposition and Management Conference, International Amphitheater Chicago, Ill.; contact Laurance C. Messick, Business Equipment Manufacturers Assoc., 235 East 42nd St., New York, N.Y. 10017

Nov. 17-21, 1968: Engineering in Medicine & Biology Conference, Shamrock Hilton Hotel, Houston, Texas; contact not yet available.

Dec. 2-3, 1968: Second Conference on Applications of Simulation (SHARE/ACM/IEEE/SCI), Hotel Roosevelt, New York, N.Y.; contact Ralph Layer, Association for Computing Machinery, 211 East 43 St., New York, N.Y. 10017

Dec. 2-4, 1968: Applications of Simulation Conference, Roosevelt Hotel, New York, N.Y.; contact Arnold Ockene, IBM, 112 E. Post Rd., White Plains, N.Y. 10601

Dec. 9-11, 1968: Fall Joint Computer Conference, Civic Auditorium (Program sessions), Brookshall (industrial and education exhibits), San Francisco Civic Center, San Francisco, Calif.; contact Dr. William H. Davidow, General Chairman, 395 Page Mill Rd., Palo Alto, Calif. 94306

Dec. 16-18, 1968: Adaptive Processes Symposium, Univ. of California at L.A., Los Angeles, Calif.; contact J. M. Mendel, Douglas Aircraft Co. Inc., 3000 Ocean Pk. Blvd., Santa Monica, Calif.

Jan. 28-31, 1969: International Symposium on Information Theory, Nevele Country Club, Ellenville, N.Y.; contact David Slepian, Dept. of Transportation, Washington, D.C.

March 24-27, 1969: IEEE International Convention & Exhibition, Coliseum and N.Y. Hilton Hotel, New York, N.Y.; contact IEEE Headquarters, 345 East 47th St., New York, N.Y. 10017

April 15-18, 1969: The Institution of Electrical Engineers and the Institution of Electronic and Radio Engineers Computer Aided Design Conference, Southampton University, So 9, 5 NH., Hampshire, England; contact Conference Dept., IEE, Savoy Place, London, W.C.2

May 14-16, 1969: Spring Joint Computer Conference, War Memorial Auditorium, Boston, Mass.; contact American Federation for Information Processing (AFIPS), 345 E. 47th St., New York, N.Y. 10017

May 18-21, 1969: Power Industry Computer Application Conference, Brown Palace Hotel, Denver, Colorado; contact W. D. Trudgen, General Electric Co., 2255 W. Desert Cove Rd., P.O. Box 2918, Phoenix, Ariz. 85002

June 16-21, 1969: Fourth Congress of the International Federation of Automatic Control (IFAC), Warsaw, Poland; contact Organizing Comm. of the 4th IFAC Congress, P.O. Box 903, Czackiego 3/5, Warsaw 1, Poland.

Aug. 6-8, 1969: Joint Automatic Control Conference, Univ. of Colorado, Boulder, Colorado; contact unknown at this time.

Aug. 11-15, 1969: Australian Computer Society, Fourth Australian Computer Conference, Adelaide Univ., Adelaide, South Australia; contact Dr. G. W. Hill, Prog. Comm. Chrmn., A.C.C.69, C/-C.S.I.R.O., Computing Science Bldg., Univ. of Adelaide, Adelaide, S. Australia 5000.

Oct. 27-31, 1969: Business Equipment Manufacturers Assoc. (BEMA) Annual Business Equipment Exposition and Management Conference, New York Coliseum, Columbus Circle, New York, N.Y. 10023; contact Laurance C. Messick, Business Equipment Manufacturers Assoc., 235 East 42nd St., New York, N.Y. 10017

Nov. 18-20, 1969: Fall Joint Computer Conference, Convention Hall, Las Vegas, Nev.; contact American Federation for Information Processing (AFIPS), 345 E. 47th St., New York, N.Y. 10017

c.a

MULTI-ACCESS FORUM

INTERNATIONAL FEDERATION FOR INFORMATION PROCESSING CONGRESS — EDINBURGH, SCOTLAND, AUGUST 4 - 10, 1968 — SOME HIGHLIGHTS

Edmund C. Berkeley, Editor
Computers and Automation

The 1968 IFIP Congress was planned for 3000 registrants. By the second day over 3800 had registered, and the committee closed the registration, because they had only printed 4000 copies of the preliminary proceedings.

These preliminary proceedings consisted of 10 booklets, about 8″ by 11 and ¾″, two columns on each page, totaling 1385 pages. Their titles were: Invited Papers; Mathematics; Software (1, 2); Hardware (1, 2, 3); Applications (1, 2, 3); and Supplement. How a registrant could absorb the contents of 1300 pages and make reasonable decisions about what to hear and what not to hear among the five parallel sessions was a question not discussed by the conference committee.

In the opening address Dr. A. P. Speiser of Switzerland, president of IFIP, commented that the cost of one million arithmetical operations is now about 25 cents, and that the computing power for a given amount of money has increased 60 times in 10 years. He also said:

> Genetic molecules are essentially information storage mechanisms, and they give us a unique opportunity to observe how the problem of read-only memory has been handled in nature. . . . Human genetic material contains something like 10^{12} bits of information, which is equivalent in capacity to the largest bulk memories made for computers. Storage is achieved with only a few hundred atoms per bit. Error-correcting schemes must be very highly developed . . . The study of the mechanisms of molecular biology teaches us an interesting lesson on how little matter and how little space is needed to store information reliably, and it demonstrates that what we have achieved in computers is still far from the limits imposed by the law of physics.

In the second main address, to an overflow crowd in Usher Hall (no auditorium in Edinburgh is big enough to hold 3000 people), Earl Mountbatten of Burma (the uncle of the Queen of England, an electronics engineer, and a former president of the Institution of Electronic and Radio Engineers) referred to a project called SDI (Selective Dissemination of Information). Through the cooperation of half a dozen scientific societies (including foreign ones), he said that:

> By 1972 the total significant world knowledge in physics, electronics, computers, and control, should be on computer data file. All this information will be capable of quick retrieval in any form required, through magnetic tapes, computer printout, SDI profiles, etc. By suitable programming an end printout will be in saleable form. . . . . The standard words used in the system were incorporated in a Controlled List or Thesaurus of Unambiguous Terms, in which synonyms had been removed, each word had a specific meaning, and the relationship between words was clearly defined.

And he recommended that computer people study their terminology and use so far as possible "what I could call easily understood everyday language."

One evening session, attended by about 40 people, was chaired by Donn B. Parker, and was devoted to "Ethics and Professionalism in Information Processing." Much of the discussion roved over many different sides of the subject, with little fruitful outcome; but one remark, by Alexander Douglas, of Leasco, London, is well worth reporting:

> "Tryanny is tolerable only when it is inefficient — and we [computer people] are in the position to make it efficient."

The hospitality of Edinburgh was conspicuously manifested in a "garden party" for all conference attendees on Wednesday afternoon, on the grounds of historic Lauriston Castle. The afternoon, in brilliant sunshine, and the fabulous views of the Firth of Forth, the castle, and its grounds will be long remembered by those fortunate enough to have been there.

The most conspicuous lack at the conference was the inability of people who would like to know each other to find each other and come to know each other. Purely by accident I found several congenial people, whom I now count as friends, by happening to sit next to them or wait for a bus with them. It is to be hoped that future large conferences will devote as much skill to fostering acquaintanceships and friendships in the computer field as they have devoted to publishing drafts of technical papers.

Otherwise, I have no doubt that the conference will be classified in the usual way as "successful." Certainly in calling forth and publishing a thorough up-to-date international report on important work being done, it has been truly successful.

COMPUTER PROFESSIONALS SHOW LITTLE AWARENESS OF SOCIAL RESPONSIBILITY

I. From Robert B. Godwin

Information Systems
Computer Sciences Corp.
650 N. Sepulveda Blvd.
El Segundo, Calif. 90245

Having entered the data processing field only two years ago, I have not yet become familiar with all of the commercial press in the field. But I am impressed with the apparent maturity of *Computers and Automation* in its attempt to arouse discussion of the moral consequences of technological progress.

The *Bulletin of the Atomic Scientists* is the only other publication of which I am aware that is committed to a moral/ethical responsibility for their creative output. Hiroshima and Nagasaki have forced this position upon the more responsible practitioners of the participating sciences.

What Megiddo of our own making in the future will of necessity force a re-evaluation of the position of the practitioners of our own "profession" relative to social responsibility for our creations? Or have we waited too long already?

As a member of several professional computer societies, I have seen little evidence of social awareness in us, as computer professionals, of our effect on those not directly concerned with our output — information. Only recently has one of the professional societies come forward with an editorial position concerning two closely related subjects: (1) a code of professional ethics, and (2) recognition of a social responsibility for negative side effects of our technology. The Association for Computing Machinery, with its Special Interest Committee on the Social Implications of Computers, has at least made its members aware that a responsibility does in fact exist. I have seen no similar statement from other professional organizations.

The question of mores, ethics, and social responsibility eventually must be faced by every member of a group. As an individual, I must be involved, however so slightly; as a programmer, I must work with my employer, my fellow professionals, and within my professional societies to bring about some sense of responsibility for those areas of my environment which are affected by the computer.

I would like to see in some periodical, commercial, or societal (and C&A is the only such one involved to date) a panel composed of executives of the various professional organizations (SPA, DPMA, ACM, ASIS, and others) defending their position, or lack of it, as professional societies in relation to moral/ethical questions raised by the widening influence of the computer.

Your infrequent department on "Computers and Moral Questions" should be emulated (not immolated, as some would have it) by other computer magazines, as has been suggested by L. Mezei and others.

Your magazine has very good special features on various topics in the computer field. So why not a special feature on "Computers and Moral Questions"? The articles could cover numerous domestic or international problems (not both) involving a moral or ethical commitment on the part of the practitioners of our profession — if such we are.

II. From the Editor

Your comments are sincerely appreciated. At your suggestion, we are looking into the possibility of doing a special feature on "Computers and Moral Questions" in *Computers and Automation.* We invite our readers to send us comments, suggestions, and articles for consideration on that topic.

COMPUTER BILL OF RIGHTS PROPOSED

Den Van Tassel, Head Programmer
San Jose State College
125 South 7th St.
San Jose, Calif. 95114

Congressman Gallagher's hearings on "The Computer and Invasion of Privacy" have uncovered serious present and proposed invasions of privacy. According to Gallagher, the Bureau of the Budget will formally present its proposal for a National Data Center to Congress in February 1969.

The major objection to the national data bank is that its establishment goes forward today without any clearly defined theory of individual privacy. All the problems that are being discussed on the National Data Center also apply to private collections of information on individuals.

Since most of the problems have been discussed, debated and argued already by proponents of both sides, I will not reiterate them here; instead, I would offer the following Computer Bill of Rights as a possible means of safeguarding the privacy of the individual in a computerized age of personal data banks:

A Computer Bill of Rights

I. Each person shall have the right to inspect his own record.

II. Each person shall have the right to challenge any inaccurate or irrelevant information on his record.

III. Each person shall have the right to control and know who inspects his record.

IV. Each person shall have the right to collect damages for the dispensation of confidential or false information.

V. Each person shall have the right to have excluded from his record all information which reveals intimate habits, beliefs or ideals.

COMPUTER DIRECTORY AND BUYERS' GUIDE — COMMENTS

I. From Sidney J. Cronsberg, Vice Pres.
Computer Research Corp.
429 Watertown St.
Newton, Mass. 02158

I was greatly disappointed in the "Roster of Organizations Offering Commercial Time-Shared Computing Services" in the June, 1968 *Computer Directory and Buyers' Guide*. Computer Research Corp. prepares a semi-annual publication, called the Time-Sharing System Scorecard, which contains a list of commercial time-sharing organizations, and for this reason, I feel that we are quite cognizant in the field. It is my opinion that the majority of the organizations listed in your roster do not offer the type of service advertised. Taking the Massachusetts section as an example, only four of the eleven firms listed actually offer time-shared computing services.

I assume that your information was derived from the questionnaire reproduced on page eight, and of course you have no control over the entries made by your respondents. However, I do feel that your organization does have some responsibility for the accuracy of information which it publishes, particularly when such information is not distributed without charge.

Since I do not like to criticize without offering some better method, may I offer the following suggestions? The first is that you might define terms such as time-sharing services in your questionnaire, and include a plea for accuracy. Secondly, I strongly feel that someone should be performing some sort of validation on these entries. Finally, if I can be of assistance to you in some way, such as advising your organization in one of my areas of interest, I would be happy to — please feel free to call on me.

There is one other point which I should like to bring to your attention. The term "leasing or financial" services may be misconstrued. The Financial Services Division of our company, for example, offers a series of applications packages in the financial field. These are computer programs for the use of people such as Financial Managers, Investment Analysts, and the like, and are offered as time-shared programs. Obviously, these have little to do with computer leasing. Since there may be similar services available, this question and the roster of "Leasing or Financial Services" may be misleading.

I hope this will be of some help to you in the future.

II. From the Editor

We are looking into the problem of accepting information from questionnaires, with the hope of coming up with a better validation procedure. I can see how financial services could have two meanings, and we shall try to distinguish between the two in the next edition of the Directory.

Thank you for writing us. Your help is much appreciated.

ASSOCIATION FOR COMPUTING MACHINERY FORMS SPECIAL INTEREST GROUP ON BUSINESS DATA PROCESSING (SIGBDP)

Paul D. Oyer
SIGBDP
c/o Association for Computing Machinery
211 East 43rd St.
New York, N.Y. 10017

A Special Interest Group on Business Data Processing (SIGBDP) has been formed by the Association for Computing Machinery (ACM). The purposes of the group are: (1) to help bridge the communication gap between computer professionals and businessmen; (2) to serve the needs of people in the business data processing field; (3) to promote use of advanced data processing techniques in business; and (4) to promote education in basic and advanced topics related to business data processing.

Activities and services provided by SIGBDP will include collection and dissemination of information on business data processing, organization of working groups to conduct R&D activities in business data processing methods and applications, and technical and tutorial seminars on business data processing topics.

Membership applications and additional information may be obtained from the above address.

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The following entries are additions to or corrections of entries in the "Roster of Organizations in the Electronic Computing and Data Processing Industry" section of the COMPUTER DIRECTORY AND BUYERS' GUIDE, 1968 (the regular June issue of Computers and Automation).

Key to Abbreviations

*C 68 - checked 1968 (information obtained in 1968); *C 67 - checked 1967, etc.
Sv - computing and data processing services
Ti - commercial time-shared computing services
Tr - commercial courses, training, or instruction in computing, programming, or systems
Co - consulting services in the computer field
Le - leasing or financial services in the computer field
Sf - sells or produces software
S - size (number of employees)
E - established (year organization was established)

We expect to mail out entry forms for the 1969 COMPUTER DIRECTORY AND BUYERS' GUIDE in February, 1969. If you wish to be certain that you receive an entry form for your organization, please send your name, organization name, and address to: 1969 Directory Editor, COMPUTERS AND AUTOMATION, 815 Washington St., Newtonville, Mass. 02160

A

ANDERSEN LABORATORIES, INC., 1280 Blue Hills Ave., Bloomfield, CT. 06002 / (203) 242-0761 / *C 68
Delay line type memories or data stores of wiresonic, glass and electromagnetic types / Co / S 350 / E 51

ANN ARBOR COMPUTER CORP., 415 W. Huron St., Ann Arbor, MI. 48103 / (313) 761-2151 / *C 68
Provide hardware engineering design service for instrumentation and control applications of computers; manufacture interfaces between computers and the processes they monitor or control. Supply software for these systems; also, supply software on a contract basis / Co Sf / S 30 / E 65

APPLIED INDUSTRIAL DYNAMICS, INC., 2702 - 3rd Ave., Seattle, WA. 98121 / (206) 682-5138 / *C 68
Data processing service bureau offering all services and contract programming. In house equipment: IBM System/360, 32K tape-disc system. On order: CDC 3150/65K tape-disc system, (Oct. 68 installation) / Sv Ti Co Sf / S 20 / E 63

THE ASSIST CORP., 7202 Poplar St., Annandale, VA. 22003 / (703) 941-9200 / *C 68
Analysis, design and programming of computer applications related to information processing, management aids, mathematical/statistical modeling and operations research. Management consulting services in the fields of ADP equipment, selection, installation and training / Sv Tr Co Sf / S 20 / E 65

C

CALABRO PLASTICS INC., Unitrack Div., 8738 West Chester Pike, Upper Darby, PA. 19082 / (215) 789-3820 / *C 68
Printed circuit card guides; plastic molding (custom) / S 15 / E 52

CALIFORNIA ELECTRO-SCIENTIFIC CORP., 2203 South Grand Ave., Santa Ana, CA. 92705 / (714) 546-9550 ext. 9551 / *C 68
Digital printers / S 23 / E 61

CENTRE D'ETUDE DE RÉALISATION ET DE GESTION, 85, rue Pierre Demours, Paris 17, France / 924-55-21 / *C 68
Programming and consulting services in areas of management sciences, operations research, design automation; specialists in PERT and computers applications in civil engineering. Complete PERT analysis; scientific computation / Co / S ? / E ?

COLUMBIA EMPLOYMENT AGENCY, INC., 342 Madison Ave., New York, NY. 10017 / (212) 661-3434 / *C 68
Personnel agency for the data processing and computer community; specialize in programming managers, programmers — commercial, scientific, software; R & D and O.R. scientists, M.I.S. managers, systems managers and analysts, consultants, DP managers, DP marketing and sales, DP operations. Special executive search division for positions in $25,000 to $50,000 range; U.S. and Overseas positions. All fees paid by employer / Sv Co / S 15 / E 48

COMPREHENSIVE COMPUTER SERVICES, INC., 3012 Johnson Rd., Huntsville, AL. 35805 / (205) 881-7629 / *C 68
Programming and consulting services; computer software development; systems analysis; utility programs; real-time systems; on-line display systems / Sv Tr Co Sf / S 3 / E 67

COMPUTECH CONSULTING CANADA LTD., 906 - 1111 West Hastings St., Vancouver 1, B.C. / (604) 688-1371 / *C 68
Computer consulting with emphasis on computer selection and evaluation, contrast systems design and programming, data processing education courses and packaged programs / Tr Co Sf / S 16 / E 66

COMPUTECH CONSULTING INC., (Subsidiary of Computech Consulting Canada Ltd.), 566 White Henry-Stuart Bldg., Seattle, WA. 98101 / (206) 623-7871 / *C 68
Computer consulting and contract systems design and programming / Co / S 16 / E 68

COMPUTER AND APPLIED SCIENCES, INC., 9425 Stenton Ave., Philadelphia, PA. 19118 / (215) 233-2435 / *C 68
Theoretical research in physical sciences; consulting, programming services, system development for computer applications in engineering, scientific studies or other areas / Sv Co Sf / S 5 / E 68

COMPUTER LABEL CO., 401 Broadway, New York, NY. 10013 / (212) 925-3345 / *C 68
Addressing label stock forms in single sheet and carbonized, gummed and ungummed paper / S 12 / E 46

COMPUTER PLANNING CORP., Union Bank Tower, Suite 590, Del Amo Financial Center, 21515 Hawthorne Boulevard, Torrance, CA. 90503 / (213) 772-2271 / *C 68
Computing and consulting services including software development, proprietary application, scientific programming, numerical control (APT), for banks and other businesses; equipment includes IBM System/360 Model 30 / Sv Ti Tr Co Le Sf / S 50 / E 68

COMPUTER PROCESSING UNLIMITED, INC., 232 E. Ohio St., Chicago, IL. 60611 / (312) 943-5636 / *C 68
Sell time, perform normal service bureau work, lease IBM S/360's; large programming staff for contract work. IBM S/360-models 30 & 40 on site / Sv Tr Co Le Sf / S 20 / E 67

CONSOLIDATED TECHNOLOGY, INC., 3005 West Fairmont, Phoenix, AZ. 85017 / (602) 264-0231 / *C 68
Manufacture magnetic recording discs for rotating memory equipment / S 11 / E 65

CONSULTANTS ASSOCIATED, INC., Lakeside Office Park, Wakefield, MA. 01880 / (617) 245-0148 / *C 68
Management consulting, systems analysis, programming, education, and facilities management / Sv Tr Co Sf / S 8 / E 66

D

DATA SYSTEMS ANALYSTS, INC., North Park Dr., Pennsauken, NJ. 08109; (609) 665-6088, (215) 925-9550 / Suite 21, 2515 East Thomas Rd., Phoenix, AZ. 85016; (602) 956-4170 / 306 North Washington St., Falls Church, VA. 22046; (703) 532-4115 / 920 Kinderkamack Rd., River Edge, NJ. 07661; (201) 265-3939 / Postkus 261, Hilversum, The Netherlands; NAARDEN 02159-13727 (BUSSUM) / 6 rue de l'abbe groult, Paris 15 e, France; 828-3334 Post 5 / *C 68
Consulting services from evaluation to recommendation and installation. Training of users' personnel. Program and system design, particularly real-time and on-line information processing systems / Co Sf / S 75 / E 63

E

EDP ASSOCIATES INC., 554 Fifth Ave., New York, NY. 10036 / (212) 581-0640 / *C 68
Computer consulting company offering contract programming systems design services, and software development; provide teleprocessing and auditing packages to commercial users / Tr Co Sf / S 40 / E 67

EDP TECHNOLOGY INC., Watergate Office Bldg., 2600 Virginia Ave. N.W., Washington, DC. 20037 / (202) 965-0090 / *C 68
System analysis, design and computer programming for military, civil and commercial users. Consulting services for data systems, evaluation of computer facilities, management information system and language processors / Co Sf / S 40 / E 68

F

FACTS INC., 345 Hudson St., New York, NY. 10014 / (212) 924-0414 / *C 68
Data processing services specializing in financial applications such as: portfolio analysis and appraisal; stock market analysis; sale of stock market data in machine rentable form. Also, operates a Control Data 3100 Computer which is interfaced to the Ultronic Systems Stockmaster Computer; design systems, programs and operate reporting systems / Sv Sf / S 40 / E 64

FINANCIAL PUBLISHING CO., 82 Brookline Ave., Boston, MA. 02215 / (617) 262-4040 / *C 68
Computing equipment: 1401 system, time-sharing terminal, supportive TAB equipment. Offer financial charts, financial analysis and accounting services prepared by computer to financial institutions & individuals / Sv Sf / S 80 / E 1898

G

GEORGIA INSTITUTE OF TECHNOLOGY, Rich Electronic Computer Center, North Ave., Atlanta, GA. 30332 / (404) 873-4211 / *C 68
Solving research and development problems for government and industry, in addition to providing support in the advancement of Georgia Tech's objectives in research, education, administration, and service. Equipment includes Burroughs B5500 and UNIVAC 1108 systems / Sv Tr Co Sf / S 80 / E 55

I

INJUN VALLEY ENTERPRISES, INC., P.O. Box 82, Ho-Ho-Kus, NJ. 07423 / (201) 447-1565 / *C 68
Computer time-shared systems and applications. New business and product planning (analytical conceptualism). Feasibility, and selection, analysis of computer systems / Tr Co Sf / S 10 / E 57

INSTITUTE OF COMPUTER MANAGEMENT, Div. of Litton Industries, 1935 Euclid Ave., Cleveland, OH. 44115 / (216) 241-3964 /

*C 68
Education of programming and operation of equipment which includes IBM/360-20, peripheral equipment and unit record equipment / Sv Tr Co / S 10 / E 65

L

LITTON INDUSTRIES, Computer Products Div., 3250 North Nevada Ave., Colorado Springs, CO. 80907 / (303) 471-1100 / *C 68
Manufacture computer components: illuminated switches S-6, magnetic heads, magnetic memory components (core planes and stacks) / S 350 / E 67

M

MACRO SERVICES, 55 Kilby St., Boston, MA. 02109; (617) 423-6250 / 666 Fifth Ave., New York, NY. 10019; (212) 765-3290 / 7300 N. Charles St., Lutherville (Baltimore), MD. 21093; (301) 821-5454 / *C 68
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MARCOM, INC., 30 E. 42nd St., New York, NY. 10583 / (914) 723-6489 / *C 68
Market and product planning services to manufacturers of computer systems, peripheral drives, and components / Co / S 15 / E 62

GEORGE S. McLAUGHLIN ASSOCIATES, INC., 785 Springfield Ave., Summit, NJ. 07901 / (201) 273-5464 / *C 68
Purchase, sale and lease of previously owned computers and components and IBM unit record equipment; purchase and leaseback of new IBM computers; sale of new disc packs and tapes / Le / S 4 / E 66

MULTIVARIATE RESEARCH INC., Millers Hill, Dover, MA. 02030 / (617) 785-0236 / *C 68
Social science consulting and programming / Sv Co Sf / S 3 / E 68

P

PROGRAMMING ASSISTANCE CORP., 132 Nassau St., New York, NY. 10038 / (212) 227-6190 / *C 68
Contract computer programming; fixed price and time and materials / Sv Co Sf / S 12 / E 67

R

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REPUBLIC SYSTEMS & PROGRAMMING, INC., 100 Plaza Centre, Secaucus, NJ. 07094; (201) 865-2000 / 342 Madison Ave., New York, NY. 10017; (212) 564-1590 / 435 W. Main St., Cheshire, CT. 06410; (203) 272-5363 / *C 68
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S

STRATEGIC DATACENTERS INC., 605 Third Ave., New York, NY. 10016 / (212) 687-2100 / *C 68
Service center processing, time rental, keypunch and verification, system generation and maintenance; equipment includes two IBM System/360 Model 30s and an IBM System/360 Model 40 / Sv / S 200 / E 67

STRATEGIC SYSTEMS INC., 605 Third Ave., New York, NY. 10016 / (212) 687-2100 / *C 68
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SYRACUSE UNIVERSITY RESEARCH CORP., Information Services Laboratory, 27 Midtown Plaza, Syracuse, NY. 13210 / (315) 477-8473 / *C 68
Studies, advisory services, research, evaluations, information systems / Sv Ti Tr Co / S 6 / E 57

SYSTEMS ANALYSIS, INC., 2702 - 3rd Ave., Seattle, WA. 98121 / (206) 682-4192 / *C 68
Software house developing systems and doing contract programming in the scientific environment. Our own equipment includes: IBM 360/32K tape disc system and a CDC 3150/65K tape disc system / Sv Ti Tr Co Sf / S 13 / E 66

T

TLW COMPUTER INDUSTRY, 4 Executive Park East, NE, Atlanta, GA. 30329 / (404) 633-2579 / *C 68
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U

U C COMPUTER, INC., 107 S. Court, Memphis, TN. 38103 / (901) 525-2797 / *C 68
Leasing, also software sales and consulting / Co Le Sf / S 3 / E 68

UNIVERSAL DATA SYSTEMS, INC., 14482 Beach Blvd., Suite B., Westminister, CA. 92683 / (714) 897-1033 / *C 68
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W

WORLD WIDE ON-LINE COMPUTER SERVICES, INC., 180 N. Michigan Ave., Chicago, IL. 60601 / (312) 263-4270 / *C 68
A batch processing service using a Burroughs B-300 computer (tape oriented), and a time-sharing service using a Control Data 3000 Series computer (disc and business oriented) / Sv Ti Co / S 25 / E 65

- End -

DATA PROCESSING TRAINING FOR MANAGERS: OBJECTIVES AND CURRICULUM CONTENT

Joel E. Ross, D.B.A.
Chairman, Management and Marketing Dept.
Florida Atlantic Univ.
Boca Raton, Fla. 33432

"The objective of managerial training can be stated in a word: behavioral — changing the manager's behavior to the extent that he both appreciates the potential of the computer and the problems of computer personnel, and has learned to use the computer to solve his *managerial problems."*

"After growing wildly for years, the field of computing now appears to be approaching its infancy." This statement by the President's Science Advisory Committee[1] not only highlights the accelerating growth of computing equipment but infers a concern of equal magnitude: the need for education at all levels. Indeed, it is becoming increasingly clear that the bottleneck to improved utility of existing and future computers is not the design and manufacture of better equipment but the education and training of human beings to better utilize the machine.

In discussing the educational needs of users, it is convenient to concentrate on business or logistic systems and uses (as opposed to engineering, scientific, or command systems) and to categorize educational needs as:

(a) Student — high school through graduate program
(b) Technician — programmer, operator, etc.
(c) Systems Analyst
(d) Manager

With regard to the student, even the most hidebound skeptic must agree that the computer has finally and inexorably invaded academe at all levels. The President's Science Advisory Committee has concluded

> ". . . students in colleges and universities must see for themselves what a powerful tool computing is, and learn to use it.
>
> No matter what his specialty, the student must be given the opportunity of using computers in learning and in doing, and the faculty member must be able to use computers in teaching."[2]

From the one extreme of the "computer appreciation" course at the high school or college level, we have the expanding number of undergraduate and graduate programs in Computer Sciences, Data Processing, Information Sciences, and related programs. A recent survey supported by the National Science Foundation projects a 260 per cent increase in these programs between the years 1964-65 and 1968-69. In the area of Computer Sciences the increase is over 500 per cent. The recommended curriculum for academic programs in Computer Science is reported in detail by The Association for Computing Machinery.[3]

The need for and the approach to training the technician, our second category of educational user, is somewhat more technically oriented and is beyond the scope of this article. The curriculum for the systems analyst has been recommended in a variety of sources; one of the most comprehensive is in a report prepared by this author for the U.S. Office of Education.[4] It is when we address ourselves to the problem of training managers, the objective of this article, that we find the least research and perhaps the most disagreement. Yet, the manner in which managers are introduced to the computer is critical for other categories of educational sectors. Obviously the executives or managers at all levels, and the way they conceive of and utilize the computer, has a multiplier effect throughout any organization.

Numerous surveys and research studies have established the conclusion that the need for management participation

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1 ________ The White House. *Computers in Higher Education.* Report of the President's Science Advisory Committee. Washington: U.S. Government Printing Office, 1967. p. 1.
2 *Ibid,* p. 2.

3 ________ "CURRICULUM 68 — Recommendations for Academic Programs in Computer Science", *Communications of the ACM,* March, 1968, pp. 151-197.
4 U.S. Office of Education, *The Relationship of ADP Training Curriculum and Methodology in Federal Government.* July, 1967. OEC Contract 1-7-071059-3908.

In addition to his responsibilities at Florida Atlantic Univ., Dr. Ross is President of General Educational Systems, Inc. He has served as a data processing consultant for both government and industry and is actively engaged in training and management development programs in data processing. Data for this article were gathered while Dr. Ross was acting as the principal consultant under an Office of Education contract.

and direction is a prerequisite for any successful management information system or other application of automatic data processing. Indeed, the so-called "communication gap" between manager and computer technician is frequently cited as the number one reason for under-utilization and failure to achieve optimum benefits from existing and planned computer installations.

The Federal Government has long recognized the need for management involvement and understanding. Illustrative of this view is the conclusion of a Presidential Task Force:

> "Almost no single action can be taken that would provide equal return in agency operations improvement, than for top officials to adopt a direct, favorable position toward ADP use and ADP training. Other ADP actions will be ineffective or even unsuccessful if such top management support is not forthcoming."[5]

In 1967 the Federal Government undertook to determine the objectives and content for ADP training programs for both Federal and industry managers because of increasing concern over the accelerating need for management development programs and training for ADP. Over forty national leaders from industry, education, and government assembled in Washington for week-long workshops on the topic. The author was principal consultant to this effort and editor of the proceedings.[6] The results are summarized in this article.

Growth of ADP Training

Second in magnitude only to the enormous growth in computer applications has been the accelerating number of training programs. Industry in general and the computer industry, in particular, is witnessing a new trend — the "education explosion." Symptoms of this trend are the 58 per cent more "in-house" training programs in ADP during the brief two-year period 1966-68. Equally as significant is the vastly accelerating attention and participation by top management, including company presidents.

Despite considerable variation in the source of managerial training (e.g., in-house, manufacturer, university, consultant, etc.) and the time devoted to it (typically 2-5 days), some common elements generally emerge among the variety of programs. Briefly, these common program elements generally include:

- Information systems — concepts, components, functions, etc.
- How a Computer Operates — components, I/O Devices, etc.
- Programming and Software
- Planning — costs, feasibility studies, scheduling
- Implementation — systems design, conversion, new applications
- Personnel and Organization Impact
- Management Uses

The university and college community is keeping pace with industry. Undoubtedly broader in scope than either industry or government, this sector has accelerated rapidly into the fields of ADP, systems, computer sciences, and related computer areas. In 1962 only four institutions offered degree courses in computer sciences; today, one can earn degrees at over 200 institutions. A study conducted in 1966 by the Systems and Procedures Association estimated that about 35% of the schools in the country will probably offer a degree in management systems by 1971.

In spite of the growth of ADP and related type training, the conclusion is clear that the output of trained personnel is substantially below the growing need for more informed managers at all levels, both in government and in industry.

Objectives — General

If we identify two "levels" or "types" of managers, the concern becomes one of defining objectives for: (1) **"Top Management"** (executive management whose task is to evaluate the proposed business system plan and gain acceptance of the plan for the entire organization); and (2) **"Operating Management"** (functional managers who specify information requirements of a system, or operating managers of a project team).

For "Top Management", the consensus regarding objectives emerged as:

(a) Orient and familiarize the manager to the end that his information processing system will be more productive by
1. Establishing the role of ADP in the organization
2. Providing tighter control over production of paper work
3. Getting the manager involved in problem solving ("EDP doesn't solve problems; people do")
4. Utilizing talents already in the organization

(b) Closing the understanding and appreciation "gap" between management and ADP operations.

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[5] *Training for Automation and Information Processing in the Federal Government.* Washington, 1966. Presidential Task Force on Career Advancement, p. 3.
[6] U.S. Office of Education, *op. cit.*

(c) Familiarizing the manager with the capability of the computer for improving management, effectiveness, and productivity through information.

For "operating management", the objective became more practical in the sense that this type manager should learn how *he* could use the computer in *his* operations.

Expected input and output to be gained from the training system could be depicted generally as in Figure 1.

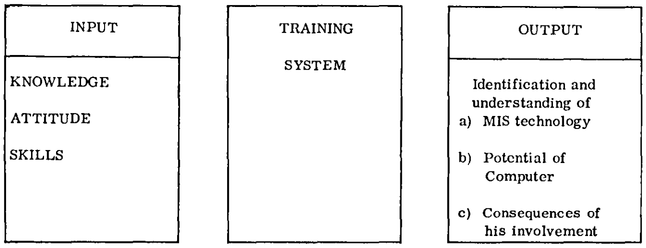

Figure 1.

In summary, it becomes clear that the objective of managerial training can be stated in a word: behavioral — changing the manager's behavior to the extent that he both appreciates the potential of the computer and the problems of computer personnel, and has learned to use the computer to solve *his* managerial problems. To quote but a few of the participant opinions reflecting the foregoing:

> "The major challenge existing in ADP training for managers is to close the understanding gap between the manager and the computer professional." (Carl Clewlow — Deputy Under Secretary of Defense)

> "The problem is to change the psychological outlook — the behavioral pattern of the executive and the manager to the extent that they can communicate with the systems analyst." (Dick Sprague, Partner, Touche, Ross & Bailey)

> "The manager needs a 'music appreciation' course so that he can talk to the systems analyst when he comes into the department." (Lyle Brewer, Head, ADP Systems, Eastman Kodak)

Participants and experts were in remarkable agreement on the content and structure of a curriculum for management development programs. This curriculum (designed for 40 hours or 5 days) with major topical and sub-topical subject matter headings is outlined below:

ADP TRAINING PROGRAM FOR MANAGERS

I. Hardware and How It Operates

The workings of a computer
Capabilities, limitations and potential
Input-Output devices
Software considerations
File organization and maintenance
Input/output documentation and display
New technology

Objective: To take the mystery out of computers and to bring an understanding of how they operate and their capabilities and limitations.

As Ed Dwyer, Assistant Commissioner of General Services Administration observed, "The manager needs to know enough about the hardware to avoid being kidded by the computer professional." A general knowledge of the hardware will also go a long way toward closing the so-called understanding "gap" between manager and technician. Just as it is not necessary for the driver of an automobile to be familiar with the firing order of the engine's pistons, it is not essential that the manager have a detailed knowledge of how the hardware of a computer manipulates data. A general understanding, however is most desirable.

II. "Hands On" Experience

Programming one language (writing a program to solve one or more problems)
Other language and sub-routine options

Objective: To bring an appreciation of how problems can be solved with a computer by getting the manager involved.

It is surprising to see the degree to which expert opinion is unanimous in the view that managerial training should include some "hands on" experience with programming. It is generally agreed that students at all levels gain an appreciation of the computer by programming it. As one participant says, "You have to get on the bicycle and pedal the thing." It is difficult to bring an appreciation and understanding of computers to the learner simply by talking about it. Computers have and will continue to make enormous impacts on the world's culture, and most people agree that you don't get the flavor of a culture until you have tried to speak the language and know its difficulties. So it is with computer languages.

III. Computer Applications

Basic existing applications
Advanced applications
Future applications

Objective: To make the manager aware of potential applications in his job to the end that he can better utilize and participate in ADP applications.

This stage of training should probably be undertaken in three phases. First, the learner should be made to understand or should be taken through the steps of transferring a simple manual system (e.g., payroll) to a computer application. The analogy of the inputs, processor, and outputs of the manual system should be made with the components of a computer and those of a computer system. With this elementary background, the transition can be made to more numerous and complex but widely used systems such as sales planning and control, production scheduling, accounts receivable, etc.

All of the foregoing are really background to bringing an understanding to the manager of additional and more sophisticated uses which *he* can make of the computer. The idea, of course, is to get his participation in designing better systems. The analyst cannot design a system for a manager to use unless the manager becomes involved.

Simulation, enterprise modeling, and other more advanced applications can frequently excite and encourage the manager to utilize such techniques in his job. At the very least they can stimulate him to become more involved in utilization of the computer.

IV. ADP in the Specific Firm, Industry, or Government

Information Economics — costs of ADP, cost-utility trade-off, etc.
Planning for the System — costs, feasibility, maintenance, planning
Environment of ADP in one's own industry or the Federal Government — legislation, regulations, etc.

Programmers and systems analysts

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IBM is helping these controllers by computerizing their information input and display systems. The computer also correlates aircraft tracks with flight plan information. (At present, the controllers position markers by hand on the basis of spoken information.)

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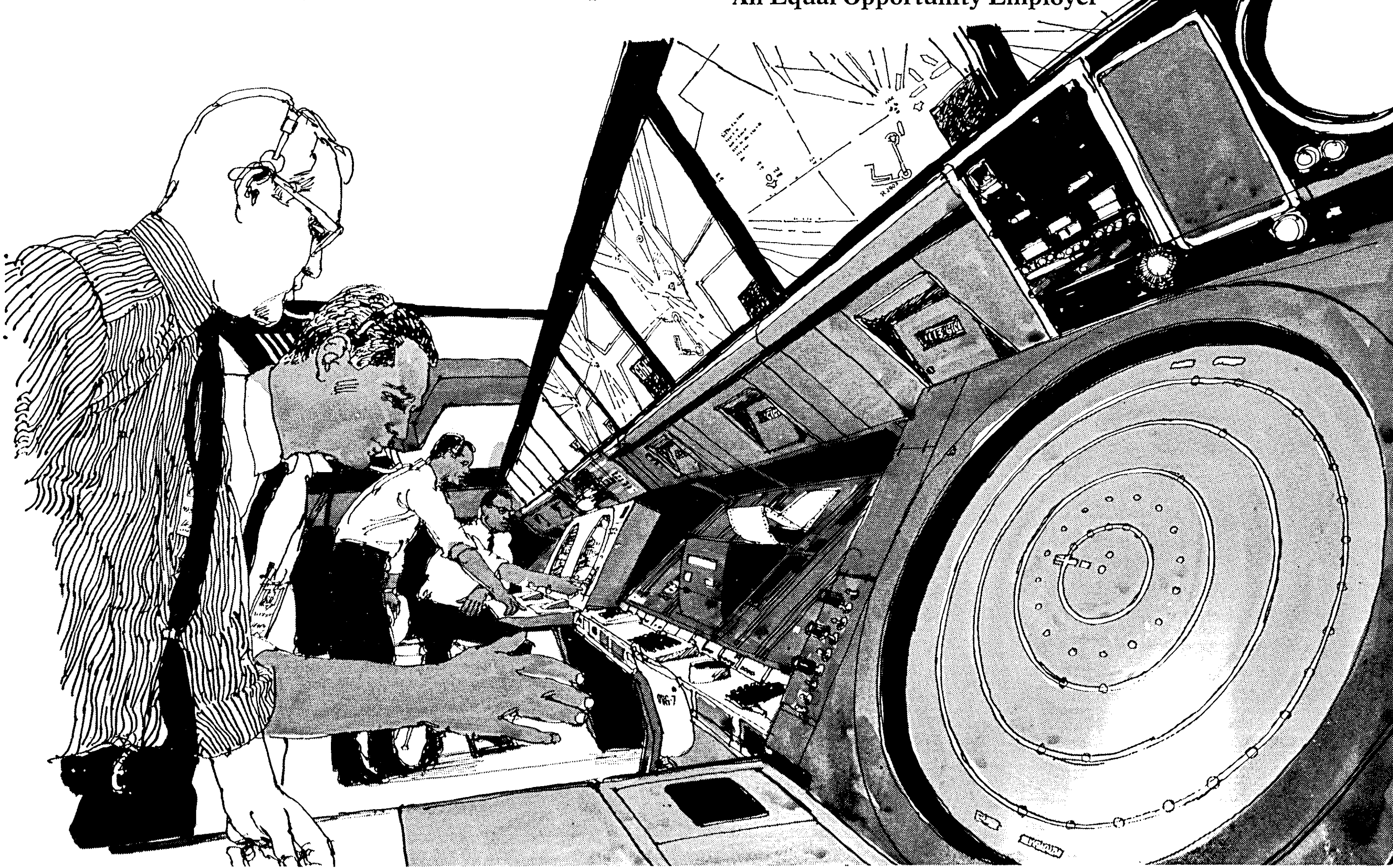

Company/agency problems and plans

Objective: To place ADP operations in perspective with regard to specific constraints and to describe cost, feasibility, and time considerations to the end that the manager will participate in and direct systems planning and utilization.

Clearly, an understanding of computer economics in the manager's specific environment is necessary, probably more so in industry than in Government. It is probably true that a large fraction of computer installations have cost more and saved less than the users originally envisaged. Proper planning, including an examination of alternative costs, can frequently avoid disappointment and achieve better utilization at less cost.

V. Information Systems Theory

Management, information, and the computer
Information systems design
Analysis and basic design techniques

Objective: To familiarize the manager with the essential nature of information and the basic principles and theory of analysis and design, in order that his effectiveness will be improved by participation in design.

This topic is perhaps the most important. Unless the manager is a fairly recent graduate of a business school, he is rusty about or unaware of the principles of good management — planning and control — and how the computer can facilitate the flow of vital information necessary for these functions.

Moreover, if the manager is to participate in or lead the management design effort, he should be reasonably familiar with the techniques of the classic steps of design:

- Determining system objectives
- Information needs
- Information sources
- Inputs/outputs
- Data flow
- Scheduling system resources

VI. Data Processing as an Aid to Decision Making

Logic, problem definition, and problem solving
Problem solving with the computer
Techniques of problem solving — linear programming, operations research, simulation, etc.
Examples and practice in problem solving — cases

Objective: To show the manager that people, not computers, solve problems. To improve his decision making and problem-solving ability so that he may become more effective with the computer.

Although this topic could logically be a "sub-system" of Information Systems Theory, it should be treated separately in order to emphasize the importance of data processing and the computer in decision-making — the synonym for management. And, although few managers are up to date on the theory and techniques of management science and operations research, a cursory examination will hopefully make the manager aware that such methods are available to him and stimulate him to examine them in more depth.

VII. Organizational Implications of the Computer

Impact on personnel and staff
Organizational changes and manpower consequences
Role of ADP personnel
ADP training

Objective: To persuade the manager to adopt a favorable position toward ADP and ADP training, and to provide an environment in which the effectiveness of ADP is optimized.

Training Technique

Consultants and ADP executives who are experienced in managerial training were unanimous that the "old fashioned", the "pedestrian", or the "blackboard and chalk" methods of training would not work for the manager. His lack of patience, the pressure on his time, and other factors create a need to make the training more interesting in a shorter period of time. Several described these methods as the "psychological and schmaltz" approach to changing behavior. Unusual visual aids, color, workshops, gaming, cases, and other attention-getting techniques must be used to capture and hold the interest of the busy manager. In a word, "multi media" is required.

Conclusion

The foregoing curriculum with its accompanying objectives represents the most comprehensive effort thus far to identify and document the majority of the important elements of a managerial development program for ADP, Management Information Systems, and related topics. This curriculum should provide a basic foundation for the many thousands of seminars, development programs, university courses, and other training efforts which will be undertaken in the future.

c.a IDEAS: SPOTLIGHT

Successful Machine Translation through Semantic "Understanding" by the Machine

John R. Pierce
in "Men, Machines, and Languages"
in *IEE Spectrum* July, 1968; he is
Executive Director of Research,
Communications Sciences Division
Bell Telephone Laboratories
Murray Hill, N.J.

It is all very well to say that meaning is central to the use of language, but this tells us neither how to define meaning nor how to make use of it. Where do we go from here? That depends on what we want to do.

If we want to use natural language as input to machines, it means that in some very real sense the machine must understand what the language is saying in the same sense that a human being does. This is the position that V. K. Yngve reached after years of work in computational linguistics. As he has written:

> Work in mechanical translation has come up against a semantic barrier. We have come face to face with the realization that we will only have an adequate mechanical translation when the machine can "understand" what it is translating, and this will be a very difficult task indeed. . . .

Human beings get at the content of sentences because they have an internal map of the world to which the sentences are relevant. This somehow enables them to arrive at the content of the sentence whatever its grammatical form and even when it is ungrammatical. . . .

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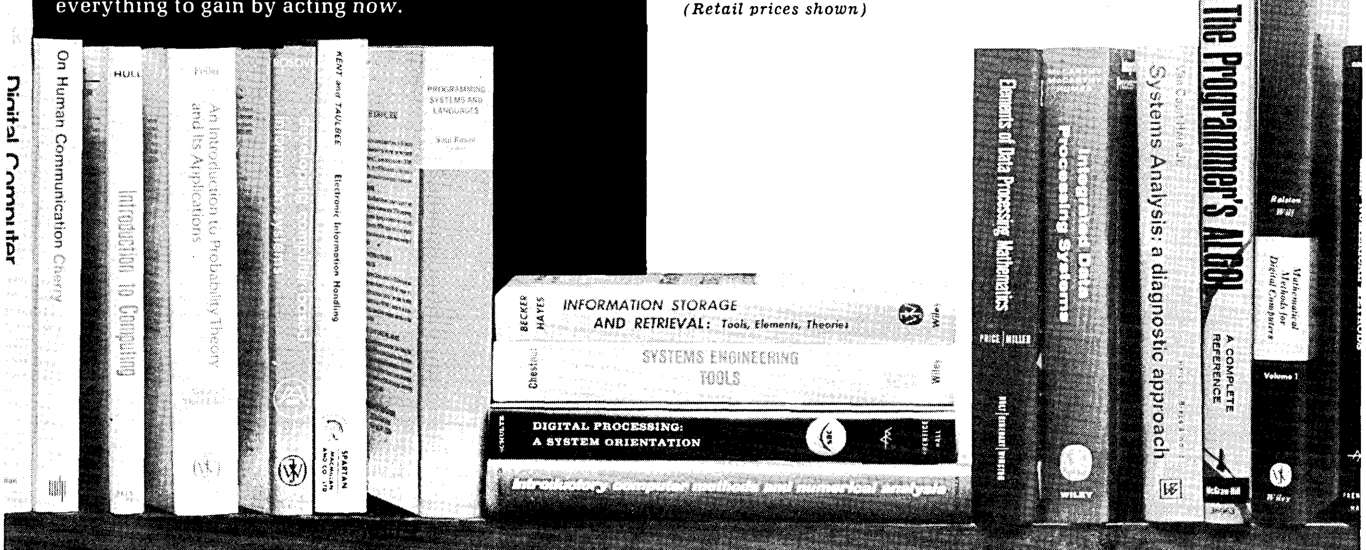

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A Flexible Concept for

RECRUITING DATA PROCESSING PERSONNEL FOR THE 1970's

Sidney Davis, Pres.
Electronic Computer Programming Institute
350 Fifth Ave.
New York, N.Y. 10001

"There is an inexhaustible supply of programming talent in the non-college graduate labor market. But like a precious mineral, it has to be dug out, sifted, isolated, refined and polished."

The use of computers as important tools for the commercial data processing user began about 1956, and has continued at an accelerated rate since that date. From that date until now, there has been no significant change in the demand/supply ratio for the basic personnel requirements — programmers and systems analysts. There is no indication that a change in this situation is imminent.

It also appears that the kinds of skills required by the data processing user will remain essentially the same. However, the advent of operating systems, time sharing systems, and communication systems, together with increased reliance on computer manufacturer supplied software, will require a more sophisticated programmer and systems analyst.

A Million Programmers and Analysts by 1975

It is estimated that there will be 70,000 computers installed in the United States by the end of 1968, and that there may well be more than 100,000 computers installed by 1975. There are approximately 150,000-200,000 analysts and programmers today. On the assumption that, for the average 1975 installation, there will be a systems manager and two analysts, and a programming manager and six programmers, we will need a total of one million analysts and programmers by 1975, or roughly five to six times as many as we have today. Where will they come from?

The allure and romance of the field continues to attract substantial numbers of personnel. This, to some extent, alleviates the problem of finding personnel for the entry positions in the field. However, turnover continues at a fearsome rate. This is due to demand pressures which cause salaries to escalate rapidly, usually at a faster pace than in-company salary ranges rise. Advanced and more sophisticated machines and applications threaten the data processing personnel with obsolescence, and they tend to move to companies that use the latest equipment. In addition, the tendency of companies to place their data processing personnel in "technicians" categories leads to job frustrations and the desire to stray to greener pastures.

Apparently, the problems which a company has today in locating data processing personnel will continue to exist. The success which a company can expect from its program of staffing the data processing department will depend largely on a thoroughly realistic view of the problem.

It is time for a fresh approach to establishing qualifications for programmers. The data processing community has adhered too long to the concept that programming requires a college degree, and it is this dogmatic approach to programmer selection that has caused many of the personnel problems it is faced with.

Determining Aptitude and Motivation

The first step in solving the problem is to define it. What general qualifications must a programmer have to be employable? It has been generally accepted that the ingredients necessary for programming success are: aptitude and motivation. There are numerous tests available for testing programming aptitude and, for the most part, the test results are acceptable in that they give a usable insight into the individual's problem solving potential and ability to reason logically.

Determining the second requirement, motivation, is a more difficult problem. Motivation itself is a rather nebulous concept, but it has been defined for our purposes as a work-attitude characterized by persistence and self-discipline. If we are discussing the employment of an experienced programmer, his motivational abilities are established by the fact that he has had programming experience — in other words, we assume that if he has had experience and has performed satisfactorily, he possesses both qualities which a programmer must possess — aptitude and motivation. This is the data processing community's conclusion as evidenced by the extensive campaigns companies conduct to attract programmers with experience.

However, there are not enough programmers with experience to satisfy the needs of industry; therefore, the answer to the problem must come from another source — the inexperienced beginner.

Here, it appears the company has two choices: the college graduate and the non-college graduate. It is in the selective employment of the non-college graduate that the solution to the problem will be found. More and more non-college graduates are being hired for business applications programming.

Is a College Degree Necessary?

Is a college degree necessary for business applications programming? Many companies say yes, categorically. The fact that he has a college degree shows that he has persistence and self-discipline, they say. Perhaps they are right — but does this mean that the non-college graduate must lack these same qualities? "A man needs a college degree to advance in our company", is another common comment. One industry source estimates that one-third of all programmers employed last year changed jobs. Does this indicate that programmers look for advancement within their company? The reverse is true. The programmer with a college degree knows he can find a higher paying job elsewhere — and he does.

If the answer to solving the personnel needs in data processing is to hire college graduates who have the necessary aptitude, then the problem should have been solved years ago. There are enough college graduates, but do they feel that computer programming is the answer to their career objectives? The answer is obviously no.

Recruiting Non-College Personnel

The non-college graduate programmer can do the job. Most companies recruited their programming staffs from within the company, initially. They gave programming aptitude tests to employees, college graduates and non-college graduates alike. Here the concept of motivation was defined by the employee's past history and record with the company. Had he performed well? Yes. Does he have the aptitude? Yes. Let's send him to programming school and see how he performs. And it worked. Yet, these same companies, when they went into the labor market to replace people who left them or to expand their departments, required new people to have college degrees. But the situation is changing. The trend today is clearly discernible — more and more companies are hiring the non-college graduate programmer trainee — and he is doing the job.

True, the selection process is more difficult. It is time consuming and often frustrating. Interviewing techniques, testing, reference checking and evaluation methods must be revised or implemented. It is worth the effort. There is an inexhaustible supply of programming talent in the non-college graduate labor market. Like any precious mineral, it has to be dug out, sifted, isolated, refined and polished. For the company that can discard dogma, the answer is apparent. The non-college graduate .programmer trainee is the only long range answer to industry's business applications programming needs. These people are producing results.

Finding Systems Analysts

The problem of finding competent systems analysts is the most severe of all. The most consistent success is found in promoting proven programmers to the systems department. This policy of offering career promotions to the programming staff also will tend to reduce turnover caused by lack of opportunity for advancement.

There is also the possibility of going into the labor market to hire experienced systems analysts. They are most difficult to find, demand high salaries which may distort the salary structure within the company, and if they come from unrelated industries, require a substantial amount of time to gain an understanding of your business.

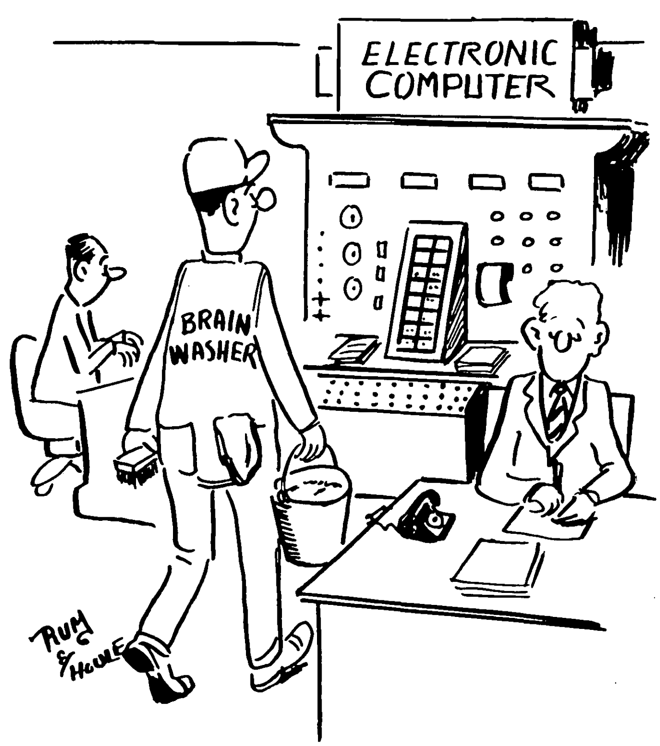
A third source may be found within the company from people who understand the company's operations thoroughly, have the required analytical ability, but lack the technical know-how. To begin with, these employees usually have little or no idea if they have an aptitude for data processing. So, it's necessary to make them aware of the possibilities in this work and to screen them with the help of a series of tests. Interested employees who qualify can then be given the necessary intensive technical training within the firm or at a reputable data processing school.[1]

Utilizing present clerical employees thus has many advantages. They already are familiar with their company's business and have probably developed a basic loyalty to the firm over the years. Recruiting personnel from within the company, of course, lowers recruitment costs, in spite of tuition costs for outside training at a data processing school. Furthermore, such upgrading of clerical personnel has a very positive effect on overall employee morale.

Management's success in staffing data processing departments for the immediate future and during the period of accelerating growth in the 70's will depend on the flexibility of its employment concepts and a willingness to implement them. By re-evaluating entry job requirements, it can open entire new segments of the labor market to fill the rapidly increasing demand for data processing personnel.

[1]The experience of the Electronic Computer Programming Institute in working with firms in testing and training their clerical employees proves the validity of this approach.

COMPUTER MAINTENANCE



PERSONNEL REQUIREMENTS IN DATA PROCESSING

Warren K. Gillis
Manager of Systems Engineering Planning
IBM
Data Processing Division
White Plains, N.Y. 10601

"Today, it is not enough to think in simple terms of 'getting' enough programmers, systems analysts, and supervisory personnel by a given date."

Data processing, which fewer than ten years ago was viewed by many individuals as a pure service function, has taken on many new dimensions and has evolved into one of mankind's most significant management and control tools. In this light, data processing jobs and career planning must take on added significance. The premise is simple — data processing cannot and will not attain its full potential without capable and well qualified professionals and management.

Today, it is not enough to think in simple terms of "getting" enough programmers, systems analysts, and supervisory personnel by a given date. For even without the acknowledged problem of finding enough capable people, anything less than a carefully conceived, structured, and formalized personnel development plan will almost certainly not provide the base of data processing skills required for the next decade. Those computer users who today rely on hiring experienced programmers and machine operators on the open market will find this increasingly difficult. What is even more important, it is unsatisfactory and uneconomic, since only the skilled data processing professional or manager who knows the operating aspects of the enterprise can affect the desired results.

A careful delineation between the type of personnel needed by data processing manufacturers and the type needed by users of data processing equipment must be established. While the basic needs do overlap at certain points, personnel requirements and development programs must be established to recognize two distinct motivations: first, for the manufacturer who is oriented toward deriving a profit from the sale of computers; and second, for the user who is oriented towards deriving a payoff from his data processing investments.

Mr. Gillis is responsible for Systems Engineering manpower and educational requirements of the Data Processing Division of IBM. He joined IBM in 1957 and has worked in systems engineering and other marketing capacities. He holds a B.B.A. degree from Northeastern University.

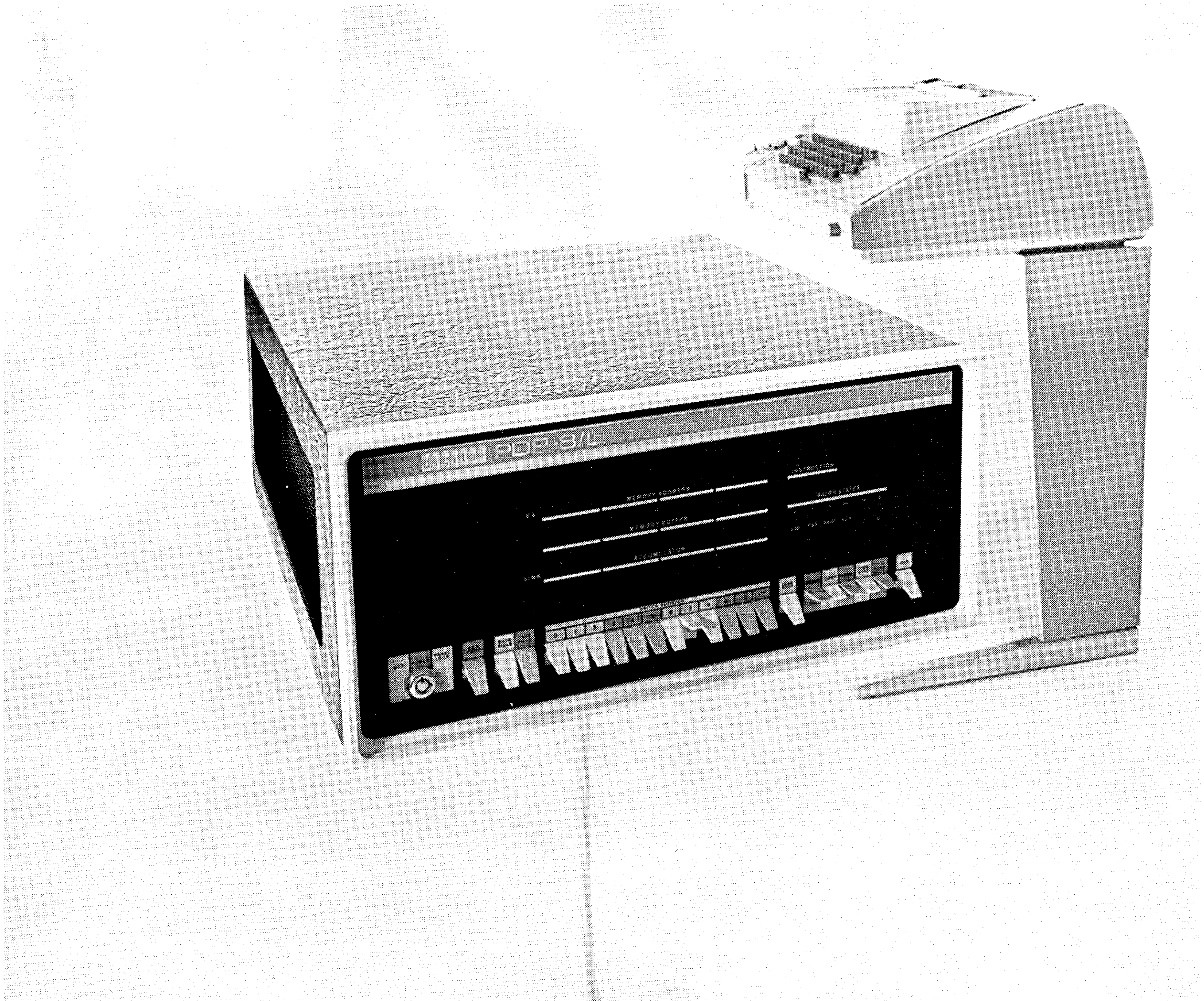
Personnel Requirements of Manufacturers

When we examine the personnel requirements of the manufacturer, we can easily establish the need for a marketing organization that consists of highly qualified and specialized data processing "solvers". This need is, of course, in addition to the basic need for product planning, development, service, and administrative personnel that are required to sustain the operation of any enterprise, irrespective of the nature of its end product or service.

Today, any examination of a data processing manufacturer's marketing organization will reveal an unprecedented growth rate and recruiting objectives that are skewed toward college graduates with degrees in engineering or other technical disciplines. The causes for the shift in recruiting emphasis, from just college graduates to those having engineering or other technical degrees, are simple. Manufacturers today must have a talent resource that is capable of sustaining the evolutionary growth of the computer as a management and control tool. They must also expect the marketing organization to provide a highly qualified cadre for their product planning and development organizations.

Personnel Requirements of Users

A contrasting examination of the personnel requirements of data processing users (including manufacturers as data processing users) reveals the need for personnel who can establish and implement the payoff objectives. This translates



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into a need for three types of individuals: individuals who can establish the information processing requirements and plans for the enterprise; individuals who can translate the statements of plans and needs into computer applications; and finally, individuals who can operate the data processing installations.

Short and Long Range Plans

To begin with, there must be short and long range plans for information systems. The enterprise's systems planners, or operations research specialists, are in a critical position for they determine the scope and nature of the data processing needs of the enterprise. These might call for a full-fledged management information system, or implementation of a series of interrelated applications. In any event, the enterprise planners must know their company, the company's marketplace, and enough about information systems to lay out the framework for the future.

In larger organizations, this function is on the corporate level; the corporation might also have an executive systems management function for data processing. In smaller companies the enterprise planners may consist of operational vice presidents and the president himself, and the systems management might be exercised by an executive vice president or the president.

Then, systems planners (and their managers) are needed to determine the specific equipment and programming to fulfill the information needs. Next, implementation specialists, and their management, are needed to actually write the programs, make them part of operating systems and other software provided by the manufacturer, refine, and maintain them.

In today's environment, the programmer must continually upgrade his knowledge and skills to keep up with the technology. Where previously he built his programs with what might be compared to hand-tools in building a home, today he is provided with the equivalent of power tools.

Operations Specialists

Rapidly attaining equivalent levels of importance and responsibility are the operations specialists and their management. These are the people who actually operate the machines. As user applications become more sophisticated the significance of computer operators must rise. There can be no payoff without efficient, effective operations; therefore, the machine operator can no longer be thought of as an unimportant element in the computer complex.

An analogy can be found with the modern jet airplane Manufacturers call on a wide variety of highly skilled specialists to produce the plane, and the airlines have a corps of specialists to keep it in operation; but in the final analysis, the responsibility for successful use of the airline's investment rests with the pilot and his crew — the operations specialists.

The growing use of operating systems with new-generation equipment has already led some companies to set up special training courses for console operators. These people now do more than change tapes and disks, and pull paper off printers. They have to analyze job control cards and system messages calling for corrective action, direct the system to change job sequences when necessary, and perform system updates and generations. Essentially, the "systems supervisor" of today is being called on to execute many of the tasks that were formerly accomplished by programmers and analysts.

Supervisors and managers, in turn, are taking responsibility for systems of far greater complexity and significance to their company.

Finally, everyone — but particularly operations managers, programmers, and systems planners — must understand their company and its informational needs as well as they understand the specifics of their jobs. This is taken for granted on the enterprise planning level; but it is rapidly becoming essential to effective job performance at the other levels as well.

There, in basic outline, are the jobs being performed today within the data processing area, and to be performed to an even wider extent in the immediate future. Where will the people come from? how will they be trained? how can the skilled professional climb the ladder to even greater success?

Education is an essential ingredient. Whether provided by the company, or undertaken by the individual, a continual upgrading of skills and knowledge could move a programmer from the implementation level to systems and even enterprise planning; or, if his inclination is different, to operations management. The movement from operations specialist to programmer, or systems analyst, or to other company functions should become fairly routine by the 1970's.

Continuity in Employment

From the point of view of company management, continuity in employment will be a key to success. Some companies have already recognized this fact, and have instituted formal career paths with built-in training opportunities for youngsters starting in the operations area, to work up to professional positions in systems analysis and programming. This type of formalized approach helps assure a supply of trained people for the future, while minimizing the effect of losing personnel after they have gained enough experience to begin to have true value to the data processing organization.

The variety of skills, personal aptitudes, and knowledge needed both in user and manufacturer organizations implies a continuous cross-pollination of technical and non-technical areas. Since people with such skills will not readily be found, management must train them.

Personnel practices can be expected to change as the pinch grows tighter. Instead of hiring to fill specific requirements, some companies may hire college graduates to work in data processing with the expectation that by the time they have completed the training program, there will be jobs waiting for them. In short, they will be hired into a "reserve" and placed in specific jobs when they are ready.

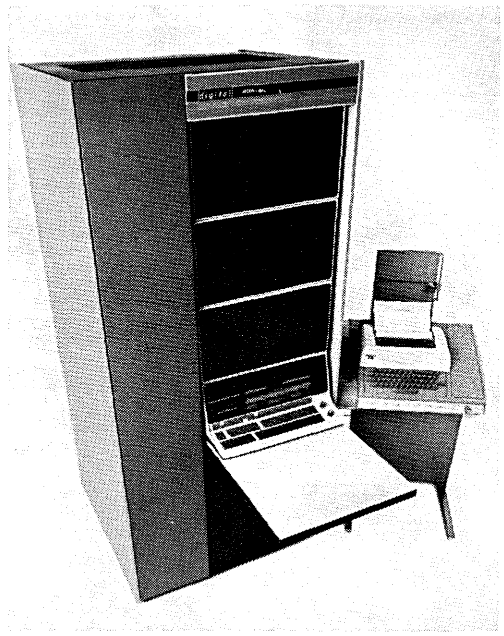
This has the advantage of giving the employer an opportunity to better analyze the trainee's aptitudes, personality, and career desires even before he is assigned to his first position. Thus, people better qualified to work in specific areas can be pointed in the right direction.

In-House Training

The need for some form of in-house training at all data processing levels will be acute by the next decade. This can be met in various ways; small and large companies alike can get assistance from manufacturers and certain educational organizations.

Many companies are currently providing in-house training for managers, and will simply expand their programs to include supervisory candidates from the data processing areas. Others without formal programs will probably experience some difficulties, for good managers do not just happen; they are the result of careful selection and preparation. They are essential if the company is to derive a solid payoff from the data processing investment. It can be expected, therefore, that the current trend towards management training programs will continue.

To attain the full potential of data processing, it is necessary to evaluate and determine the different personnel capabilities which will be needed. The increasing importance of the investment in information systems requires formalized personnel planning and follow-through.



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THIRD GENERATION HARDWARE—
FIRST GENERATION APPLICATIONS

Robert F. Trocchi
Honeywell EDP Div.
60 Walnut St.
Wellesley Hills, Mass. 02181

"Will the individuals who are being trained as programmers now meet the capabilities of the equipment being designed for the seventies?"

Robert F. Trocchi is the industry marketing manager for government and education at Honeywell's electronic data processing division. He received a bachelor's degree in electronics from the Univ. of Mass. in 1955 and a masters' degree from Northeastern Univ. in 1958, after which he joined Honeywell. He is a member of the Association of Educational Data Systems and the American Vocational Association, and has been a speaker at many national and regional educational conferences.

It is quite common today to read in professional data processing magazines as well as the daily newspaper about the tremendous demand that exists for programmers. The data processing industry often raises the very serious question as to where and how this demand will be met. Yet, of far greater concern, it seems to me, is the growing gap between the capability of the third-generation hardware and the capability of the people who program and manage this hardware.

Hardware Capability

Hardware, over the years, has changed quite dramatically. Has training kept pace? Are quantities of people being supplied without an upgrade of quality? In a matter of fifteen years, three generations of equipment have been produced. The capability of this equipment has gone from very simple, limited, data processing to much higher levels of sophistication. Formerly, every job was handled as a separate entity, and every job was approached in the crudest of terms. Today, equipment exists in which several jobs can be operating simultaneously, communications equipment can be operating in parallel, and networks of computers may communicate with each other in what someday may be gigantic information utilities.

Simplifying Programming

Parallel with this growth in hardware capability has been a parallel growth in the tools which come with a hardware system to program these newer computers. In the course of the three generations of computers, programming of data processing has moved from what essentially was machine-language programming through assembly language programming with availability of library and macro routines, into essentially English-language compilers, which are in great use today.

This improvement has been a conscious attempt on the part of manufacturers and large EDP users both to simplify the job of programming. The objective, of course, is to ease the task of providing new talent to program these computers. Parallel with hardware and programming language developments, additional aids are being made available to EDP users to fill the void of fully qualified programmers. These two developments must be analyzed in order to determine the possible effect they will have on both filling the void and changing the content of curriculum offerings.

Software Packages

First of all, there has been a tremendous growth in the number and size of software firms producing for sale packages of codes for applications. Parallel with this development, there has been a move on the part of some manufacturers of data processing equipment to provide fully coded and supported application-oriented packages for users, to ease installation of their equipment. Users of EDP equipment are in many instances willing to modify their own internal accounting procedures to accommodate the generalized packages provided by either the vendors or the software houses. This willingness, of course, comes from the lack of fully qualified programmers. It is too early to tell whether or not this approach to application packages will stop at the software. Will the next generation of equipment have some of these same applications "wired in," thereby still further reducing the need for programmers as we now know them? This of course is a question which does not have to be answered today. But it is imperative that educators concerned with data-processing curriculum be concerned with developments which relate to what will be expected of programmers in the '70's.

The Gap Between Computers and Programmers

Examination of today's training of programmers and systems analysts gives insight into the gap between computer and programmer capabilities. This training has proceeded over the years as somewhat of a bootstrap operation. Initially, the burden fell upon the EDP vendors themselves. Hundreds of thousands of programmers have had only that formal training given by vendors. The remainder of their training has been on-the-job. Systems designers have, for the most part, been born and not trained. To an extent, some courses are offered at the college level in systems analysis and design. By and large, however, the successful systems designer has been the type of individual who through his own self improvement has progressed into systems analysis. EDP managers, in many ways, display an extension of this progression of successful programmers into systems, then into management.

The result of this training is to produce continually, by the tens of thousands each year, individuals who can indeed program the third-generation equipment produced, but who have little or no conception as to how organizational information is handled as part of the decision-making process for that organization.

Looking at Information Within the Organization

Studies conducted by consulting firms have indicated that many computers are costing organizations more than they are returning as part of that investment. In the main, the reasons have little to do with the capabilities of the equipment or the service that the vendor supplies. The problem generally lies in failure of the company to organize a task force capable of looking at information within the organization which is used to aid management people in their day-to-day operations. Far too often, the major applications which are put on the computer are the high-volume, clerical-type activities. This is not to say that these clerical, high-volume applications should not be put on the computer. These, indeed, must be done in order to establish the data base which is necessary to get the next level of data analysis. This next level is to provide highly focused information to middle and top management in order, to aid decisions. This, indeed, is where the largest payoff on the computer really begins.

An example of this might be information generated (on an exception basis) to a school guidance counselor on potential problem students. Another example might be information provided to a city manager showing valuation trends. Illustrations could be multiplied. The point, however, is that there is a gap between the management people, who, in the main, do not know about EDP potential, and the systems analysts and programmers who have little conception about the information requirements needed by middle and top management to make decisions. As a result, there appears a continuing lag between third-generation hardware and first-generation applications. This lag is typically found in installations today.

Current Demand for Programmers Will Be Met

I am not disturbed that the demand for programmers, as we know them today, as well as systems people and EDP managers, will not be met. I am not overly concerned where they will come from, how they will be trained, or who will train them. In all likelihood, demand in the future will be met in much the same way as the demand was met in the past, together with some more formal training.

For example, public, vocational, and technical schools, long a supplier of trade and agricultural skills, are now filling a void in their courses by offering EDP training. Practically every new vocational or technical training school in the country which has opened in the past several years is offering EDP courses. Likewise, a growing number of private EDP schools, some the subject of much controversy, have opened for business in the last several years. These two developments, in addition to courses, offered by EDP vendors and users themselves, should handle the demand.

The Future

This, then, leads us to the question of how well will the individuals who are trained as programmers meet the demands of users. More importantly, will they meet the capabilities of the equipment being designed for the seventies? Should training be much more systems oriented, much more involved in information handling, and much less on programming aspects? Should the EDP manager be much more knowledgeable in information handling and decision making and less knowledgeable in hardware?

It would appear as we progress in hardware design and software supplied by the vendors that programming systems will continually become much more user-oriented. Many low-level applications, such as payroll, accounts receivable, payables, basic inventory control applications, etc., might well be hardwired into the computer or supplied to the users, either from the vendor or from a software house. If this, in fact, does happen, then the demand for information-handling specialists will escalate tremendously, and the demand for programmers as we know them today will begin to slacken.

What is mainly needed is, it seems to me, a comprehensive analysis of curriculum objectives. The power to get more value from computer applications will increase only in direct proportion to the effort put into defining the curriculum objectives for programmers, systems analysts, and all types of middle and top management.

WORLDWIDE

REPORT FROM GREAT BRITAIN

National Prices and Incomes Board Curbs IBM Price Hike

A setback of no mean dimensions to International Business Machines (UK) will result from action taken by the National Prices and Incomes Board to block a rise in rental charges on existing contracts.

IBM at the turn of the year announced a flat increase of ten percent for both outright purchase and for the rental of all its equipment, to run in the latter case from August 1 and in the former to apply forthwith.

Britain has a watchdog organisation with the above-indicated title, but commonly known as PIB, formed as a Government gesture to the toiling masses to investigate any industry that should unduly raise its charges in this period of wage restraint.

IBM was reported by customers to PIB which took several months to sound the opinion of large numbers of IBM users and, strangely enough, of non-users as well.

In a nutshell it said IBM could go ahead with its straight price rise and with ten percent more on its rentals for new contracts concluded since the turn of the year. But for existing contracts on System 360 machines, the rise should be limited to 7 percent and for those on older equipment, to 5 percent.

IBM would not say — after having accepted the recommendations, while observing that they had no force in law — how many machines were affected. But since it has always been purported to have 40 percent of the UK market and to put some 75 percent of its machines out to rent, a figure of 800 machines appears more than credible. The IBM Computer Users' Association estimated that it would "save the country," that is, cost IBM around £2m this year and considerably more thereafter.

Perhaps of greater importance than the arguments over a few percentage points in charges — after all, IBM's many competitors will not be slow to draw the lesson — is the way in which PIB championed IBM users, which it clearly thought to be a somewhat supine breed.

It found a "certain amount of frustration" among them in the face of some inflexibility on the part of the company. But on rental, the company's position is made so clear that customers "do not perhaps go to very great lengths to persuade it to change that attitude." The result is that the company is under the impression *"which they conveyed to us"* that there is little or no demand for variation.

But, PIB says, there *is* such a demand, whether IBM has noticed it or not. It proposed that IBM offer an option of a much longer initial period than the 12 months now current and extend the three month period of notice of termination on each side accordingly. Because of the greater assurance of continued income this would give, IBM should consider a reduction in its charges. The extension of the three month notice on the customer side would mean less of an upheaval if the customer decided to switch to other equipment.

Black Day for Burroughs

A black day for Burroughs was that on which the two great banks, National Provincial (Natpro) and Westminster, received permission to merge their main London operations and their thousands of provincial branches. Natpro had tentatively ordered a B-8500 but was making do on rented IBM units, none larger than a 360/50. Westminster had gone further in putting the provinces on line to the main centre and had one or more 360/65's bespoke. The upshot of the deliberations between the two data processing staffs with economy in mind seems to have been that the devil they know is better than the B8500. Accordingly it has been decided that the "Natwest," as the City calls it, shall put 3,600 branches equipped with TC500 terminal computers on line to IBM central equipment in London and that the British company, Plessey, shall provide the multiplexing equipment without which line rental charges would become exorbitant.

One sop to Burroughs is the fact that it will now supply $24m worth of terminals or about twice as much as before. But the image of the company as the vanquisher of Number 1 in UK banking is a bit tarnished. The other merger, between Barclays, Lloyds and Martins to form one of the biggest banks in the world is stymied. The Monopolies Commission has reported adversely on it, but by a split vote that leaves everybody in the air except the management of the three banks, who are going ahead as if nothing had happened. The Government, not unfavourable to the move, is more than nonplussed in that if the Monopolies men had been allowed to cast an eye on some of the ruling party's actions to merge industries during these last few months, there seems to be little doubt that many of these would have got the thumbs down sign.

Stymied or not, I believe we will in the end come to a merger. Then exactly the same situation will prevail in data processing equipment. On the one hand Barclays, somewhat disenchanted with IBM, has ordered a B8500 and will get a pilot B5500 in the near future. On the other, Lloyds is a fervent IBM supporter and has four 360/65's on order. What is more, Lloyds has reported favourably on the performance of IBM terminal units which Natpro had earlier rejected in favor of the Burroughs machines.

It is all a question of timing. Any delay could well put the Barclays DP men in front of a fait accompli and leave them no option but to sacrifice the giant 8500.

ICT Plans Multi-Access System

An interesting development following the rash of time-sharing and multi-access schemes which has broken out all over Britain has been the announcement that ICT's money-earning bureau subsidiary is planning what will amount to a general purpose multi-access system to be started in January 1969. It will begin with scientific and technical users over keyboards having access to Algol, Fortran and Jean (conversational) computers, and its designers — with a baleful eye on the GE-265 system in London and a PDP-8/PDP-9 system now in the course of installation — stress that they will be offering a "full computational ability, not a simple calculator service." It will be extended to commercial usage quite quickly.

The service will start with 30 users on a 32K core store 1905F, and may have up to 100 users when the store is doubled. The company is releasing two operating systems to handle multi-access with batching, but has admitted delay on its major general purpose operating system called George 3, which demands a minimum of 10K of core.

Post Office Balks on Data Transmission Network

While in the U.S. the common carriers and the manufacturers are at odds before the FCC on the subject of who shall do what in communications, desperate skirmishing is going on in Britain around the General Post Office, the monopoly which is steadfastly refusing to do anything towards setting up the separate high-speed data transmission network which this country is going to need early in the 1970's. The GPO's argument always is that it has nearly $1 billion invested in local cable systems, and it is going to use them come hell or high water.

ICL's Giant Machine

The junketings around the formation of the single British computer group got off to a good start with the announcement of Government orders worth $7m — long may it last, as the recipients said. Meanwhile, there is still the matter of the giant machines, but by the time these lines are printed, the company — International Computers Limited or ICL — should have made an announcement on its plans for what may cost it and Britain some $50m to launch.

If the giant machine series is based on the 1906A announced a few months ago, it will be a serious contender with any of the top-of-the-range equipment from any of the U.S. manufacturers.

A 1906A figures among the units to be delivered under the aforementioned Government send-off to ICL, but it is not for delivery till 1971. At the same time, Manchester University, which developed the very first Atlas, has concluded a far-reaching development contract under Government R&D backing, with ICL also aimed at the super-scale area. Is there a link and does this mean that full integration between ICT and English Electric equipment will come first at the top, but not till the next decade?

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BUYING . . . AND SELLING . . . COMPUTER TIME

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"The total potential market for computer time throughout the United States approaches a billion dollars a year."

Companies throughout the United States have been jumping on the computer-time bandwagon in increasing numbers. The idea that additional income of substantial amounts can be generated by the data processing installation by selling idle hours on the computer has caught the fancy of many top executives. This production of income has already reached the point where it has a decided effect on the profit of several nationally recognized companies. The total potential market for computer time throughout the United States approaches a billion dollars a year. A company selling a hundred hours per month on a good size 360/30 would probably be adding close to $70,000 to annual income, at an expense of approximately $20,000.

A "Perishable" Commodity

Selling excess computer time is difficult, even if rewarding. The market is an established one, with rules and conventions, just as is any other market. The big profits go to the well-managed installations who are attuned to the needs of their customers, and who consider time buyers to be just as important customers as in-house users of the equipment.

Just as in any other segment of business, good organization and day-to-day attention to operation pays big dividends. The product to be sold is very real, although it is a very "perishable" commodity. (If you don't sell today's shift today, it won't ever be for sale again.)

Requirements for Selling Time

Although many sellers offer their time for sale, only about thirty percent of them show any real profit. This is principally because a potential seller must examine his own operation to see if he really is going to be able to sell time. Trying to sell three hours on the third shift every Thursday night is a good way to become disillusioned in the computer time sales market. Buyers, in general, are looking for accessible, cooperative installations with plenty of free time, so that they can be assured of a relatively stable supply, even if their own requirements get much larger than their initial request.

Generally speaking, a seller should have a shift (preferably first or second) free for continuous usage. His premises must be accessible, and his service must be better than his competitors. Prices, in the last few years, have become relatively stable (pricing will be discussed in another section).

Sophisticated sellers who have experience and ability expect that over a period of months (the market fluctuates) they will receive somewhere between twenty and fifty percent of their monthly computer rental in time sales (several large companies have men whose only job is to coordinate time sales). The usual limiting factors with experienced sellers are a lack of suitable time for sale, and a falling off of interest in time selling as their own work takes more and more of the day.

Many potential sellers never sell an hour of time. Usually they become disheartened with the marketing effort required, or else pressures from their own organization reduce the time needed to serve outside customers.

Time Brokers

The market for time has developed ever since the first computer. At first, users "swapped" time, but this soon became a one-sided arrangement, and today practically everyone pays the market price for time used. As the market got bigger, equipment manufacturers' salesmen arranged back-up agreements; but these were cumbersome and did not always encompass a wide enough area. In 1964, the concept of time brokers was developed. The professional time broker has done a great deal to establish the market for computer time. When the market is once established, it becomes easier and easier to buy and sell time — neither can exist alone. Once the idea has been accepted by a large group of companies, it then becomes an established business practice. In fact, certain consultants feel that if a company has not either purchased or sold computer time in

Mr. Hegan founded Time Brokers, Inc., national brokers of computer time, in 1964. Prior to that, he worked as a salesman for IBM, and was the general manager of a large department store.

some quantity during the year, they are not managing as efficiently as they might.

Time brokers operate on a commission of ten percent, payable by the seller on collection, and the seller enters into an agreement that he will never charge less to an outside user than he charges to a broker's customer.

Once in a while a broker will purchase a block of time from a seller, and retail the time to his customers. Most buyers dislike such an arrangement, since they are charged more than the standard ten percent.

The development of national time brokers organizations, with offices from coast-to-coast, has developed a lively intercity business in time on larger computers. This development should continue.

How Much Does Time Cost?

Pricing of computer time depends on the interaction of the following five factors.[1]

1. Configuration

Generally speaking, prices rise as computing power, core size, number of tape drives, and internal speed increase. Usually the price quoted for a specific configuration includes all components, even if all components are not used by the buyer's program. A small number of sellers make an additional charge for more than the minimum number of tape drives, but this practice is disappearing.

All manufacturers' computers have a following of buyers, but particularly in the engineering and research fields, computer time is sold on virtually *any* manufacturer's computer.

2. Shift

Prime shift is most expensive since it is most in demand.

Second shift costs from ten to fifteen percent less than prime, while third shift sells for from ten to forty percent less than prime.

Weekend prices, normally lowest, are negotiable, and depend on availability and the individual circumstances of the seller.

3. Availability

If a computer is in reasonably heavy demand, prices tend to remain stable at the level sellers are accustomed to receive. Prices seldom fluctuate from day to day, but over a period of time, sellers do adjust their prices to conform to demand.

4. Size of Job

Large jobs tend to produce lower rates. The definition of "large" is difficult to pin down, due to variations in installations. One seller will consider a single sale of fifteen hours as "large," while another will consider this only a small part of the week-end. In addition, there are two dimensions to "size." First, there is the actual number of hours to be used, and second, the number of days or weeks over which these hours are used.

Unless there is a great deal of excess computer time, rate schedules should be kept to a simple single hourly rate. Most large volume jobs are sold by contract, under which prices and other conditions vary widely.

5. Ability to Bargain

Bargaining is a skill developed with experience. However, the DP executive can gain that experience by working with a few customers. Most sales are for relatively small amounts, and with a few sales completed, the executive will feel more at home. Primarily, he should approach the session with the attitude that he is able to service a customer well, and that for this good service, he should be rewarded with payment for all his expenses, plus a reasonable profit.

[1]Excerpted from the *Uniform Guide for Computer Time Marketing,* Time Brokers, Inc., 380 Lexington Ave., New York, N.Y. 10017. Free on request.

A Good Rule of Thumb

Determining the exact price to be charged is really a function of the market place and the five foregoing factors, but a good rule of thumb to be used is five or six dollars per hour for each thousand dollars of monthly rental. Thus, if a 360/30 were renting for ten thousand dollars per month, the price for prime time would be from fifty to sixty dollars per hour.

Typical prices in today's market for a 360/30, 65K, 5/tapes, 2/disks might be $80 for prime, $70 for second and $60 for third shift, while a 360/40 131K, 6/tapes, 3/disks would be around $130 for prime time.

There is a monthly national publication called the "Computer Time Report," published by Time Brokers, Inc., 380 Lexington Avenue, New York, N.Y., which is sent free on request to those interested in purchasing computer time. It contains sample listings from throughout the country, and gives an excellent idea of prices for every type of equipment.

How to Sell Time

The interested data processing executive always has one question, "How do I sell?" The answer is that selling computer time is like selling any product. One sets up a marketing plan and carries it out. It includes identifying potential customers, and contacting them through personal visits, agents or advertising. The plan should include closing the potential customers once they appear interested, through demonstration and personal salesmanship. Administration of the computer room, including scheduling, programming service, help with storage facilities, etc., is really an attitude of service on the part of the seller. Carrying out the recording of time used, billing and collection should be familiar functions for any company.

Two or three tips are in order: First, try to work with a reputable broker — he can help. Second, one should try to develop his own list of potential customers, and keep them on a mailing list. Whenever a hardware change is made, send out a letter to a hundred potential customers. Even if changes are not made, potential customers should be canvassed once in a while by letter. Third, if time is promised to a customer, that promise should never be broken. Finally, the accounts receivable must be controlled — all the profits can be tied up in promises.

Seller's Problems

Selling computer time does cause problems. Management must balance its desire for increased income against the cost of obtaining this income. Foremost in the mind of a new seller is the problem of company security. Almost without exception, companies leave a person or two on the premises when outsiders are using the computer. There is remarkably little difficulty with misuse of equipment, since the user's operator is probably as professionally trained as is the seller's own man. (Some sellers provide their own operators at no extra charge, while others will make an operator available for $5.00 extra. Usually time is sold without an operator.)

Credit problems should not present problems, but they do. Disputes about time used will cause a buyer to withhold payment; the executive in charge may sell time to an underfinanced company; the credit department may not follow up time sales as closely as they might the company's product sales. Good credit management techniques are used by every successful seller.

New sellers often create problems for themselves by ordering additional equipment solely for the purpose of "selling more time." This may or may not be in the seller's best interests. Increasing the capacity of the equipment without having an in-house need may just be putting the seller in a different, but not necessarily more profitable, segment of the time market.

Purchasing Computer Time

Important though selling time may be to some companies, there is probably a larger potential saving for the usual commercial installation through the use of purchased computer time.

Saving money by purchasing computer time implies that a company will consciously install a computer too small to handle its peak daily or seasonal peak load. By doing so, it may be possible to reduce potential rental by anywhere from one to twenty thousand dollars per month, depending on the size of the installation. By purchasing computer time to meet the peak demands, the internal utilization of the computer approaches 100%. (This is one good reason for not being a time seller.)

The peak-load planning approach to buying computer time has only been possible for the past year or two, since prior to that time, the market was not stable enough that a buyer could be reasonably certain computer time would be available at attractive prices. Time brokers have had a decided effect on developing a stable market for computer time.

There are other reasons why a buyer goes into the time market. Unplanned loads are always coming up, and this forces the manager to send out some of his work. Back-up time falls into this category, but as a percentage of time sold, this category is minor, although to the company whose computer is down, it can be a great emergency. (Sellers cater to this sort of emergency situation, since this often is a buyer's first introduction to buying time.)

Many programmers encourage their managements to purchase computer time for testing and debugging, since they are relegated to testing on third shift. Most progressive managements recognize that a programmer is not highly productive after midnight, and that it is probably cheaper in the long run to buy time "off premises" if the production schedule cannot be changed to provide for prime-shift testing.

Big conversions are often sent to outside computers on the theory that in-house work should not suffer during a one-time change-over.

Finally, many newer programs require additional core or excessive numbers of peripherals in order to function efficiently. It may not be economic to add the equipment to the in-house computer, and it is certainly not economic to waste a programmer's time trying to cram a complex 65K program into a 32K machine. Until a cross-over point is reached, computer time should be purchased to run this sort of program.

Buyers' Problems

Buyers do have their problems, although they may be of a differing nature from that of a seller. The primary problem is that of assuring availability. Experienced sellers have made this much less difficult, by making a sincere effort to live up to their promises.

Price is really not a primary problem. Because of the activity of time brokers, the market has stabilized, and brokers do a good job of fitting the right buyer with the right seller. There are very few buyers of time who have not heard of time brokers, and as a result it is quite rare to find a buyer which is paying *twice* what he should be. On the other hand, it is also rare to find a seller who is charging *half* what he should be.

Buyers look for clean, well-run installations, with plenty of storage space, and room to check out their work. They want good time recording practices, and prompt, efficient billing. High minimum sale prices often scare off potentially large buyers, and extremely tough cancellation policies frighten everyone. (The usual cancellation policy is to charge for half the block of time reserved unless the block is cancelled more than an hour before the buyer is scheduled on the equipment.)

Probably the biggest complaint of buyers is that the seller is disinterested in his problems. Good salesmen are *always* interested in their customers' problems, no matter how insignificant they may seem! After all, it is much easier to keep an old customer than to sell a new one.

In order to do a good job of buying time the buyer should first examine his needs. He should be certain he actually needs time, and that merely rescheduling his own operation will not obtain relief. When he is certain he actually needs time, he should make a specific list of his requirements. This should include a complete configuration, approximately how much time is required, on what schedule the time is needed, and approximately what budget is to be set aside for the time.

Finding available time is a matter of contacting friends, other installations, salesmen, and time brokers.

If the purchase is large, a visit to the installation is in order, so that the buyer and seller may completely discuss any questions about the arrangement. In small purchases, price is rarely open to negotiation, since the seller has probably sold at the market price several times before, and has established a scale of standard prices.

Negotiations for larger purchases of time should be conducted on the basis that any transaction must be profitable to both buyer and seller.

Some Definitions

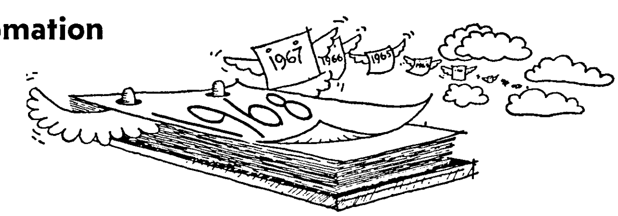
Certain definitions and conventions have been established over the years. A few of the more important ones are listed below:[2]

Computer Time for Sale — Computer time for sale is that number of hours during a given period in which a computer is not utilized. In general, monthly rent of a computer system is based on a minimum of 176 hours per month, measured by meters on each component. Usage of more than the minimum hours is charged for on each component separately at a much reduced rate. The cost of any computer installation (owned or leased) is made up of a heavy fixed charge and a light variable charge. It follows that a company with low internal usage can be expected to pursue the sale of time with vigor in order to reduce the total cost of the EDP Department, and thus becomes a "seller."

Meter Time — Meter time is the time recorded on a computer when it is actually processing. It is seldom used as a base for pricing. Only in cases where other means of recording time are difficult, is it sometimes used. This method does provide an accurate way of establishing the time the computer was actually processing, but it also allows the buyer to monopolize the equipment without actually using much time. This is particularly true when a buyer is testing or debugging a program. A more commonly used basis for computer time sales is "Wall-Clock Time," which is explained below. If meter time is quoted, the hourly rate will normally be considerably higher than if wall-clock time is used.

(Please turn to page 40)

[2] *Uniform Guide for Computer Time Marketing, op. cit.*



Who Will Man the New Digital Computers?

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The new field begun with the construction of the first automatic and electronic digital computers hardly ten years ago — the Harvard Mark I and the ENIAC — has now moved into a stage of runaway growth. With its growth comes an immediate and pressing need for people to man the machines.

In addition to those first two digital machines, a vast number of improved editions have come off the drawing boards and later off construction lines since their inception. In government and university laboratories, there are operating: the EDVAC, an outgrowth of the ENIAC; three more Harvard machines; six computers of the so-called "Princeton" type, plus one more still being built; four SEAC-SWAC type machines; and Whirlwind I with at least one off-spring. Among the large commercial organizations, International Business Machines Corp. is now completing eighteen Type 701 computers and has announced a new magnetic drum computer Type 650 to be mass-produced. Eight UNIVAC systems are now in operation as a result of the efforts of Remington-Rand's Eckert-Mauchly Division. An unknown number of Engineering Research Associates' computers have been built; a recent program includes three on-line data-processing computers for a single installation.

At least six other organizations, with less expensive automatic computers, are producing one or more units of their products: Burroughs; Nuclear Development Associates with Hogan Laboratories; Elecom Division of Underwood Corporation; Consolidated Engineering Corporation; Monrobot Corporation, a subsidiary of Monroe Calculating Machines; and Computer Research Corporation Division of National Cash Register — to mention only a few.

The first large insurance company is now renting an experimental digital computer. A Detroit automotive firm, among others, has been studying automation of its data-handling for several years. The list of prospective, even perhaps committed, would-be users is larger than a casual observer would guess.

On the basis of the group of computers mentioned above, it can safely be said that by the end of the year there will be close to a hundred automatic, electronic, digital computers in operation. The number in succeeding years, provided there is no economic down-turn, staggers the imagination.

Now each of these machines may put to work anywhere from 5 to 50 engineers, mathematicians, and associated trained technical personnel. These people are needed merely to man them upon completion, and do not include those men and women who have been involved in their design and construction. So, a potential lack of trained personnel — already apparent to those persons now trying to staff computer installations — becomes obvious. We need quick action to train the personnel without which a completed machine cannot run.

Four types of programs, in general, have been set up to bridge the gap. The first type has been instituted by commercial organizations seeking to sell or rent machines. IBM, Remington-Rand, and the CRC Division of National Cash Register, among others, have announced short training courses for incipient users of their own equipment. Such programs are obviously useful, but have not yet been able to train enough personnel to man the machines being sold by those organizations only.

The second type is training on the job itself, carried out by the customers. Provided a trained nucleus staff is available, and time can be spared, this may prove satisfactory. Unfortunately, the economics of a costly digital computer often does not allow the lifting of a group's abilities in this way.

A third type of training has been attempted with success by several universities and technical institutions. Mass. Inst. of Technology, the University of Michigan, the University of Toronto, and Wayne University, among others, have offered special summer programs in digital computer techniques. Such intensive courses are useful in helping to establish the trained nucleus at a burgeoning computer installation; but so far they have not appeared to be able to train the masses of people that are really needed for adequate staffing.

The bulk of the training job must therefore fall, it appears, on the fourth type of training, regularly scheduled graduate and undergraduate courses and programs in universities. From these schools should issue a steady stream of mathematicians, computer engineers, assorted scientists, accountants, and business school graduates, all trained in several or many aspects of automatic digital computers.

Such a program has been begun. A prime essential for courses involving digital computation is the presence of some type of digital computer at the university. A number of universities and technical institutes now possess or have access to digital computers for training purposes. On the East Coast, M.I.T. with Whirlwind, Harvard with Mark I and Mark IV, and Columbia with access to the IBM-701, have this prime

*John W. Carr, III is now associated with the Moore School of Electrical Engineering at the University of Pennsylvania.

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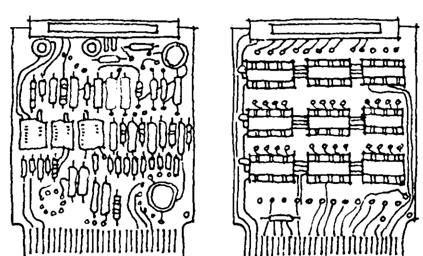

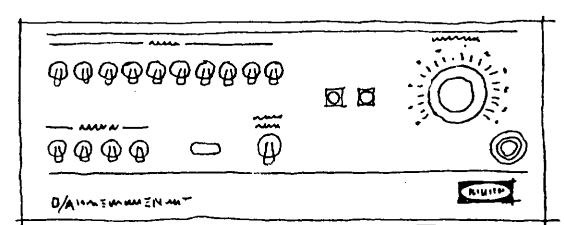

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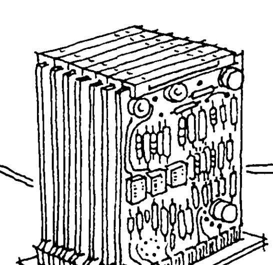

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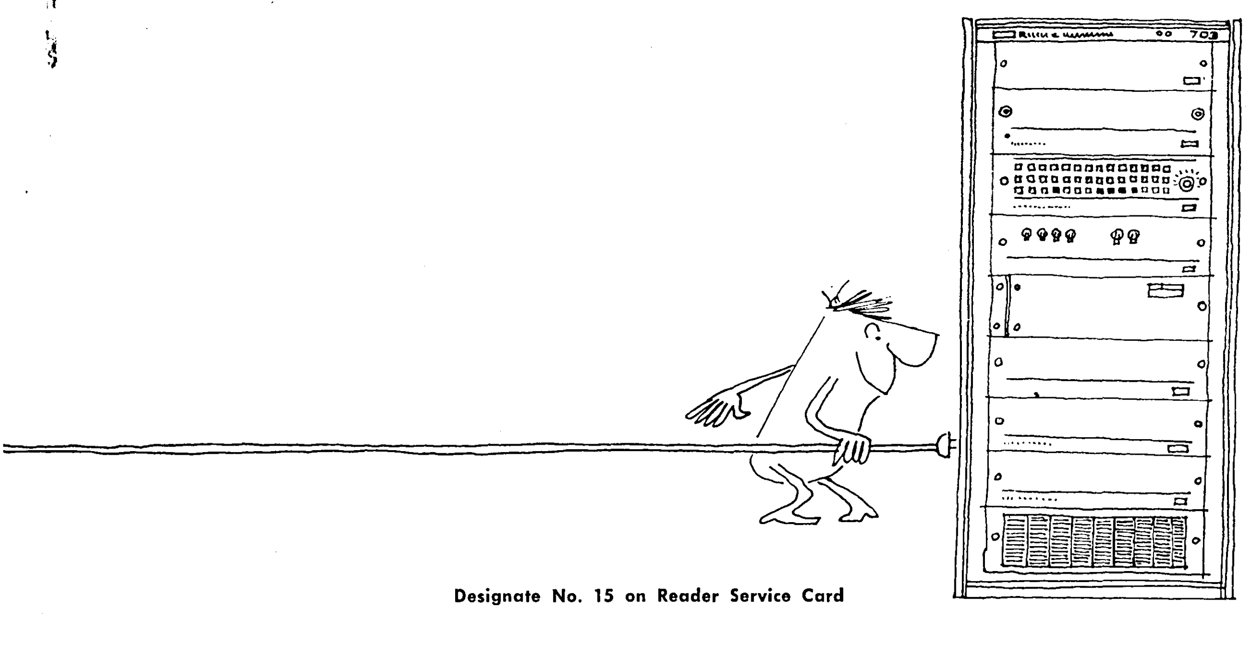

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- 16-bit word length
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- Up to 32K Memory
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requirement satisfied. In the Mid-West, the Illinois computer at Urbana, the MIDAC at the University of Michigan, and the soon-to-be-completed Wayne computer will be available to their respective institutions. On the West Coast the SWAC is located on the U.C.L.A. campus.

A slightly different pattern of cooperation between educational institution and industrial organization, but one that might well be copied, is the course being offered jointly by Trinity College and United Aircraft in Hartford using its Type 701 computer. Other organizations needing trained computer men might take this example of such a joint effort and reformulate it for their own local requirements.

The attitude of the Atomic Energy Commission toward univeristy use of its computers at New York University, at Argonne Laboratories near Chicago, and in Oak Ridge, is not yet known. But if the pattern established with the machines for particle acceleration prevails, schools and universities may be able to use those computers in the New York, Chicago and Southeast areas.

Other schools have programs underway aimed at building or completing machines. The University of Pennsylvania's Moore School, University of Wisconsin, and University of California have unfinished projects. Purdue University is just beginning building a computer.

Even with the presence of a computer at a University, the job of establishing a curriculum in computers and computation has hardly begun. The burden falls heaviest on the mathematics and electrical engineering departments representing those who are to use and maintain machines; but other departments, ranging from astronomy to business administration, in each school need to adjust their teaching to what is indeed a revolutionary tool.

Courses in numerical analysis with specific applications need to be started by mathematics departments. Courses in machine programming must be begun, either by mathematicians or engineers or by several kinds of teachers working together. Courses in the use of machines must be set up by business administration groups and industrial engineers in the field of data-handling that is not mathematical. Courses in machine design, logic, and construction must be offered by the electrical engineering departments. Graduate programs need to be set up, either to give specific degrees in computation or else to give degrees in older fields with specialization in the use or design of computers.

Some schools have had previous experience in inaugurating training in the analog computation field. Most of the schools mentioned above have started one or more courses in the digital field within the last five years; several have broader plans covering the fields listed above.

If satisfactory use is to be made of the new data-processing tools in computation, business, and process control, it is the duty of men already in the computer field to encourage, in every way they can, adequate high-level training by colleges and universities, both those with facilities now available and those who later on may have such equipment. The rapid rate of growth of the digital computer field today depends in large measure on the availability of enough professionally trained persons to man the computers. The challenge is evident, and confronts American universities, governmental agencies, and private business, the three major societies (AIEE, IRE, and ACM), every one interested in the field. It must be met promptly.

Hegan, "Buying and Selling Computer Time" —

(Continued from page 34)

Wall-Clock Time — The vast majority of sellers price their time based on the number of hours and minutes the buyer has possession of the equipment, regardless of how much meter-time is used. Thus, a buyer cannot monopolize the equipment without paying for it, but an efficient buyer will cut setup time to a minimum. Usually, sellers expect that a buyer will use from forty to fifty-five meter minutes for each hour of wall-clock time purchased. The price of time reflects this fact. In some installations, the recording is done by keeping a log; in others, a time-clock is punched. In almost every case, the buyer signs for the time he has used upon completion of his work for that day.

Shift — The following chart is suggested to define the hours in various shifts. It has been accepted generally, but not completely by Data Processing users throughout the country:

Prime Shift — Working days, 8 a.m. to 6 p.m.

Second Shift — Monday to Friday, 6 p.m. to Midnight

Third Shift — Any job starting after Midnight

Weekend — Saturday and Sunday

In addition, certain other conventions are common in the market:

Sorters, keypunches, etc., are usually free unless the privilege is abused.

Paper (one-part) is usually supplied at no charge. Multiple-part paper is billed at cost, and if over a box of cards is used, these too are billed at cost.

Ribbons, scratch disks and scratch tapes are supplied by the seller. No scratches may be removed from the computer room. (The buyer supplies his own tapes and disks for permanent use.)

Watchman service is paid for by the seller, if this is required by the building. The seller in most cases leaves one person on the premises when time is being sold. Usually this person does some sort of off-line productive work. It is rare that a buyer will permit himself to be left alone on a seller's premises.

Sales taxes are collected by the seller, and are always added to the quoted price. Computer time is taxable in many states.

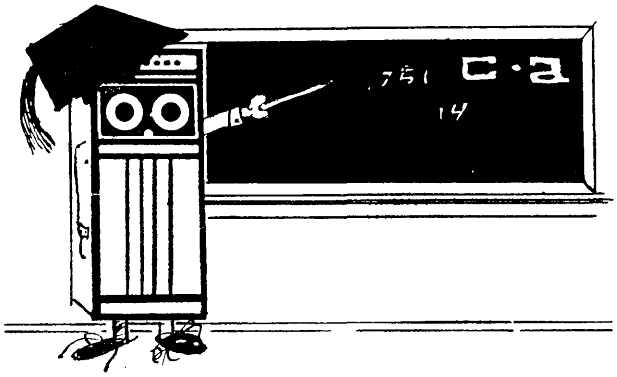
The computer time market is a Net market. Depending on the seller, terms will be Net 7 days or Net 30 days. Discounts are very rare, such bargaining taking place over the price of time, rather than over its terms.

In unusual cases, the seller will ask for cash in advance (credit risk is always borne by the seller).

Certain sellers require a quarter or half-hour minimum every time the computer is used, but most take a chance that the five-minute test shot buyer will be back for a five-hour production run later. There is no common rule, and the buyer should be sure of the individual situation prior to committing himself to short test shots.

Most time is sold without a contract, but when one is required, caution should be used. Contracts should be examined by the company attorney, regardless of how agreeable and friendly the seller and buyer may be.

In conclusion, the computer time market is one in which well-managed companies can improve profits by buying time wisely and well in periods of peak demand, and selling their idle time. The organizations which look on their computer time as a product to be sold, market it aggressively, and treat their customers well, may succeed in making a substantial contribution to over-all company profit.



Using a powerful, modern, small, general-purpose computer (a Digital Equipment Corp. PDP-9 which can perform 500,000 additions per second, etc.) which we have recently acquired -- and our experience since 1939 in many parts of the computer field, we have started to teach:

Course C12:

COMPUTING, PROGRAMMING, AND SYSTEMS FUNDAMENTALS FOR SUPERVISORY MANAGEMENT— WITH 'HANDS-ON-THE-COMPUTER' ORIENTATION AND EXPERIENCE

This course will be offered: September 11, 12, and 13 (Wed. through Fri.) and October 16, 17, and 18 (Wed. through Fri.), and from time to time thereafter. Computer time for course enrollees will be available, without additional charge, Wednesday through Sunday. The fee is $190; the enrollment is limited to 15.

WHO SHOULD TAKE COURSE C12?

In a recent article in Computers and Automation, Swen Larsen, Vice Pres., Computer Learning Corp., said:

> "In many companies, the top operating executive --the one who makes the key decisions -- came into his position of responsibility before the computer revolution. Of all the men in an organization, he is probably the one in the greatest need of knowledge of the computer. Two computer experts describe the manager's plight in this way:
>
> > 'The executive is likely to be baffled, or confused, or snowed. He has confidence in his firm's EDP manager, but he doesn't understand the jargon that he hears, nor does he comprehend what can be effected from the tools he controls.'"

Course C12 is directed squarely towards these people and this problem.

After the lectures beginning at 9 a.m. each day, the course will center around study groups of three or four persons who will have access together to the computer for three hours at a time; while one person runs his program, the others will work out or correct their programs. The instructor will, of course, be regularly available for guidance.

WHAT TOPICS ARE INCLUDED IN COURSE C12?

- Fundamentals of Computing, and Orientation in Computers and Programming, with "hands-on-the-computer" experience in: how to compute; how to program; how to edit a program; how to assemble a program; how to debug a program
- Some Powerful Concepts in Programming
- Introduction to Programming Languages
- Basic Principles of Systems in Computer Applications
- Applications and Nonapplications of Computers
- Some Natural History of Mistakes, and How to Avoid Them

WHO IS THE INSTRUCTOR?

The instructor for this course is Edmund C. Berkeley, editor and publisher of Computers and Automation since 1951, and president of Berkeley Enterprises, Inc., since 1954. He has been in the computer field since 1939. He took part in building and operating the first automatic computers, the Mark I and II, at Harvard University in 1944-45; he is now implementing the programming language LISP for the DEC PDP-7 and PDP-9 computers.

Mr. Berkeley is: a founder of the Association for Computing Machinery, and its secretary from 1947-53; the author of eleven books on computers and related subjects; a Fellow of the Society of Actuaries; and an invited lecturer on computers in the United States, Canada, England, Japan, the Soviet Union, and Australia.

We believe the experience of:

- sitting at a computer;
- having the entire machine at your command;
- being able to look into any register you choose, to see just what information is there;
- experimenting first with simple programs, then with more complicated programs; and
- having someone at your elbow to answer questions when you are perplexed;

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This experience is, we think, part of the essential background of supervisory management. With such experience, supervisors of data processing departments and divisions are better able to:

- make reality-based appraisals of computing and data processing;
- form sensible judgments that are relatively independent of what the computer professionals in their groups may tell them;
- avoid commitment to unworkable proposals and costly errors.

If you are interested, or have questions, or are considering enrolling, write, wire, or telephone:

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COMPUTER SELECTION

Joseph A. Orlicky
Industry Consultant
IBM Corp.
White Plains, N.Y. 10601

"It is probably safe to assume that salesmen will not volunteer *information they do not want the customer to have; but if the customer knows the right questions to ask, he can expect to get straight answers and be in a better position to select a computer."*

Joseph A. Orlicky received his Master's degree in business administration at the University of Chicago, and his Doctor's degree in law and economics from Charles University, Prague. He was formerly the Education Manager for manufacturing industries at IBM before assuming his present position.

When procuring machinery needed for the conduct of business, such as machine tools, transportation and material handling equipment, or office machines, management normally can rely on time-tested selection techniques. In these cases, criteria for objective selection are, in fact, so well established that responsibility for specific decisions can safely be delegated to specialists. But a computer is not "just another machine" and the process of selecting it cannot and should not be reduced to a formula.

This is chiefly because of the complexity of the computer itself, but also because of the unusual way in which computers are being marketed, and because of the long-range effects of the selection on the business operation.

A computer is complex not only in terms of its internal structure but in its open-endedness, i.e., variability of configuration, which affords an almost endless number of different mixes of capabilities. The total job the computer is to do in the future would have to be precisely defined — and this is seldom possible in a commercial application environment — if the exact mix, no more and no less, of capabilities required is to be determined.

This is the principal difficulty in making a valid compari-

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*This article expresses the author's own professional opinions which are not necessarily endorsed by any other individual or organization. It is excerpted from the author's forthcoming book, *The Successful Computer System: Its Planning, Development and Management in a Business Enterprise,* to be published by McGraw-Hill Book Co. this fall.

son between different computer makes and models. The way that computers are being marketed affects their selection, because the computer buyer is, in effect, entering into a rather intimate long-range relationship with the computer vendor. A computer user does not just buy or rent a machine; but he depends on the computer manufacturer for assistance, support, and many services.

Business, not Technical View Should be Predominant

The business manager needs to be better oriented in the principal considerations concerning computer selection, because he will be faced with the conflicting claims of salesmen of competitive computers, and possibly even the claims of his own advisers. It is probably safe to assume that salesmen will not *volunteer* information they do not want the customer to have; but if the customer knows the right questions to ask, he can expect to get straight answers and be in a better position to make the decision.

The average business executive may counter this argument by pointing out that his technical experts *know* which questions to ask. True enough, as far as technical questions are concerned, but *computer selection also has a non-technical, business aspect.* The vision of the specialist is usually narrowed by his expertise in technical matters; he should not be expected to exercise broad business judgment. When selecting a computer for business applications, it is not the technical so much as the business view that should be predominant.

To orient the business manager in the area of computer selection, specific considerations will be reviewed below, the discussion being organized as follows:

1. Outside assistance in computer selection
2. Vendor selection
3. Machine selection
4. Considerations of growth
   (a) Compatibility
   (b) Emulation and Simulation
   (c) Modularity
5. Economies of scale

Outside Assistance

Expert assistance in computer selection can be obtained from the computer manufacturer, or from an independent consultant specializing in computers, or from one of the major public accounting and/or management consulting firms, or from one of the new technical firms specializing in programming and other computer-related work, or a combination of them.

When seeking outside assistance in computer selection, the business executive should be careful to distinguish between machine selection and vendor selection. Choosing the vendor is essentially a matter of business judgment: the prerogative of exercising it should be retained by the business executive. In fact once management decides on a given vendor, the vendor can be expected to provide competent advice regarding nearly all facets of machine selection. All reputable computer manufacturers can be counted upon to provide the services of qualified specialists to resolve nearly all technical questions.

In cases where selection of the vendor will be subordinated to machine selection, outside advisers — provided they are qualified — will render a valuable service by bringing some objectivity to the questions. It would not be realistic to expect such objectivity from competing computer salesmen.

Vendor Selection

In selecting a vendor, business management has a basic choice between *single source* vs. *multi-source* selection. This is the choice of either pre-selecting the most desirable computer manufacturer or putting out invitations for bids.

Where an existing computer installation is to be replaced and multi-source selection is considered, the case against the changing of brands, (assuming that there are no serious grounds for discontinuing the relationship with the original vendor) lies mainly in its cost. Switching back and forth between computer makes is always costly, whether or not the associated costs are immediate and evident. Representatives of competitive computer manufacturers will, of course, minimize these costs of changing. Such costs mostly derive from the need to reprogram, to reorganize file records and to otherwise adjust to the differences inherent in the "strange" machine. Some computer manufacturers have developed special aids to facilitate such conversion. Some of these aids are known as "emulation," "simulation" (see *Considerations of Growth* below) and "liberation," i.e., termination of dependence on the original vendor due to the programs being written in a language uniquely suited to the installed machines.

Conversion Costs

Conversion programs often do an effective job of translating existing computer programs into the form that is required if they are to run on a different make of machine, but the practice may be questioned because translated programs nearly always cannot work as efficiently as if they had originally been written in the new machine's "native" language. Accordingly, many of these programs may eventually be (and should be) rewritten, at considerable cost; but this fact is often obscured at the time of conversion.

Furthermore, a company that is changing vendors should inquire who will reconvert their future programs should they wish to return to the original vendor at a later date. Of course, if programs are written in higher-level languages, problems of conversion will be lessened, though not entirely eliminated.

In selecting a computer vendor, the business executive should look at the capacity of the machine, its cost, the reputation of the computer manufacturer, software support, commitment to application development ("canned" programs meeting the needs of a specific industry), probability of future offerings, the computer manufacturer's research and development activity, and the various services offered along with the machine.

Evaluating Services

The scope and quality of services provided as part of the package bought by the computer user through the rental or purchase price, are clearly important. Such services include system engineering assistance, machine maintenance, technical publications, application aids, and education services ranging from the training of equipment operators and programmers to special classes for executives.

There are also other, less tangible qualities of a computer vendor's organization that it is wise to consider when selecting from among the competitors. Will the computer manufacturer be ready to come to the customer's assistance if things should go wrong either with the machine, its software, or with applications? Does he stand behind his product? Is he dependable? Can he be counted upon to make good on announced future products and services and other promises explicit or implied? What is the quality and *esprit de corps* of his personnel? Is he dedicated to excellence not only in word but in deed? All of these are valid questions that should play some part in vendor selection.

Another question to be considered in multi-division or multi-plant companies, is what is the degree of standardization of computer equipment and programs? This is becoming the goal of more and more corporate managements. System standardization facilitates the relocation of both products and people from one plant or division to another, and generally permits much better utilization of corporate systems resources. Where corporate policy calls for such standardization, the selection of the computer vendor will also be a matter of policy. A related question is that of computer equipment compatibility, i.e., the ability of a given program to run on several, or any and all, of the computers installed throughout the corporation. This is another valid objective, which will favor single-source computer selection.

Multi-Source Selection

In cases of multi-source selection, there are eight main criteria that can affect the final choice:

1. Availability and quality of software
2. Hardware performance
3. Manufacturer support
4. Compatibility among the various computer models offered
5. Cost
6. Capability of system growth
7. Delivery
8. Availability of application programs

These selection criteria are ranked here in the order of decreasing importance attached to them by commercial computer users, according to a recent survey. This reflects practice, which does not necessarily make it right. Nor do responses of users to a survey necessarily tell the whole story.

Machine Selection

In the case of machine selection, there are said to be objective vs. subjective criteria of selection, but they would probably be better labeled as *technical* compared to *business* considerations. The "objective" methods of machine selection are as follows:

1. Published evaluation reports on the performance of hardware and software
2. *Benchmark* problems
3. Programming and execution of test problems
4. Simulation and mathematical modeling

Assessments published in data processing literature reporting performance of the various computer models represent the most frequently used guide to machine selection. Where specifications or performance evaluation data do not provide a clear picture of relative capability, the business executive can ask for actual tests. This approach is often used by private corporations, and always used by government, to decide among competitive makes.

Testing Machines

The essential difference between the two types of test, i.e., the benchmark and the test problem, consists in the selection of the problems and the purpose of the tests. The so-called benchmark problems are selected so as to represent the *job* to be done. The results of the benchmark test are judged on whether and how well the computer met the requirements specified for the application. The technique of benchmark problems is only applicable where the full, specific job the computer will do is known in advance.

The programming and execution of test problems is aimed less at testing the job and more at testing the various *functional capabilities* of the machine. The test problems are selected to measure such capabilities. The results achieved by the machines tested can then be compared and price-performance judgments can be made. However this technique is limited, since weights have to be assigned to the different aspects of a machine's capacity, before any comparisons can be made. Furthermore, data on performance tests unrelated to the actual task the machine will have to perform are not very useful.

Simulation and mathematical modeling techniques are, at present, not often used for machine selection, although they can serve as valid evaluation tools. Eventually better analytical techniques of computer cost-performance should become available.

Cost vs. Performance

As far as computers are concerned, establishing a clear measure of cost vs. performance has so far proved to be elusive. The problem lies not in cost, which is known, but in the definition of performance. Performance in relation to what? Even computer manufacturers lack a fully satisfactory method of determining cost vs. performance of their products for purposes of marketing strategy and pricing policy. The basic reason is that a computer has too many different facets of capacity, too many separate capabilities, to permit clear comparisons even between fairly similar machines.

A predominant characteristic of the computer, and the main measure of its power, is speed. But speed alone, as expressed in terms of memory cycles per second in the machine's specifications, is almost meaningless. Even the whole collection of capabilities of the machine is almost meaningless if unrelated to the actual jobs the computer will have to do. The fastest computer is the one which has the greatest *throughput,* i.e., which performs the most work per week per dollar of rental on sale price. When evaluating two or more machines of roughly comparable capacity range, the only foolproof method would be to program, in advance, all of the jobs for each one of them and then run these jobs in their proper mix, over a period of time. Short of this, comparison data should be taken with grains of salt.

Job Definition

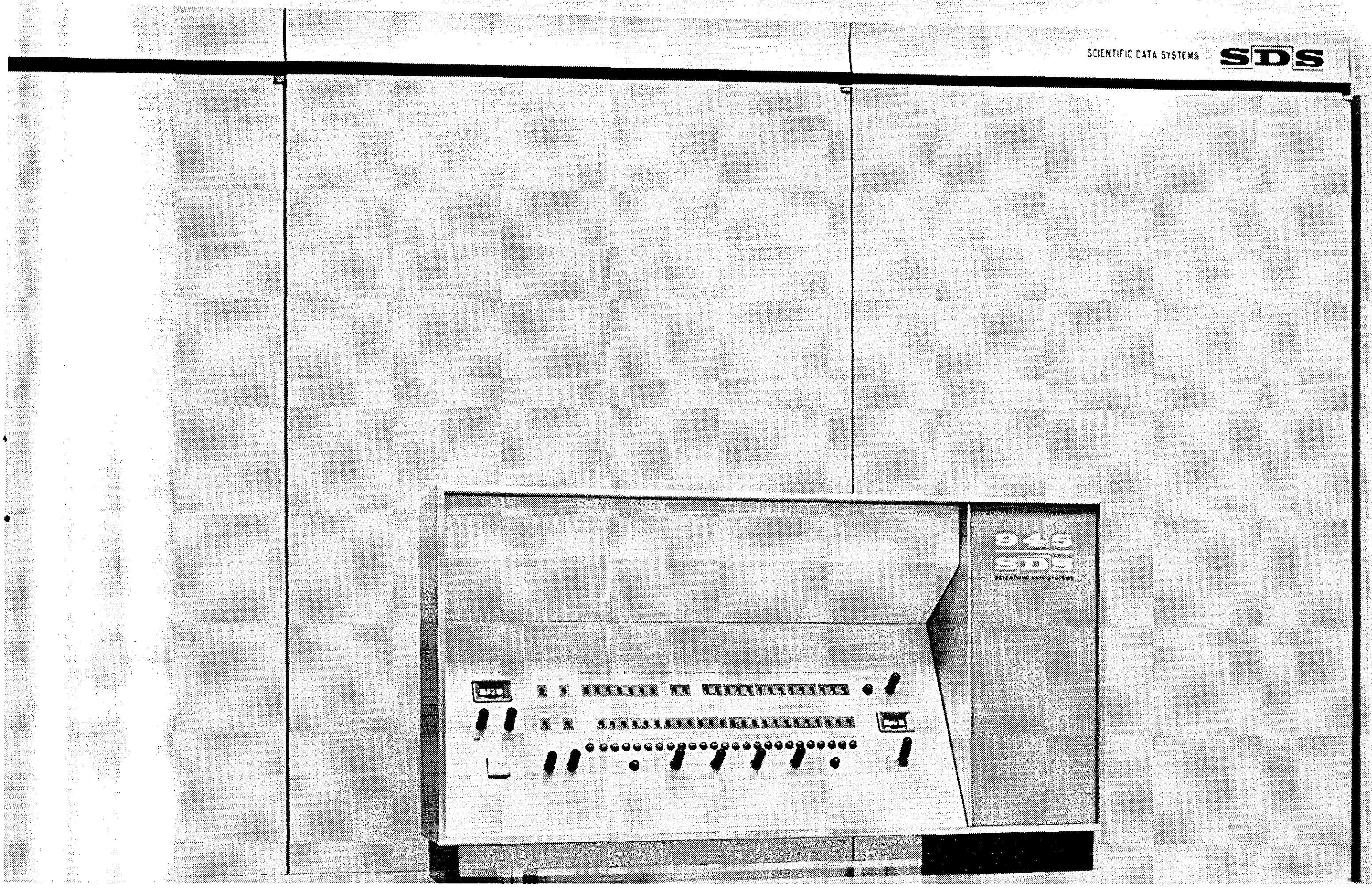
Accordingly, job definition is the real key to machine selection. What is the job and how do we want it done? This is the question that should be answered by the computer user, not by technical specialists. Incidentally, job requirements also reveal the other side of the coin of cost-performance. If the computer will not do what you want it to do, it makes no difference how little it costs.

Among the business considerations in machine selection is equipment *reliability.* This is a function not only of the technology of the product, but also of the manufacturer's maintenance service. *Effective* reliability derives from the zeal of the computer vendor's field personnel to keep the equipment operational at all times.

Another consideration of machine selection is equipment and program standardization within a given corporation. It may be advisable to tailor configurations so as to satisfy the objectives of standardization, even though a different, or smaller, machine would satisfy local requirements.

When selecting a computer, economies of scale should also enter into the decision. A larger machine is usually cheaper in terms of cost per task performed.

The business executive should also consider plans for future additions to the computer system. A system can grow, by adding additional (or more efficacious) input-outut de-



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Now you can also get it with our new 945 computer. The 945 will cost you less than $15,000 a month. That's about $10,000 a month less than a 940. And it's as cheap as renting 5 full time terminals from a time-sharing service bureau. (You get 24 with the 945.)

In fact, the 945 is the least expensive time-sharing computer on the market. It's every bit as fast as a 940, it has the same excellent response time, and it uses the same software.

Which means that the 945 comes complete with Basic, CAL, conversational Fortran, Fortran II, a two-pass assembler, a text editor (QED), a debug package, a utility package and a complete library of special programs and routines. And even though the 945 is new, the software has been proven by the toughest customers you can find: time-sharing service bureaus.

Then why is the 945 so much cheaper?

Simply because fewer people can use it. The 940 is designed for service bureaus and large companies with hundreds of different users. The 945 is designed for companies and institutions with dozens of users.

The 945 can recognize up to 64 individual users. And up to 24 people can use it at the same time.

That, more or less, is the whole idea of the 945.

Less people can use it and more people can afford it.

SDS

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vices, more secondary storage, more main memory, and other features. The longer-range growth of a computer system should be geared to corporate strategic planning; otherwise information processing objectives are not likely to be realized. This bears on the future performance of the company as a whole, and therefore merits serious attention from executives.

Considerations of Growth

A computer system grows as a result of growth of the job. The job the computer is to do can grow three different ways, i.e.,

1. Increase in work *volume*
2. *Additional* applications
3. Application refinement and *sophistication*

If the business and its product line expand, it will cause an increase in transaction volumes and file records. The capacity of the computer system will sooner or later have to be increased accordingly, if it is to handle the work load. This type of computer system growth should represent no problem, as long as more input-output units, file storage devices, blocks of main memory and special speed-increasing features can be *added* to the same computer model.

If job growth is the result of additional applications, it can take two directions. When the new applications do not affect previous applications, and their programs, the solution is straightforward, i.e., capacity can be expanded in the same way that it would be increased for an increase in work volume. If, on the other hand, the new applications are not independent of the ones already programmed, the programs will have to be related, and there will be some reprogramming.

If the growth of the computer system is the result of making the original applications more comprehensive, more effective, and more sophisticated, existing programs will obviously have to be revised and perhaps drastically changed. The effect on computer system growth may also be profound, since the new approach to the job may call for a substantially different hardware configuration and a different set of software. As the growth of the information processing job establishes the need for increasing the capacity of the computer system, some special considerations apply in regard to both hardware and programs.

Compatibility

Compatibility is an important feature of modern computers, but its full significance can often be elusive. In principle, compatibility among a series or family of computers implies that the various models of a product line utilize the same basic design logic, sometimes called design *architecture*. Thus they have an identical *instruction set,* i.e., all models accept the same instructions and execute them to produce identical results, although at different speeds. Because computer programs are made up of strings of such instructions, the conclusion can be drawn that a given program can run, without modification, on any of the "compatibles." The implication of compatibility is that growth can take place *without reprogramming*. This is not strictly so, however. Do we have to reprogram, then?

To answer this question, it must be pointed out there is a difference between *upward* and *downward compatibility*. A program written for a smaller model will regularly run on larger models (assuming they contain the same special features, etc., as the small model), but not vice versa. A program cannot be used downward without modification, if, for instance, it occupies more main memory than the small machine has, or if it utilizes both hardware and software facilities available *only* with larger models. Downward compatibility sometimes exists; a small, simple program can be compatible up and down the line.

Upward compatibility is a more important consideration, however, because computer systems typically expand rather than contract. Does this mean that as long as the computer system grows, original programs need not be modified? By and large, the hardware of a compatible computer family is truly and fully upward-compatible, i.e., the circuitry will handle the program and will produce identical results. It is the software, the operating system, and the compilers, that may be an obstacle to full compatibility.

Software

Different computer models use different software. The larger and more powerful versions of software require larger memories and more speed, to make their utilization economically feasible. Does this mean that the larger software packages *must* be used on the larger models? It does not. Can we not, then, continue using the smaller versions of software on the larger model, to avoid the need for program modification? We can indeed, but we would not want to, because using the smaller, simpler software packages precludes using the larger machine's full potential. This brings us to the heart of the compatibility dilemma: to take literal advantage of the compatibility inherent in the hardware means not taking full advantage of the machine. What is true for software is also true for all other programs. They *could* be left in thir original state, but leaving them in it would *underutilize* the computer.

Depending on circumstances, such underutilization may be very costly. While it will cost less per operation, instruction executed or character stored when using a larger computer, the machine itself costs more and if it is only partially utilized — if we, in effect, use only half of the machine — cost per operation may actually go up whereas it should have gone down. Theoretically, compatibility exists, but in practice we cannot afford to take full advantage of it.

Thus, as the computer system grows, at least some program modification and some reprogramming must be performed *for the sake of economy*. Unfortunately under conditions of rapid system expansion, a computer-using company can tie up its whole programming staff on conversion, program modification, and reprogramming work. Some companies have, in fact, gone two or three years without a single new application program being written. Utilization of the machine is certainly important, but hardly ever is this important.

Not *every* existing program need run with maximum efficiency. To determine what should be reprogrammed from scratch, what should be modified, and what should be left alone, programs can be ranked by how frequently they are being run. Large, daily jobs should be made to run with maximum efficiency; their programs have to be rewritten. Small programs and medium frequency programs may deserve some rewriting. Infrequently used programs should, if possible, be left as they are.

Compatibility still is a valuable attribute of modern computers. Because of practical considerations, *effective* compatibility is only partial, but even so it saves reprogramming dollars and facilitates the growth of the computer system. Compatibility is helpful when converting from a smaller to a larger computer model, but it should be looked on as a temporary aid.

Modularity

Modularity is an extensively publicized attribute of modern computers.

Modular computers are indeed designed so as to enable the user to arrange his configuration, and later expand it, in terms of "building blocks," as required. Thus main memory can be built up in several blocks. Channels, input-output devices, file units, etc., can be added to the system one at a time. When one computer system saturates the central processer, a larger one can be substituted. Thus the system can be upgraded and, because the equipment is compatible and modular, it can generally just be added to, rather than completely replaced.

Modularity conveys the impression of gradual, smooth, pain-free computer system growth. This is true as long as additional devices and features are being added to a given central processor. But central processors grow, within a product line, in discrete steps and as a computer system is upgraded from one model to another, larger one, the smoothness of growth is interrupted and certain problems arise. These problems, and the related considerations, are similar to the problems of compatibility. Modularity exists in principle; but in practice the user would not wish to take full advantage of all its implications.

As with compatibility, the limitation lies not in the hardware, which is truly modular, but in the software. With a larger model of the computer the user gets, and can use, the larger versions of compilers and of the operating system, which is all to his great advantage. But it creates problems of conversion. Computer system growth is not completely gradual; it occurs in steps.

If the small user graduates from a model for which programs have been written in a basic assembler language and now wishes to use, say, COBOL, his new computer *must* have at least the minimum size of memory specified by the computer manufacturer who developed the compiler. The most advanced version of FORTRAN, for instance, requires a memory size of about 100,000 character positions and can function only with the largest versions of operating systems. This is called "paying the minimum entrance fee" to reach a new plateau of data processing power.

A business executive should understand the advantages, as well as the limitations, of the concept of computer modularity. Then he will be better able to evaluate the claims of computer manufacturers regarding modularity. He will know how to ask questions about the details of modularity.

Emulation and Simulation

Emulation and simulation are terms used to describe two techniques used to implement conversion. They are offered by computer manufacturers to facilitate the transition between a computer and its successor when these are *not compatible*. As was mentioned above, competitive manufacturers also sometimes use these tools to induce a change in computer brands.

An emulator is a piece of *hardware,* whereas a simulator is a *program*. Both serve the same purpose, which is to make it possible for programs expressed in the language of the machine being replaced, to run on the new machine. This obviates the initial need for reprogramming.

An emulator is a unit of machinery which can be thought of as a second, alternative control unit of the central processor to which it is linked. The "foreign" program's instructions are channeled through the emulator which, in effect, causes the circuitry of the central processor to act in the same way the machine being replaced would act in executing such instructions. This, then, produces the same results as the machine that is being emulated would yield.

A simulator, which is a special program that resides in the successor computer's memory, treats the "foreign" instructions as data, which it operates on and translates into instructions in the "native" language of the new computer. They can then be executed. Thus the operation of the machine that has been replaced is simulated. It is somewhat as if the old, smaller machine were contained within the new, larger one, because the simulated program only deals with those hardware devices and facilities that are functionally the same as those of the replaced machine, and is regularly unaware of the rest of the power of the new machine.

Programs that are either emulated or simulated fail to utilize the full resources of the new computer. Again, as in the case of compatibility, the degree of such underutilization can be significant. For example, suppose computer A has three so-called index registers which perform certain valuable functions within the central processor. Suppose another computer B has sixteen index registers. Then if a program for computer A is emulated or simulated on computer B it will use only three of the sixteen.

Another example might be a disk storage unit of the new computer which has twice the capacity — double the number of tracks — than that of the replaced computer. Original programs, if simulated or emulated, "think" that the disk file they work with has only half the number of tracks it actually has, and therefore utilize only those. Such waste can, of course, be quite costly.

These conversion aids serve a useful purpose, as a temporary arrangement to ease conversion by avoiding the necessity for large and hasty reprogramming. These devices permit productive operation of the new computer system throughout the conversion period. The paychecks, reports, etc., go out — but at a cost. But some companies continue to operate their new computers in emulation or simulation mode virtually for years. So they pay rental for the whole new computer but are actually using only part of it, thus wasting a lot of money.

Economies of Scale

It is widely known that it is cheaper to use a bigger computer than a smaller computer, per job processed. On a big computer it costs less to execute an instruction, to add two numbers, to store a character in memory, or to keep a record in random-access file. This phenomenon is not a marketing thesis of computer manufacturers but is a natural consequence of computer design and structure, and larger scale production of computing.

A knowledgeable business executive will take economies of scale and their implications into account when deciding on what computer to select. Obviously, the size of the computer selected is a function of the scope of the information processing job, present and future. Will the job grow and will the computer system grow? The business manager should give growth the benefit of every doubt. Computer systems *will* grow.

Computer selection is a difficult and very complex task. The best basis for an intelligent decision is the fullest possible job definition coupled with projection of job growth based on corporate long-range planning. With fewer and fewer of these prerequisites, computer selection is more and more of a gamble. After the present job and the future job are defined, the business executive should ask:

1. Does the proposal meet the requirements of the job?
2. At what cost?
3. What other considerations are there?

Computer selection is a complex decision, like many other major business decisions. Both technical and business considerations are relevant, and, because of its complexity, it calls for the application of broad business judgment. That is why a business executive should not only delegate study, but also involve himself personally in computer selection.

Honeywell — "the Other Computer Company"

Ted Schoeters
Stanmore
Middlesex, England

When Honeywell five years ago decided to tackle Number One by presenting "a machine that would take over from the 1401 better and faster than anything the Giant has in the pipeline," it did so with superlative success. Far quicker than many others who came into EDP at a much earlier date, Honeywell moved into the black on its computer operations, where it seems to have been firmly anchored since April last year.

This was undoubtedly due to the success of the "200", a success which prompted rivals to coin the description "a good replacement for an obsolete machine", and hang the label old-fashioned around any machine the company has announced since. This is flagrantly wrong and has only gained some credence because Honeywell always has had the honesty not to announce with great pomp and circumstance a "new, compatible range" of machines which were the final word in technology as too many of its rivals have done, even when only one model had been built and operated and others were still laboratory gear, proposed modifications thereof or worse still — blueprints.

A Commonsensical Philosophy

The company has operated on quite a different philosophy for most of its computing history. It is the commonsensical one that "the customer is not interested in technology". More crudely put, a man using a computer could not care less whether it works on the most advanced microcircuits or on buttons and hairpins, so long as it works efficiently and without breakdowns.

Honeywell has introduced the new techniques, microelectronics, multi-layer circuits, mass memories and the like into its equipment only when it was ready and convinced that:

a. they would definitely improve performance; and
b. the improvement would mean operating economies.

A pointer to what Honeywell may have in mind for the rest of the series is the use for the first time in a general purpose machine — its new H4200 — of Large Scale Integration or LSI in circuit design. Although the company modestly says these are "early versions" and some officers say the circuits really are Medium Scale Integration (MSI), it clearly has leapfrogged all its competitors and advanced a major step further towards the goal seen years ago by circuit makers of turning out whole sections of computers on fully automated lines just like baking biscuits.

The H4200

It is well worth looking at the newest product for a moment for ideas which will undoubtedly appear in other ranges. No small machine — it rents for $30,000 a month — the 4200 works with Mod 4, a new operating system, to run up to 20 concurrent jobs. Control is handled by resident monitor or executive, together with four non-resident system components. Some of these features will be available for the existing 2200 and 1250 units.

Simultaneously memory access is available to the central processor and I/O controller. The equipment has an electronically alterable read-only memory, floating read/write channels, diagnostic maintenance instructions and a separate maintenance processor.

The read-only memory operates at only 125 nanoseconds, while the basic 131K character main memory has a cycle time of 750 nanoseconds per four characters per module. This is derived from the fact that the main memory, expandable to 524K in six 65K increments, can be split into four 131K modules, each of which can be accessed simultaneously and independently through its own set of read/write electronics by either the central processor or the input/output controller.

This is no small beast, and the company is geared up to sell in the U.S. and in Europe where its activities have expanded at great speed during the past three years. It hardly needed an introduction since the brand name has been known throughout industry for many years.

Honeywell Overseas

The computer drive into Europe began in 1962 with the opening in London of a major computer center when Honeywell placed a number of its massive first all solid-state H800 machines in Britain. It gathered major impetus with the announcement of the "200", which was closely followed by the start of the German operation. The Netherlands, Belgium, Switzerland, France and Italy followed in quick succession, with each Data Center set up being equipped with machines from the 200 group to provide training, technical support and engineering assistance, as well as functioning as service bureaus and demonstration centers.

Apart from IBM, Honeywell is probably making a bigger overseas effort than any other U.S. manufacturer, the main application of which is at Newhouse in Scotland where the plant has expanded to close to a million square feet. As new equipment is introduced by the parent company, Newhouse takes up manufacture to meet demand outside the U.S., and has even supplied several systems to Canada.

The company has many other plants in Europe set up specifically for control gear manufacture, but the staff at these plants are trained in electronics, and therefore easily converted to EDP equipment assembly and maintenance.

But to revert to the Newhouse operation. Honeywell has shown a far better understanding of Britain's economic problems than any other U.S. manufacturers operating from it as a trading base. After all the company is no post-war phenomenon, it set up house in the U.K. in 1936. Since manufacture of the 200 series started in Britain, there has been a sustained drive to use as many locally-made components as possible and, at one time, the company could with justice claim to be "more British than some of its British rivals".

This is in contrast with IBM whose policy of manufacture in Europe precludes it from obtaining locally more than 60 percent of the components for its small 1130 machine, which it also makes in Scotland. Under the circumstances, it is hardly surprising that the Ministry of Technology's Joint Parliamentary Secretary, Dr. Jeremy Bray, can claim that so far as the Ministry is concerned "Honeywell is a British company".

"The Automation Company"

So far, I have not mentioned the other vital ingredient of the Honeywell personality — its huge array of controls, though this knowledge of basic and relatively simple automation paired with EDP make the company unique in the U.S. arena.

It is "the automation company" in the U.S., though it has been calling itself "the other computer company", and its sales, surpassing the billion dollar mark for the first time in 1967 at $1,045m ($914m previously) were predominantly automation systems for homes, buildings and industry ($475m), followed by aerospace and defense ($330m), and computer systems and components ($270m). The last category is maintaining its 20 percent share of an expanding total while the first is down and the military side is six percent up.

If trends so far this year are borne out, 1968 will end with a massive advance in gross revenue to a point twenty percent higher than at the end of 1967. By then, all the effects of the switch back to straight computer leasing and the operation of Honeywell Finance Inc. should have smoothed themselves out.

Figuring at only $25m of annual sales, which is out of all proportion to its significance in Honeywell's future, the Computer Control Company taken over in 1966 has helped Honeywell to gain valuable time which it would otherwise have spent in developing its own process control machines.

A Bright Future

If this sector of the data processing market expands at 40 percent a year as A. K. Watson of IBM has predicted, Honeywell cannot fail to be the major beneficiary. No other concern has the range of instruments and process control machines to meet the variety of plant requirements automated manufacture implies. And what is as important as IBM's entry into the data processing market — its long-established tabulator operation — is the name Honeywell has made for itself in industrial instrumentation these last 80 years.

Once plant engineers start to consider the control computer as "just another facility" which needs to be designed into the system as a powerful aid to more economical operation, Honeywell will expand at an even faster clip and, since it is the only group able to offer a completely integrated operation of control and data processing machines, it will not fail to exploit this advantage.

Four years ago it took a lot of business from IBM with the 200. It has just invaded the sanctity of the "Sabre" American Airlines reservation system and sold 20 of its small process control DDP-516 machines to replace IBM 1006 Terminal Interchange Units which formed part of Sabre. Honeywell really intends to be "the other computer company".

C.a

PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

PROBLEM 689: NIMBONACCI

"Just got a bright idea for our exhibit at the WJCC," Pete said as he handed the boss a sheet of paper. "You wanted something that would attract the visitors and make them acquainted with our new visual display gadget. Right? This is it — a game the people will be invited to play against the computer."

"Not another Tic-Tac-Toe playing program, I hope," said the boss, somewhat skeptically.

"Not at all! I call this game Nimbonacci. It's like Nim, with the player and the machine taking alternately from a pile of counters, the one getting the last counter winning. But the number that can be taken at any point is one of the terms of the Fibonacci series: 1, 2, 3, 5, 8, etc."

"Is that the series with each term equal to the sum of the two preceding terms?" The boss was beginning to get interested.

"Yes! We'll have a list of these numbers, say up to 100, displayed on the scope. But the interesting thing will be that the computer will win most of the games — in fact, it should win about 80% of the time."

"How do you expect to arrange that?"

"Well, the starting number will be selected by what seems like a random process, but actually there will be a 40% chance of getting a number ending in 0, and also a 40% chance of getting a number ending in 4, with each of the other final digits having a probability of only .025."

The boss studied the sheet for a few moments. "I think you're in for a disappointment," was his verdict.

Why?

Solution to Problem 688: Different Differences

For even N there will be exactly $3^{\frac{N}{2}}$ distinct differences when all N bit numbers are subtracted from their reversals. For ten-bit numbers, therefore, there will be 243 differences. One of these will be 0; the remaining 242 will be half positive, half negative, so that the total number of differences will be 122. This is the number of storage locations that would have to be provided.

Readers are invited to submit problems (and their solutions) for publication in this column to: Problem Editor, Computers and Automation, 815 Washington St., Newtonville, Mass. 02160.

WORLDWIDE

REPORT FROM AUSTRALIA

Two events important for the development in computers in Australia took place around June 30th, which is the end of the financial year here. The first was the largest order for the installation of computers from a commercial company (instead of a government department), and the second was the formation of the first locally-owned company to manufacture computers here.

Largest Company Places Largest Order

The largest order came from Broken Hill Proprietary, usually known as BHP, the largest company in Australia. Originally an iron and steel manufacturer, BHP in partnership with Esso is at present attracting a lot of headline and share market interest because of oil exploration in the Bass Strait, which separates Tasmania from the mainland in the southeast. Almost every well drilled turns out to be a winner and BHP shares, which a year ago were selling for $A9.50 each and are now hovering around $A25, are at the heart of the current Australian stock market boom — so much so that quite a small variation in the price can make a one point change in share price indices.

The computers ordered, however, are mainly for the management of the iron and steel complexes at Newcastle and Port Kembla, 150 miles apart on the New South Wales coast, and at Whyalla, a thousand miles away in South Australia. They are to be CDC 3300s.

In July CDC will complete the installation of its 13th computer for the Bureau of Census and Statistics. This is a CDC 3200 and is the last to be located in a state capital — Hobart, Tasmania, which is the smallest of the six states. The installation of this network of computers for Census and Statistics began in June, 1964, with the location of a CDC 3600 in the federal capital, Canberra.

First Locally-Owned Computer Manufacturer

The formation of the company to manufacture computers here also relates back indirectly to CDC, who a few years ago in the U.S. took over Data Display, Inc., a manufacturer of computer read-out display units. Malcolm Macaulaey was president of Data Display and afterwards set up his own computer engineering consulting business in St. Paul, Minnesota. Last year he was visiting Fellow at the University of New South Wales, undertaking post-graduate research in computer terminal development.

He is managing director of the new company, Information Electronics Ltd., which has been formed to manufacture a machine known as the Intergraphic, and numbered IE 10000. (Incidentally, this is one of the first extensions of brand numbers from the thousands to the ten thousands.)

In launching the new company, Macaulaey said: "Based on a comparison of American and Australian computer trends, I believe that at least $A250 million will be spent on purchasing computers in Australia in the next ten years." ($US 100 = approximately $A 90). He also said that talented Australian designers and development engineers would now be able to seek opportunities with the local industry rather than being forced to go overseas — mainly to the U.S. and Britain — for advanced practical experience.

The Intergraphic computer is the result of a three-year research and development project at the University of New South Wales. Information Electronics has purchased sole world rights from Unisearch, Ltd., the research and development company of the university. In describing the new computer, Mr. Macaulaey said: "Briefly, the main applications of the IE 10000 computer are for monitoring another computer's performance, inspecting and reporting instantaneously on electronic files, providing an information summary for management analysis of another computer's operation, and for interrogating bigger computers to check programming mistakes."

Software Factory for ICL

Another plan aimed at eliminating some of the brain drain of computer people from Australia was aimed at programmers rather than designers and development engineers. This was for the setting up of a small software factory for ICL — an area less capital intensive than the manufacture of hardware, since only the right people, computer time, office space and reams of paper are required for the production of software.

Peter Hunt of ICL, Britain, made a whirlwind tour of the training facilities at Australian universities and institutes of technology and decided that this was a feasible project. First intake of programmers is likely to be 20, but, if successful, expansion could be at the rate of 50% per annum, since there is a definite shortage of this kind of programming talent in Britain.

Mergers overseas often cause minor complications in Australia, where the companies to be married often have divergent interests. The ICT/English Electric/Plessey/British Government creation of ICL meant in Australia co-ordination between ICT, Australian Computers and Plessey Pacific. However, Australian Computers had a participation of English Electric 60% and Amalgamated Wireless of Australia 40%, and in many fields the latter company is in competition with Plessey Pacific. All is now settled and the final details — a duplicate of what was announced in March — were recently confirmed at a film shown on computers (British naturally) at the British High Commissioner's office (equivalent to the consulate) in Sydney.

U.S. Post Office Contract

Telephone and Electrical Industries (TEI), a member of the Plessey Pacific group of companies, has recently been awarded a study contract by the U.S. Post Office Department and has two men in Washington working alongside a U.S. Post Office research and engineering group. In announcing this, Robert Hall of Plessey Pacific said: "This rare contract is a tribute to Australian technology as much as to our particular industry." TEI is at present providing automation equipment for the Australian Post Office.

Time Sharing

Time sharing is at last beginning to be practised rather than being just a subject for theoretical discussion. GE inaugurated a time-sharing bureau in Sydney in March, making Australia the fifth country to have such a GE service bureau. Qantas, the Australian international airline, like most airlines has completed the first phase of its communications message handling and seat reservation systems on IBM 360/30 computers, and the Bank of New South Wales is at present training operators on Olivetti terminals for use with one of its GE computers. There will be much more to report on time sharing in a year's time than there is at present.

Frederick A. Bland

Frederick Bland
Potts Point
New South Wales
Australia

C.a

PROOF GOOFS

Neil Macdonald
Assistant Editor

With this issue we start a new department in *Computers and Automation.* Here we shall print actual proofreading errors in context as found in actual books; we will print them concealed, as puzzles or problems. The correction that we think should have been made will be published in our next issue.

If you wish, send us a postcard stating what you think the correction should be.

We invite our readers to send in actual proofreading errors they find in books (not newspapers or magazines). Please send us: (1) the context for at least twenty lines before the error, then the error itself, then the context for at least twenty lines after the error; (2) the full citation of the book including edition and page of the error (for verification); and (3) on a separate sheet the correction that you propose.

We also invite discussion from our readers of how catching of proofreading errors could be practically programmed on a computer.

For more comment on this subject, see the editorial in this issue.

Proof Goof 6891

At the exact moment, the *Docker* was driving westward along the coast, looking for a place to land. Since sunrise, by Worsley's estimate, they had gone 14 miles, past point after point, without seeing a single site fit to beach the boat on. During all that distance, there had not been a glimpse of the other two boats, and it was now almost nine-thirty. The *Docker's* crew were sure that they alone had survived the night. "Poor blighters," Greenstreet whispered to Macklin: "They're gone."

Then they rounded a tiny spit of land, and there, dead ahead, were the masts of the *Caird* and *Wills,* bobbing in the backwash from the breakers. By some incredible coincidence, the *Docker's* inability to find a suitable place to land had reuntied her with the rest of the party. Had there been a haven somewhere in those 14 miles behind her, the two groups might now have been miles apart, each assuming the other had been lost.

The men aboard the *Docker* gave three hoarse cheers to their shipmates, but the noise of the breakers drowned them out. A few minutes later, their sail was sighted from the *Caird,* and just then Shackleton himself looked up and saw the *Docker* bearing down upon them. By then the *Wills* was close inshore.

— From page 161, *Endurance,* by
Alfred Lansing, Avon Book Division
The Hearst Corp., New York, 1959.

Proof Goof 6892

Most hermits live hard lives in their hermitages and taste the fleshpots of the world only when they come out of them. Kumar reversed this. He lived rather comfortably in his hermitage, where nobody saw him, and he lived with gaunt austerity in places where he was more under observation. By this means he managed to be publicly edifying and personally sound in wind and limb. If his tall, half-naked figure showed rather fewer bones that it ought, it did not matter. His fascination lay in his eyes, which were large, black, and always burning.

It was these eyes which won him his principal admirer. This was Govinda, by far the richest cloth merchant of Ayoda, who had in the way of wealth and terrestial comforts more to renounce than any other member of his caste. He had grown in girth and weight step by step with his business; by the time he met Kumar his warehouse and his cummerbund were the most impressive sights in Ayoda after the royal palace and the main temple.

Hearing Kumar preach one day on the temple steps (for the Brahmins would not allow him to preach inside) the cloth merchant was converted the moment that Kumar ran his burning eyes first over Govinda's belly and then over his face. He asked Kumar to take a meal with him and when Kumar had eaten it he told the ascetic that he had made up his mind to give all his worldly wealth to the poor and to join Kumar in his hermitage.

— From page 107, *The Ramayana*
as told by Aubrey Menen,
Charles Scribner's Sons, New York,
1954

ACROSS THE EDITOR'S DESK

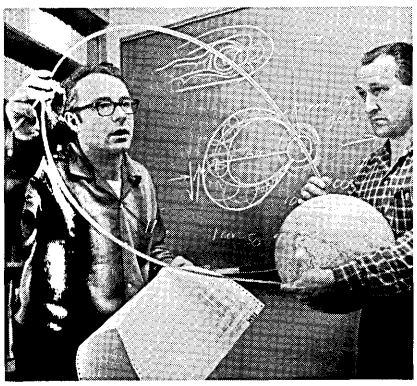
Computing and Data Processing Newsletter

Table of Contents

APPLICATIONS

ALASKAN SCIENTISTS APPLY COMPUTER IN STUDY OF NORTHERN LIGHTS

Scientists near the Arctic Circle are using a computer to shed some new light on the nature of the aurora borealis. Information being processed by the computer is expected to disclose new facts on the high altitude nature of the atmosphere, the heights to which auroras occur, and to provide a better understanding of auroral rays.



Dr. T. Neil Davis, left, and Albert E. Belon, researchers at the University of Alaska, College, Alaska, are shown discussing computer results of recent experiments proving that auroras seen near the earth's north and south poles are almost identical. The computer, an IBM System/360 Model 40, at the University's Geophysical Institute is being used to analyze data collected in the experiments by two instrument-laden jet aircraft.

Information from these experiments also enables scientists to use the computer to produce mathematical models of auroras. These studies, simulating auroras between the northern and southern hemispheres, are helping to further define auroral similarities and to more precisely map distortions in the earth's magnetic field.

The warped, plastic rod touching the globe near the polar regions, held by Mr. Belon in the picture, illustrates how lines of force in the earth's magnetic field extend into space. Energized particles, which cause auroras, were measured as they bounced along these lines of force by the two airborne laboratories.

While the primary intent of these studies is basic research, Dr. Davis does not rule out their immediate use and application. "It is well known that the energized particles which cause auroras can be lethal in space, as well as damaging to spacecraft and satellites," Dr. Davis said. "They are a potential danger to passengers in new aircraft such as the supersonic transport, which will cruise outside the shielding atmospheres." The new knowledge gained from this and other investigations into different atmospheric phenomena are important to the national space programs and to advances in supersonic transportation.

YIELD AT MINE ANALYZED ON-LINE BY COMPUTER SYSTEM

A computer system for simultaneous handling of data from two independent x-ray spectrometers is providing continuous and nearly instantaneous reports on conditions along three separate processing streams at Texas Gulf Sulphur Company's Kidd Creek Mine, Timmins, Ontario.

A digital computer from Honeywell's Computer Control Division receives and interprets real-time information gathered by on-line x-ray analyzers. The Honeywell system consists of the digital computer, operator's console, input/output unit, and four teletype units — one corresponding to each of three flotation processes operating at the plant plus a spare.

The computer system advises control room operators of the relative amount of each of five elements at five points in each of the three process streams. The system can provide a quantitative analysis of the five elements at a given point in the process within 60 seconds — 120 times faster than a chemical laboratory assay. In addition to providing current assay information, the system monitors and alarms failures in the x-ray equipment and reports excessive heat in 48 grinding mill bearing points.

The system prevents the loss of valuable minerals which must be accepted with slower detection of process yield trends. With current assay information available, the mill operator can make timely process (flotation reagent) adjustments to correct any deviation from desired results. The computer also totals tonnage figures from eight weightometers and prints eight-hour shift reports and a daily three-shift or 24-hour report.

The Ecstall operation, a subsidiary of Texas Gulf Sulphur Corp., is recovering copper, lead, iron, silver and zinc at its Timmins location, 500 miles north of Toronto. The major ore body was discovered at the site in 1964.

VANCOUVER SUBURB USES COMPUTER TO PREPARE FOR FLOOD EVACUATION

The District of Surrey, a 132-square-mile suburb of Vancouver, British Columbia, is using its computer system to prepare for the next time the Fraser River overflows its banks. The Fraser River loops along the district's northern border and normally empties into the Pacific Ocean. During the yearly spring flood, however, the snow-swollen river also empties over much of the District of Surrey.

The district's Honeywell Model 120 computer system has completed a classification of the community's 83,500 residents, most of whom live along the river. The computer knows, for example, which residents have their own flood transportation so that rescue efforts won't be wasted trying to reach families already evacuated. It also lists persons who have volunteered to house flood victims and classifies them according to such things as job, income and religion. Thay way district officials hope persons driven from their homes will find temporary quarters in the homes of persons with similar religious beliefs, jobs and incomes.

While the last major flood occurred in 1948 when more than 1200 families were evacuated, the floods are severe enough every year to force evacuation of some families. The information now stored in the computer will speed rescue operations during the floods and will soften the hardship experienced by persons driven from their homes.

NEW YORK STATE SYSTEM DUPLICATES DRIVERS' LICENSES VIA REMOTE TERMINALS

Motor Vehicles Commissioner Vincent L. Tofany has announced a new system in the New York Metropolitan area which enables an individual who mislays his driver's license to obtain a duplicate — in moments — from a computer 150 miles away. (Under the previous manual system of preparing duplicates, a driver would have to wait days or even weeks.) In addition to duplicating driver's licenses and instantly preparing license documents by remote terminal, this new system also amends licenses and issues licenses to new residents who hold valid licenses from their former states.

Special communications terminals have been installed in the Department's New York City area offices. These are linked by telephone lines to an IBM System/360 Model 65 and its files, which is located at the Department's headquarters in Albany. A total of 58 terminals soon will be operating in the five boroughs of New York City, including 16 in Manhattan and 15 each in Queens and Brooklyn. By December 1969 the Department plans to have about 270 terminals operating in 93 offices throughout the State.

Under the new system, an individual seeking a duplicate license goes to a motor vehicle office. The clerk makes a note of the applicant's name, birth date and sex and transmits this information through the keyboard of the IBM terminal to the central computer. At the same time, she places a blank license form in a special holder on the terminal. The com-

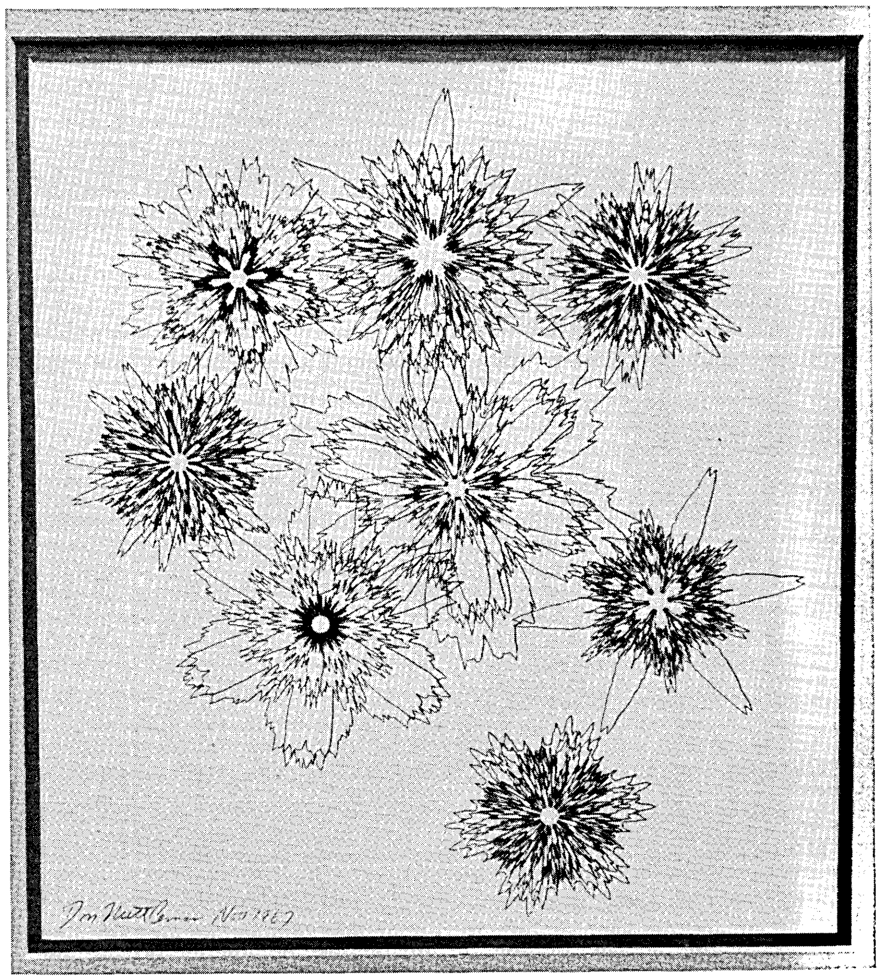
puter, upon receipt of the data, locates the applicant's record in its files and checks to make sure the license has not been suspended or revoked. Then, under control of the computer, the license is automatically printed on the form previously placed in the terminal. In the picture, Commissioner Tofany is shown watching the operation.

If a suspension or revocation has been noted in the applicant's record, the computer tells the operator through the terminal why the license is not issued.

OIL PAINTINGS PRODUCED WITH AID OF COMPUTER

Oil paintings done with the aid of a computer were exhibited recently in Chicago, Ill. The computer-directed oils, among the very earliest examples of their type, were shown at the formal opening of a new Chicago office for the Univac Division of Sperry Rand Corporation. The artwork included red and blue paintings of the Marina City Office Building where the office is located. Each of these paintings, composed of many thousands of lines, required about nine minutes of computer time and forty minutes of plotter time, to complete.

The program, written in the FORTRAN IV computer language is processed by the computer, which then records on magnetic tape the numerous instructions for the device which actually draws, or paints, the art. In the Notre Dame system, a Cal-Comp plotter is used. The tape can direct the plotter in any of three motions: X axis (sideways), Y axis (up), and Z (both up and down). To produce computer oil paintings, oil colors are mixed as they would be for the usual brush-stroke hand-painted pictures. The oils are then used in the Cal-Comp plotter.



The paintings were produced completely automatically from programs recorded on magnetic tapes by a UNIVAC 1107 computer at the University of Notre Dame. The tapes then directed a plotting device for the actual artwork. A group under Dr. Don Mittleman, Director of the Computer Center at Notre Dame, developed the software for the oil painting project.

Dr. Mittleman, a pioneer in computer art, has exhibited in the Indianapolis 500 Festival, the art gallery of Southwestern Michigan College, Dowagiec, Mich., and several other showings. One of the outstanding features of his work is the variety of materials used, including inks, water and vegetable colors as well as oil paints.

BLOOD TEST RESULTS ARE FASTER, MORE ACCURATE, USING COMPUTER LINKED TO TESTING INSTRUMENTS

A computer linked to automated testing instruments is providing doctors at the University of Kentucky's Albert B. Chandler Medical Center, Lexington, Ky., with blood test results faster and more accurately than was possible before. Dr. William B. Stewart, professor and chairman of the Department of Pathology, said the new system is one of the first of its kind and has enabled technologists to increase the number of tests performed each month from 30,000 to 45,000.

The computer, an IBM 1800 data acquisition and control system, is linked to autoanalyzers and other laboratory instruments which automatically test the blood sample. These instruments transmit electronic impulses to the computer where they are translated into numerical values. The final test result then is printed out over a high-speed printer in a matter of seconds. Previously a technologist with a graph chart manually correlated the instrument output to determine the test results.

"At the present time," Dr. Stewart said, "the system is performing 12 different types of blood tests, those most frequently requested by doctors. Eventually, it will be used to perform as many as 20 different tests." Future plans, he said, call for using the 1800 computer to monitor the condition of patients requiring extensive care.

ORGANIZATION NEWS

DATA GENERAL DEVELOPING NEW SMALL COMPUTER PRODUCT LINE

Data General Corp., Hudson, Mass., recently announced that it is developing a new small computer product line for introduction later this year.

Data General was formed three months ago by a group of former Digital Equipment Corporation employees and an employee of Fairchild Semiconductor. President of the new Corporation is Frederick R. Adler, partner of the New York law firm of Reavis and McGrath. Private investment in the new company has come from a small group of individuals in the financial and electronics communities.

The founders include Edson D. de Castro, formerly head of small computer design at Digital, Henry Burkhardt III, formerly head of small computers applications programming at Digital, Richard G. Sogge, formerly head of memory and circuit development at Digital, and Herbert J. Richman formerly Eastern Sales Manager for Fairchild Semiconductor.

De Castro and Sogge were responsible for the design of Digital's PDP-5, PDP-8 and PDP-8/I product lines. Burkhardt was responsible for applications programming for those product lines.

COGNITRONICS ACQUIRES BALANCE OF COMPUTER DATA CORP. STOCK

Cognitronics Corporation, Mount Kisco, N.Y., has exercised its option to acquire the remaining 50% of the stock of Computer Data Corp., Gardena, Calif. The original agreement was entered into in August, 1967.

David H. Shepard, president of Cognitronics, said Computer Data, presently engaged in data processing services, will be operated as a wholly-owned subsidiary. He said Cognitronics intends to establish a Remote Optical Character Recognition processing center there.

KDI CORPORATION ACQUIRES 3 COMPANIES

KDI Corporation, Cincinnati, Ohio, recently announced the acquisition of three (3) companies. Two of these companies specialize in the application of computer technology to educational and industrial training. The third company produces computer software systems for the automated design of electronic hardware. KDI president Walter G. Cox said the acquisitions were made for an undisclosed combination of cash and KDI common stock.

Automation Systems, of Encino, Calif., produces computer programs which automatically design electronic circuitry for manufacturers of electronic hardware. The company also produces software systems for automated map plotting and typesetting. Automation Systems will join DKI's Technical Products and Services Group. Donald E. Robinson and John W. Cellar will continue as its president and vice-president-treasurer, respectively.

Educational Research Associates (ERA) and Fore, Inc., both of Washington, D.C., will be combined into a single company, Forera Corporation. ERA specializes in the development of advanced hardware/software systems used by industry and schools for educational and training purposes. Fore is a consulting company in the field of education and industrial training and serves local school boards, state education departments, and a variety of industrial corporations. Forera Corporation will be operated by John Leslie, president, formerly ERA president. Stephan H. Alex, previously president of Fore, will be senior vice president.

KDI manufactures electronic and electromechanical components for industrial, aerospace and government needs, computer peripheral equipment, and provides environmental testing and aerospace product decontamination services.

MACS ANNOUNCES ACQUISITION OF COMPUTER TAPE FIRM

Management And Computer Services, Inc. (MACS), Philadelphia, Pa., has acquired the Tape Service Company of Philadelphia. The new facility has been incorporated under the title of MACS Computer Accessories, Inc.

The newly-acquired firm will offer the Delaware Valley data processing community a computer tape rental service designed to help data processing managers to conserve capital. The firm also will offer a complete range of tape maintenance services: tape rehabilitation, resurfacing, recertification and sales of computer tapes and other data processing supplies.

VARIAN ASSOCIATES AND GRANITE EQUIPMENT HAVE LEASE-MARKETING PROGRAM

Varian Associates (NYSE), Palo Alto, Calif., and Granite Equipment Leasing Corp. (AMEX), Garden City, N.Y., have announced a cooperative lease-marketing program. Under the agreement, Varian will offer lease programs to their domestic customers

— through Granite — for many of Varian's diversified product lines.

Varian's corporate director of marketing, Will B. Rodemann, said, "The purpose of this lease-marketing program is to provide Varian's customers with convenient alternative methods of acquiring instruments and equipment."

Varian's product lines include scientific instruments ranging from spectrometers to gas chromatographs, small digital computers, electrostatic recorders, ultra-high vacuum pumps, electron tubes and other electronic devices not covered by this leasing arrangement.

URS CHANGES NAME TO URS SYSTEMS CORPORATION

URS Corporation of San Mateo, Calif., has changed its official corporate name to URS Systems Corporation. URS is engaged primarily in the computer software field. The announcement of the name change was made by the president, Richard De Lancie.

In addition to its professional services in the computer software field, URS Systems Corporation performs physical and engineering sciences research; urban planning and engineering; and management and economics consulting for industry, governmental bodies and educational institutions.

MILGO ELECTRONIC CORPORATION FORMS COMMUNICATIONS FIRM

Milgo Electronic Corporation, Miami, Fla., has announced the formation of International Communications Corporation. This wholly owned subsidiary will develop, manufacture and market an extensive line of products and systems for data communication, including the data communications equipment previously produced by Milgo.

Initially, the primary ICC products will be the Modem 4400 series of data sets, for transmitting computer data over telephone lines. The data sets, based on a narrow-band concept of transmission developed by Milgo, transmit digital data at speeds as high as 4800 bits per second over voice grade telephone lines.

The recent ruling by the Federal Communications Commission removing restrictions on equipment attached to public telephone systems is expected to accelerate the use of the Modem 4400 data sets.

PRELIMINARY NEGOTIATIONS ARE COMPLETED FOR ACQUISITION OF AMERICAN BUSINESS SYSTEMS BY CONTROL DATA

Mr. William C. Norris, Chairman of the Board and President of Control Data Corporation (Minneapolis, Minn.) and Mr. Arthur W. Schmidt, Jr., Chairman of the Board of American Business Systems, Inc. (Philadelphia, Pa.), have announced that their companies have completed negotiations for the acquisition of American Business Systems, Inc. by Control Data through a tax-free transaction. The heads of the two companies noted that the terms of the acquisition are in the preliminary stage and that the proposal is subject to the completion of a definitive agreement as well as the approval of the directors of both companies and the stockholders of American Business Systems.

American Business Systems, Inc. is a manufacturer of continuous forms and punched cards for use in data processing equipment. Control Data Corporation is a manufacturer of advanced computing systems and related peripheral equipment.

EDUCATION NEWS

STATE UNIVERSITY OF NEW YORK GETS DATA SCIENCE INTERNS

Teaching internship programs in data processing have been established for the first time in a New York State two year college. An $18,500 program under the Vocational Education Act has been approved for the State University Agricultural and Technical College at Cobleskill. The College will employ these interns during 1968-69.

The new program is designed to provide teaching and technical experience for candidates completing a bachelors or masters degree in business, mathematics or a related field. The intern is paid from federal funds by the college during the semester or academic year.

Over the course of the training period, the intern gains teaching experience in a subject area compatible with his background, and advances his own proficiency in data processing by computer language improvement and by observing and assisting with data processing courses in the associate degree program.

For the period of the appointment each intern will work with an experienced instructor in data processing under the supervision of William B. Brophy, Chairman of the Business Division. Upon completion of the program the intern is free to accept employment of his choice.

SCHOOL TO TEACH BIOLOGY USING I.C.T. COMPUTER

In cooperation with a school in Sussex, I.C.T. (International Computers and Tabulators Ltd.), London, England, is starting an experimental computer project which will help the children in their biology studies. The Thomas Bennett Comprehensive School in Crawley has in the last year been preparing programmed learning texts for biology under the auspices of the Nuffield Foundation "Resources for Learning Project". Some 330 pupils, aged eleven and twelve, are learning their biology in this manner.

The computer project will be run parallel to the school's use of programmed learning textbooks. This computer-based Adaptive Testing System (ATS) will be used to aid the testing, guiding and scheduling of the pupils as individuals thus improving the overall system of programmed learning.

Between 4 and 6 interrogating visual display units (VDU) will be linked to one of I.C.T.'s own computer installations. When a student is satisfied that he has learned a particular stage of his studies, he will use a VDU to test himself. Having typed in his name and number on the keyboard, the computer will select the appropriate questions for that pupil. If the child answers correctly, he will be told to study for the next stage. If the answer is incorrect, the computer will be able to determine where the pupil went wrong. Depending on how the teacher wishes the program run, the computer either will explain to the child where he went wrong and retest him, or tell him to see the teacher.

The computer does not replace the teacher, but it enables him to distribute his time more appropriately to those pupils who need it.

Although the teacher will not write the computer programs, he will have a complete and overall control over the content of them. This experimental project is due to go live at the end of this year.

IOWA COLLEGES PLAN $1.2 MILLION REGIONAL COMPUTER NETWORK

The University of Iowa (Iowa City) and 10 area colleges have announced plans for a $1,159,808 "experimental computer network" designed to stimulate computer use in research and teaching. Colleges participating in the project are: Coe College, and Area 10 Community College, both of Cedar Rapids; Marycrest College, and St. Ambrose College, both in Davenport; Clarke College, and Loras College, both in Dubuque; Grinnell College, Grinnell; Iowa Wesleyan College, Mount Pleasant; Central College, Pella; and Augustana College, Rock Island, Ill.

Gerard Weeg, project director and director of the U of I Computer Center, said the network will involve 10 "remote terminals", each connected by telephone line to a central computer at the U of I. Using the terminals, the 10 participating schools will have the same access to the U of I computer (an IBM 360/65) as local users. The network is to be in operation October 1.

The computer terminal and the educational effort on each campus will be managed by a campus coordinator. Campus coordinators will plan short courses in computer programming, conduct seminars on computer applications and consult with faculty members on computer uses. The entire network will be coordinated by Paul Wolfe, former operations manager of the U of I Computer Center. Studies will be made at the end of the first and second years to evaluate the educational impact of the network on the schools.

To help finance the network, the National Science Foundation has approved a $581,700 grant. The remaining cost will be met by the U of I and the colleges. The federal grant supporting the program is the largest of 11 such grants which have been awarded throughout the country by NSF, and is the first such award in the Midwest.

COMPUTING CENTERS

TALLMAN, ROBBINS & COMPANY ENTERS COMPUTER SERVICE FIELD

Tallman, Robbins & Company, Springfield, Ill., a leading supplier of continuous, zip-out & optical scanning business forms has entered the computer service field. The firm has purchased a Control Data 915 Page Reader system which optically scans printed or typewritten data and sends the information directly to a computer.

Tallman, Robbins & Company will supply service on the 915 for such applications as inventory list conversion, name and address file conversion, directory computerization and data conversion for companies planning a computer installation.

GREYHOUND ESTABLISHES SAN FRANCISCO COMPUTER CENTER

Greyhound Computer Corp., San Francisco, Calif., one of the largest non-manufacturing computer leasing firms, has entered the computer services business with several partially-owned computer centers and with the first wholly-owned center in San Francisco, opened in July. Director of the new San Francisco facility is Gilbert J. Mitchell, a former executive of Control Data and C-E-I-R.

Mr. Mitchell said emphasis at the present will be on service to scientific and engineering users. Systems already installed include an IBM 7094 (large scale scientific), several models of the IBM 360 series and a Calcomp Plotter. Time sharing and remote batch processing systems will be added to the facility this fall.

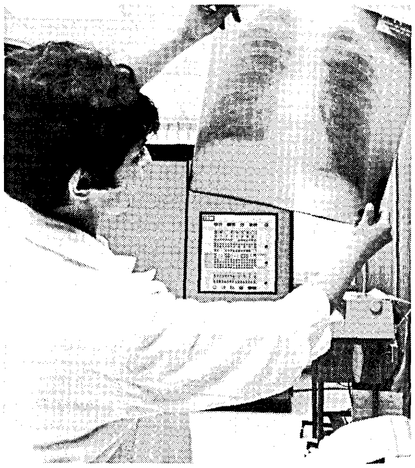
COMPUTER RELATED SERVICES

COMPLETE MEDICAL EXAMINATION AT NEW COMPUTERIZED MEDICAL DIAGNOSTIC CENTER TAKES ONLY 2½ HOURS

A computerized medical diagnostic center which opened recently in suburban Detroit (Mich.) will provide in two and one-half hours a complete medical examination that ordinarily might take two to three days. Dr. Jack Kevorkian, medical director of Check-Up Medical Diagnostic Center, Inc. (Southfield, Mich.) said that the significant reduction in time is achieved by the use of automatic analyzing equipment and an IBM data acquisition and control system.

When an examinee is sent to the center by his doctor, the tests he receives are more extensive than in most medical examinations given in doctors' offices. "In some cases," Dr. Kevorkian said, "we will conduct tests that are available only at a hospital, and a few not even available there. As a result, we can provide a doctor with more information in a shorter period of time, making it possible for him to treat a greater number of patients."

Each examinee, in addition to laboratory tests, fills out a complete medical questionnaire about his present and past health. This information is keypunched into a final report. The results, along with those of the laboratory tests, are fed into the computer and printed our for the examinee's doctor.



— Technician Karen Jones is shown examining the chest X-ray of one of the center's patients. Control panel of the IBM 1800 is seen in the background

The new privately-supported center presently has 15 testing stations, or specialty equipment rooms. A total of 14 doctors (all specialists) and technicians are on the staff. Dr. Kevorkian said four multi-test centers similar to Check-Up, Inc., but with public health service support, plus two more supported by private foundations, are in operation or planned. Check-Up, Inc., is the first comprehensive privately-supported center.

TIME-SHARING SERVICES

PHILCO-FORD'S COMPUTER SERVICES NETWORK (CSN) WILL OFFER TIME-SHARING SERVICES

Philco-Ford Corporation's Computer Services Network (CSN), providing data processing to firms along the Eastern Seaboard, is being expanded to offer complete on-line time-sharing services. Lloyd W. Cali, director of data systems for Philco-Ford's Communications and Electronics (C&E) Division, said it will be, when fully implemented next January, the Philadelphia area's largest time-sharing computer utility.

To increase CSN's data storage, C&E is adding a disc memory which can store up to 52 million characters of information. To achieve time-sharing operation, CSN is implementing computer programs developed in conjunction with Ford Motor Company's Technical Computer Center, Dearborn, Mich.

CSN uses two Philco-Ford designed and built computers. Basic computational power is supplied by a Philco-Ford Model 212 large-scale and high-speed computer. A Philco-Ford Model 102 computer operates as CSN's front-end processor. The Model 212 is left entirely free to perform computational duties for CSN, channeling finished work back to the Model 102 for retransmission to CSN subscribers.

TIME-SHARING CENTER OPENED BY NEW FIRM IN DETROIT AREA

Direct Access Computing Corporation (DACC), a Detroit based time-sharing and computer systems consulting company, has opened its first time-sharing center located in Southfield, Mich. DACC, a new company, was founded by Robert M. Franklin, formerly of Chrysler Corporation Management Systems Staff.

DACC's initial equipment complement is a Burroughs B-5500 large scale system. The firm provides time-sharing services, remote batch data processing, data center processing and programming consulting. Languages available on the time-sharing system will initially include BASIC, FORTRAN IV, ALGOL and COBOL. Computer systems consulting and custom software design will be provided to clients on a contract basis.

The DACC Michigan facility will provide service to the Metropolitan Detroit and neighboring Ohio, Indiana and Canadian markets.

NEW PRODUCTS

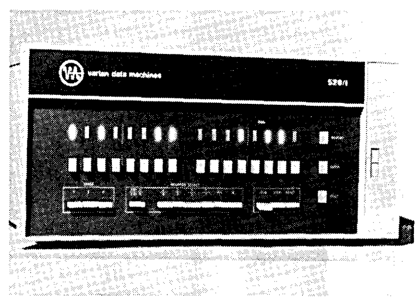
Digital

VARIAN DATA 520/i DUAL PROCESSING COMPUTER

The new Varian Data 520/i, recently announced by Varian Data Machines, Irvine, Cal., is equipped with two complete sets of "hardware" operating registers to permit dual processor operation. One set of registers can be general purpose processing in one word length, while the other set of registers are processing the I/O in another word length.

The Varian Data 520/i has eight operational hardware registers (16 bits each); variable operand precision up to 32 bits; dual-environment; complete instruction list; direct addressing to 4,096 bytes; indirect and hardware-indexed addressing; direct memory access standard; programmed input/output channel; and monolithic integrated circuits. It occupies only 8-3/4" x 19" of rack space and weighs 48 pounds.

The 520/i's memory has a cycle time of 1.5 microseconds. A 1.5 usec instruction can transfer control back and forth between parallel programs or between processing and I/O programs. Memory is expandable from 4K to 32K bytes. The 520/i uses medium-scale, monolithic integrated circuits (MSI), and has a complete control panel with register displays.

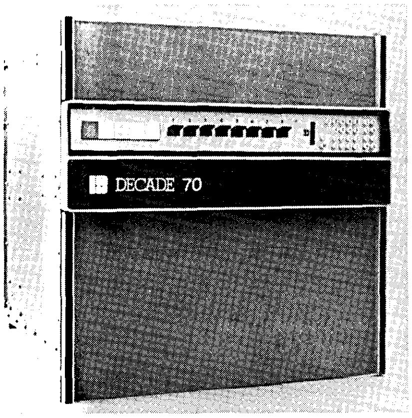


Available software includes an assembler, utility program and subroutines, and a complete set of diagnostics. The 520/i has controllers for all computer peripherals.

The 520/i is capable of handling such industrial processing jobs as controlling temperature and flows in a chemical plant, can be used to direct the flow of data in a communication center, or may serve as a peripheral device controller. (For more information, designate #41 on the Reader Service Card.)

DECADE COMPUTER CORPORATION ANNOUNCES DECADE 70/2

Decade Computer Corporation of Huntington Beach, Calif., has announced its newest computer, designated the Decade 70/2. Company president, Paul Linebarger, states that the machine is the industry's lowest cost computer for systems operations requiring a machine with 8,000 word memories and multiply and divide.



The basic machine is available with a 4,000 word memory and is internally field expandable to 16,000 words. Mr. Linebarger says that the Decade 70/2 is a 16 bit machine yet is competitive with 12 bit units. Memory cycle time is 900 nanoseconds.

Other standard features are decimal as well as binary arithmetic, direct memory access, memory protect, memory parity and automatic power shutdown and restart. Software delivered with the 70/2 includes FORTRAN IV (ASA Standard) and a one-pass assembler and utilities.
(For more information, designate #42 on the Reader Service Card.)

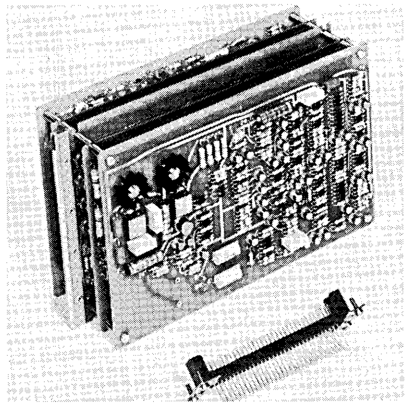
Memories

PHILIPS OFFERS INEXPENSIVE BOOKSHELF-TYPE CORE MEMORY SYSTEM

N. V. Philips' Gloeilampenfabrieken, Eindhoven, the Netherlands has announced the FI-2, the first of a new line of 4-core memory systems which cover a capacity range from 1,000 to 130,000 bits. Applications for Philips FI-2 magnetic core memory system include equipment for automation, instrumentation and process control, and small office machines.

The FI-2 has a cycle time of 4 usec, an access time of 600 nsec., read/write in split-cycle, capacities up to 1024 eight-bit words, and an operating temperature range of 0 - 55°C. Where larger capacities are required, additional FI-2 systems can be used without increasing the cost per bit.

Key to the low manufacturing cost of the FI-2 is its simple but reliable construction: five printed wiring boards, incorporating core matrix, decoding and selection circuits, current drivers, sense amplifiers, inhibit drivers and timing circuits which are arranged side by side and electrically inter-



connected by means of flexible hinging strips. This compact system measures 120 mm high, 75 mm wide, and 180 mm deep.
(For more information, designate #44 on the Reader Service Card.)

HONEYWELL ADDS HIGH-SPEED DRUMS FOR MASS STORAGE TO ITS PRODUCT LINE

Three high-speed drums for mass data storage on medium- and large-scale Series 200 computer systems have been added to the product line of Honeywell's Electronic Data Processing Division, Wellesley Hills, Mass. The drums provide on-line storage of 2.1 million to 16.8 million characters of information which can be randomly accessed.

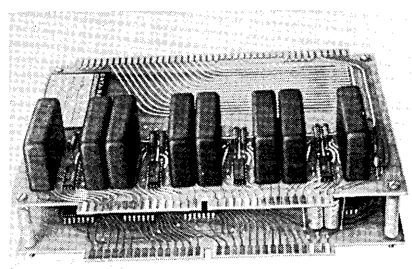
The Type 265 and Type 266 drums each store 2.1 million and 4.2 million characters of information, respectively. Data is transferred to and from the computer at 300,000 characters per second. Average access time is 8.6 milliseconds. The type 267 drum stores 4.2 million characters and transfers data at 1,200,000 characters per second (four bits in parallel at one time).

Integrated circuits are used throughout the electronic network of all three drum units. Each has the same basic design. The recording disks, read/write heads and required electronics are hermetically sealed in a shock-resistant chamber filled with inert helium gas to prevent dust, dirt and other foreign materials from damaging the mechanism. Disks and heads can be serviced on-site by Honeywell field engineers.

Up to four drums may be connected to a computer's central processor through a single control unit — the Type 260-1 control unit for the Type 265 and 266 drums, and the Type 260-2 control unit for the Type 267 drums.
(For more information, designate #43 on the Reader Service Card.)

DATA-STOR 100® CORE MEMORY FROM DATA-RAM CORPORATION

A new, special-purpose core memory system from Data-Ram Corporation, Princeton, N.J., has been designed specifically for use as a low-cost buffer memory in key punch-to-tape and high speed printer applications. The complete "pluggable" system is contained in two standard size, pluggable printed circuit cards for integral equipment mounting and wiring.



The new Data-Stor 100 operates on ±5 volt power and has decimal address logic and modular construction. The system has a specified operating temperature range of +10° C to +40° C and operates without temperature stabilization of the address currents. Thermistor output to system power supplies is provided for when operating outside these limits. Read time is 3 usec after initiation of memory cycle time. Data retain circuits retain the correct information in the cores when power is turned off.

The Data-Stor 100 measures 8" long x 6-3/8" wide x 2-1/2" thick and weighs 2 pounds. The dual printed circuit boards fold out for ease of servicing.
(For more information, designate #45 on the Reader Service Card.)

Newsletter

Software

ALICS (Assembly Language by ICS) / Information Control Systems, Inc., Ann Arbor, Mich. / Developed for all PDP-5/8/8S/8I computers, this assembler offers one tape-pass assembly, relocatable object code, and automatic paging. ALICS is a language designed to save the user assembly and programming time.
(For more information, designate #46 on the Reader Service Card.)

1401 SIMULATOR / Compuvisor Inc., Ithaca, N.Y. / This inexpensive program, a standard OS/360 job, simulates 1401 tape systems. It accepts as input 1401 object decks and a simple "automated operator" command language. Special interfaces with OS/Sort are provided which can speed up the simulated run considerably. The package may be multiprogrammed with other jobs and is especially well suited to 360's.
(For more information, designate #47 on the Reader Service Card.)

ICS EXTENDED FORTRAN / Information Control Systems, Inc., Ann Arbor, Mich. / Developed for all PDP-5/8/8S/8I computers, this non-interpretive, standard FORTRAN II compiler. It has fast compilation and execution, a large capacity, provision for subprograms, and automatically linked relocatable object code.
(For more information, designate #48 on the Reader Service Card.)

IMP / Parsons & Williams, Copenhagen V, Denmark / This software package (Integrated Manufacturing Planning) is for integrated planning of production and materials. The package consists of six modules, one each for capacity planning, machine loading/scheduling, material planning, purchasing, dispatching, and cost control. IMP is programmed for the Univac 1107/8 and for the IBM 360/40 or larger. It contains many applications of Operations Research optimizing techniques, among them an algorithm for optimum machine loading and dynamic programming routine for economic lot size calculation.
(For more information, designate #49 on the Reader Service Card.)

ISIS (Instant Sales Indicator System) / Economatics, Pasadena, Calif. / The new proprietary computer program determines the correlation between the cumulative volume of sales for a future period and the volume of sales to-date. It establishes the confidence limits within which the projected sales amount will take place, based on all past sales patterns. ISIS, written in FORTRAN IV, can be used on any third-generation computer and on a variety of sizes. The program costs $3600 including a demonstration of the operation, a user's manual, and the FORTRAN deck.
(For more information, designate #50 on the Reader Service Card.)

Power System Planning (PSP) / IBM Corporation, White Plains, N.Y. / This new package of computer programs enables electric utility engineers to plan the future growth of power networks. PSP allows engineers to simulate within System/360 the various conditions affecting power system expansion and change. Only a minimum knowledge of computer programming is needed to use PSP. Programs are written primarily in an English-like language called PL/I. The package is scheduled to be available in the fourth quarter of 1969.
(For more information, designate #51 on the Reader Service Card.)

Problem Language Analyzer (PLAN) / IBM Corporation, White Plains, N.Y. / This package of programs enables a professional to create a dictionary of the terms he uses in his work. After the dictionary is entered into the computer, he can — in his own language — direct the computer to solve his problem. While any problem solver can develop his own computer language with PLAN, there are three ready-made PLAN dictionaries and their associated programs. They are for designers of optical systems, prefabricated structures and mechanical linkages. PLAN may be used with an IBM 1130 data processing system under the Disk Monitor System, or on an IBM System/360 Model 25 or larger under Operating System/360 or Disk Operating System/360. The programs used to define entries in the PLAN dictionary can be written in assembler languages or FORTRAN.
(For more information, designate #52 on the Reader Service Card.)

Program Reporting and Information Systems for Management (PRISM) / Cybernetic Applications Inc., New York, N.Y. / PRISM, a proprietary system for industry, generates data processing programs in the COBOL language for computer data file maintenance, retrieval and reporting and allows for numerous sub-function possibilities. Cybernetic Applications spokesmen say the new system offers a reduction in programming investment of from 75% to 90%. PRISM, designed to work with a minimum of 64K core storage, can be used with most computer operating systems that provide a COBOL compiler.
(For more information, designate #53 on the Reader Service Card.)

Peripheral Equipment

OPTOMECHANISMS INC. MARKETS HARD COPY GENERATOR SYSTEM FOR COMPUTER/TV OUTPUTS

Quality hard copy of computer and video outputs can be generated in seconds with the new, automatic RAPCOR System, Series 725, now being marketed by OPTOmechanisms Inc., Plainview, L.I., N.Y. This hard copy generator system will photographically record all types of information displayed on a video monitor or CRT, including alphanumeric, graphical, and continuous tone imagery. Reproducible quality prints (8½" x 11") can be turned out at an input rate of three to four sheets per second.

Highlights of the RAPCOR System include: fully automatic operation, instant quality recording of internally displayed information, continuous or intermittent delivery of dry hard copy within seconds, multi-station control and video inputs from remote locations, low per-copy cost, long print life, and simple plug-in operation wherever needed.
(For more information, designate #54 on the Reader Service Card.)

MULTIPLE PAGE KEYBOARD (MPK) ANNOUNCED BY PHILCO

A new device developed by Philco Houston Operations of Philco-Ford Corporation (Houston, Tex.) enables the operator of a computer-oriented system to control 327,360 functions from a small keyboard through the use of removable books of 10 plastic pages. The device, called the Multiple Page Keyboard (MPK), will accept a maximum of 1,023 books. Each book provides control of 320 functions.

The MPK is designed to work in conjunction with a cathode ray tube

(CRT) in displaying information for the operator. Information stored in a computer can be called up, and displayed on the television monitor, by depressing the appropriate button. The Philco-Ford MPK has 32 buttons on the front surface (which measures 19 inches wide by 7 inches high). Electronics necessary to operate the various switches are packaged behind the panel.

The MPK plastic pages each have a tab for operator identification. Pages measure 5-3/4 inches deep and 13 inches wide when opened. When a book is closed and removed from the MPK, it is about the size of an ordinary office note pad and requires no special care.

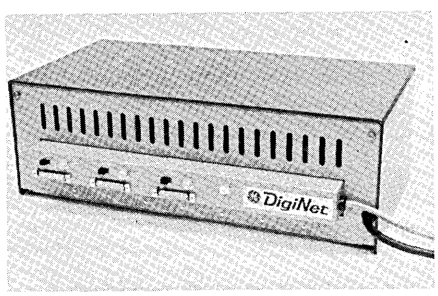
Books are inserted by latching two simple catches at the centerfold. As a book is inserted, coded buttons are depressed which enables the computer to identify the book. Other coded switches provide identification as the book is opened, or as pages are turned. When a book is open, the buttons protrude through holes in the pages. Identification of each button is achieved through the use of adhesive labels. If the function of a button is changed, the label is easily replaced and, in most cases, such a change requires only minor changes in the computer program.

The MPK is designed for installation in the operator's console of control systems for the military and for industrial systems such as those used by electrical power companies, for pipeline transmission and distribution of water, gas and oil, manufacturing and process control systems and in inventory control.
(For more information, designate #60 on the Reader Service Card.)

DIGINET 150 SERIES — DATA MULTIPLEXING SYSTEM FOR COMPUTER TIME-SHARING CENTERS

The DigiNet 150, announced by General Electric, is being built at GE's Communication Products Department, Lynchburg, Va., to enable computer time-sharing centers to make more effective use of communications circuits and to extend service into distant areas to users not previously served. The multiplex system allows the time-sharing center to take better advantage of dedicated transmission lines by multiplexing many simultaneous full duplex time-sharing data communications channels onto a single voice grade telephone circuit.

GE's DigiNet 150 Series data multiplex systems provide both private and commercial computer time-sharing centers with up to 15 channels on a single, conditioned voice grade circuit. The system equipment will allow the communications processor in a time-sharing computer system to transmit and receive data from remote switched-network data sets (such as Western Electric's 103A, 103C, or GE's DigiNet TDM-111 data sets) through a single 3KHz telephone channel at up to 150 bps. The line termination is arranged to allow units to be connected or removed without disturbing other data channels on the same line.



Solid state multiplex equipment for a typical 12-channel DigiNet 150 Series data multiplex system consists of four DigiNet Remote Buffer Units (RBU) at the terminal end and four DigiNet Computer Interface Units (CIU) at the computer end. Each of the terminal units is a compact, self-contained, modular cabinet which includes transmitters, receivers, control circuits and power supply to handle three data channels. Modular construction of the DigiNet 150 units permits a time-sharing center to start out with a basic three-channel system and expand with market growth as the needs arise.
(For more information, designate #61 on the Reader Service Card.)

"MASTER TRANSLATOR" PERMITS AUTOMATED BUSINESS MACHINES TO "TALK" TOGETHER

The newly introduced "Master Translator", produced by Advanced Space Age Products, Inc., Alexandria, Va., permits complete "language" compatibility between automated business machines — regardless of age, make or model — and the American Standard Code for Information Interchange (ASCII). All business machines can "talk" together ... direct, locally — or between any locations served by the Bell System Communications Service at speeds up to 50,000 characters per second.

The Model 180 Master Translator covers the entire spectrum — from punched tape to magnetic tape. Solid state, modular concepts are used throughout. Systems can be 'customized' to specific user requirements.

Model 180 will handle from 1 to 1,000 or more inputs each having 1 to 7 (or more) bit-words plus parity — and convert to the 1 to 7 (or more) bit-words plus parity — in the system common language. Parallel to serial, and serial to parallel, conversions are provided as required. Operational modes include: off-line, on-line, transmit, receive, duplex, and multiplex — with mixed speeds up to 50KHz on an asynchronous basis.

A complete method for checking unit operation is incorporated in the standard Model 180 — no additional test equipment is required. (For more information, designate #59 on the Reader Service Card.)

NEW CONTROLS SPEED DATA TO VISUAL DISPLAY UNITS

Control units which transfer data at very high speed between visual display units and a Honeywell Series 200 computer have been announced by the firm's Electronic Data Processing Division, Wellesley Hills, Mass. The units transfer data at 42,000 characters per second for instant full-screen display of 768 characters of data on 7-by-9 inch television-like terminals called Visual Information Projection (VIP) units. VIPs may be located up to 1,100 feet away from the computer, to provide data entry and display from several remote locations within a single, large office building.

This transfer rate is 140 times faster than the current 300 characters per second. It makes on-line data entry through a VIP device a reality because there is virtually no delay in sending the information directly to the same computer system from several VIP terminals. (Maximum delay: one-fourth of a second for any one of 30 VIP units connected on-line to the same computer system.)

The new high-speed system involves three units: (1) a Type 335 high-speed interface that connects to a Type 323 universal control unit, (2) a Type 386 high-speed control unit for the Series 200 central processor to allow connection of the Type 335 interface, and (3) a Type 386-1 channel adapter to permit the addition of seven more Type 323/335 universal control and high speed interface devices.

VIP terminals connect to the Type 323 universal control unit. Up to nine 768-character display areas or 48 VIPs with 128 characters can be connected to each universal control unit. An installation, then, could have up to 288 VIP terminals, each with 128 characters displayed, or 72 VIP terminals of 768 characters each. (First delivery will be in April, 1969.)
(For more information, designate #56 on the Reader Service Card.)

IBM MACHINE READS FULL PAGES DIRECTLY INTO COMPUTER

Full pages of business information can be read directly into a computer by a new machine, the IBM 1288 optical page reader, recently announced by IBM Corporation, White Plains, N.Y. The IBM 1288 can read letters, words and numbers — including hand-printed numbers — from a wide variety of documents.

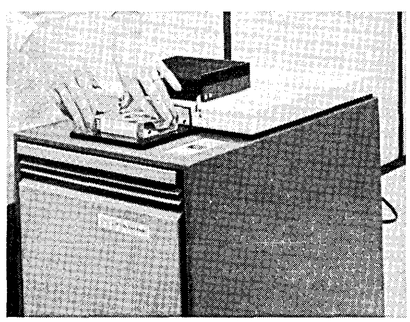
Designed for use with the IBM System/360, the 1288 transmits information into the computer at a rate of about 840 single-spaced standard typewritten pages an hour. Smaller documents, such as utility bills, can be read automatically into the computer at about 19,600 an hour. Documents may range in size from 3 x 6.5 to 9 x 14 inches. Reading speed depends on the document size and format.

Recognition logic, built into the machine, translates the numbers and words into computer language and sends them, through cable connections, to the computer. The 1288 can read data into a System/360 without interrupting other jobs that are in progress. Letters and numbers read by the machine are from the USA Standard Character Set for Optical Character Recognition. This type face can be produced by electric typewriters such as the IBM "Selectric." The new machine also recognizes hand-printed numbers, a numeric Gothic font, and pencil marks in pre-defined document areas.

The 1288 is designed for use with System/360 Models 25, 30, 40 or 50. It operates under Disk Operating System/360 and Tape Operating System/360. Initial customer deliveries are scheduled for the first quarter of 1970.
(For more information, designate #58 on the Reader Service Card.)

FAST NEW TAPE READER FEEDS IBM MT/ST TAPE CARTRIDGE INTO IBM 360 COMPUTER IN 15 SECONDS

The Data TR 6708 Tape Reader, manufactured by Data Corporation's Industrial Products Division, Dayton, Ohio, feeds IBM MT/ST Typewriter produced cartridges into an IBM 360 computer at the rate of one every 15 seconds. The combination



of the IBM MT/ST and Data Tape Reader eliminates key punch, verifying and scanning. No operator training is necessary for the preparation of the input material.
(For more information, designate #55 on the Reader Service Card.)

LOW SPEED TAPE READER PRODUCED BY DECITEK

A Photo-transistor Tape Reader is available from Decitek Inc., Worcester, Mass. This low cost tape reader has double sprocket, in line, tape drive. The device will read all standard 5, 6, 7 or 8 channel punched tapes at speeds up to 60 characters per second. The reader is bi-directional and will read synchronously or asynchronously in either direction or can be supplied uni-directional with rewind.

Options include spoolers, fan fold tape boxes, transistorized motor drive card and transistorized output card or relay output card and power supply.
(For more information, designate #57 on the Reader Service Card.)

Data Processing Accessories

COLUMBIA'S SF-100 RIBBON PROVIDES IMPROVED IMAGING

Effectiveness of optical scanning systems is linked directly to the imaging techniques and materials used in preparing the copy for their inputs. One of the first suppliers to respond to the demand for improved imaging was Columbia Ribbon & Carbon Manufacturing Company, Inc., Glen Cove, N.Y., with its introduction of a Plastisol solvent ink/reusable polyester-base ribbon. Columbia's SF-100 Ribbon is designed for the most rapid tabulating, data processing and addressing equipment.

The new ribbon consists of a tough, thin, polyester film coated on one side with the Plastisol formulae. When struck, the ribbon "prints" by releasing the ink — rather than by simply mass-transferring an image onto the surface of the card or paper stock. Thinness of the ribbon, combined with the resiliency of the polyester film and the "squeeze-out" action of the Plastisol formulae provides a smooth, uniform, clear image.
(For more information, designate #62 on the Reader Service Card.)

INDEL INC. INTRODUCES NEW COMPUTER TAPE REWINDER

Indel Inc. of Tulsa, Okla., has introduced its Model HSR high-speed precision Computer Tape Rewinder. Model HSR is said to meet both Industry and Federal tensioning specifications. Precision tensioning of the computer tape is held precisely between 7-8 ounces of torque. This is accomplished through the use of two series electric motors, driven by keyed belts, that have exactly 7-8 ounces of difference in their torque.

The Indel HSR will rewind a 2,400-foot reel of $\frac{1}{2}$ inch tape in only 90 seconds. It requires no attention once the reel is placed on the specially designed Indel "Quick-Change" Hub and the tape is threaded onto the take-up reel. The machine automatically shuts itself off when the rewind cycle is complete. In event of a power failure or a break in the tape, the rewinder will automatically apply double brakes, through activation of a "no tape" sensor to keep the tape from being damaged or reeling off onto the floor.

The three controls — a "power," a "slow," and a "run" button — are sequential and interlocked; the operator cannot cause tape damage by pushing the wrong button.
(For more information, designate #63 on the Reader Service Card.)

NEW LITERATURE

COBOL REFERENCE MANUAL AVAILABLE FROM ATLANTIC SOFTWARE

COBOL-REF, a comprehensive Cobol reference manual, is now available from Atlantic Software Inc., Philadelphia, Pa. This Cobol guide, researched and produced by E. R. Squibb & Sons, Inc., is useful to commercial Cobol users and especially to software and programming firms. The multitude of Cobol references which one must search to effectively understand and use each Cobol division, section, paragraph, clause and verb have been combined in COBOL-REF.

As a Cobol conversion guide, the manual specifically defines all areas of difference between 1410/7010 Cobol and 360-OS Cobol compilers. Any organization, commercial user, or system and programming firm concerned with the details of System 360 Cobol also could find it useful as a training tool.

COBOL-REF is fully warranteed and supported by Atlantic Software Inc.
(For more information, designate #64 on the Reader Service Card.)

FINANCIAL AND BUSINESS NEWS

Boxscore of Sales & Income for Computer Field Firms

C&A presents below comparative operating results for firms of interest to computer people, as distilled from the latest group of news releases.

COMPANY	PERIOD	SALES Current Period / Previous Period	(%)	NET INCOME Current Period / Previous Period	(%)	NOTES
Ampex Corporation, Redwood City, Cal.	Year ended April 27, 1968	$233,433,000 / $215,529,000	(+8%)	$7,665,000 / $10,326,000	(-26%)	A strike lasting throughout April significantly affected sales and earnings
Brandon Applied Systems, Inc., New York, N.Y.	Year ended February 29, 1968	$935,061 / $597,000	(+56%)	$41,482 / $21,780	(+90%)	
Computer Sciences Corp., Los Angeles, Cal.	Year ended March 29, 1968	$3,304,000 / $1,704,000	(+94%)	$53,549,000 / $38,860,000	(+38%)	
Data Products Corp., Culver City, Cal.	Year ended March 30, 1968	$23,070,105 / $14,512,529	(+60%)	$968,885 / $25,470	(Loss)	Figures reflect acquisition of Uptime Corp. in June 1967
Digital Equipment Corp., Maynard, Mass.	Year ended June 29, 1968	$57,339,400 / $38,895,782	(+47%)	$6,856,690 / $4,541,205	(+47%)	
General Instrument Corp., Newark, N.J.	Year ended February 29, 1968	$233,679,108 / $154,141,580	(+52%)	$12,860,509 / $6,680,343	(+93%)	
Granite Equipment Leasing Corp., New York, N.Y.	Year ended February 29, 1968	$7,200,000 / $2,900,000	(+148%)	$913,000 / $390,000	(+134%)	Figures reflect operating results of companies acquired during fiscal 1968
Informatics, Inc., Sherman Oaks, Cal.	Year ended March 30, 1968	$7,868,204 / $6,427,558	(+22%)	$396,788 / $279,020	(+42%)	Net income (1968) includes a non-recurring tax credit of $23,000
Programming and Systems Inc., New York, N.Y.	Year ended February 29, 1968	$1,599,269 / $1,283,612	(+24.6%)	$252,974 / $151,124	(+67%)	
Rixon Electronics, Inc., Silver Spring, Md.	Year ended April 28, 1968	$5,700,000 / $3,700,000	(+54%)	$318,000 / $211,000	(+51%)	
SCAM Instrument Corp., Skokie, Ill.	Year ended June 30, 1968	$10,684,615 / $10,578,997	(+1%)	$1,018,609 / $1,110,118	(-8%)	
Sperry Rand Corp., New York, N.Y.	Year ended March 31, 1968	$1,562,829,216 / $1,487,120,143	(+5%)	$64,022,894 / $53,902,168	(+19%)	Univac Division was largest contributor to increase in company's earnings

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Sperry Rand Corp., Univac Division	Computer Sciences Corp., Los Angeles, Calif.	Twenty Univac 1108 computers for CSC's nationwide system of regional time-sharing computer centers	$50 million
Burroughs Corp., Detroit, Mich.	National Accommodations Reservations Service (NARS), Orlando, Fla.	Two B6500, six B500 computer systems and 600 TC500 terminal computers — to implement a nationwide network of reservation, credit validation, reporting and accounting programs to serve the public and the hotel and motel industries	$15 million
Conrac Corp., New York, N.Y.	Burroughs Corp., Detroit, Mich.	An undisclosed number of "private label" information display devices; Burroughs will market the terminals, supplied with its own colors and house marks, to complement its existing line of display equipment	$7 million
Babcock Electronics Corp., subsidiary of Esterline Corp.	U.S. Army	A personnel target scoring system; this new central computer-controlled target system will allow infantrymen complete freedom of movement within the range, and will provide firing scores for each individual soldier	$3.5 million
Bunker-Ramo Corp., Canoga Park, Calif.	U.S. Army Map Service, Corps of Engineers	Up to three computerized map-making systems, known as UNAMACE (Universal Automatic Map Compilation Equipment). UNAMACE automatically prepares terrain contour charts and orthographically correct photos from stereo aerial photos	$3,099,999
Memorex Corp., Santa Clara, Calif.	Scientific Data Systems, Inc., Santa Monica, Calif.	Model 660 Disc Drives	$2.5 million
Stromberg Datagraphics, Inc., a subsidiary of General Dynamics, San Diego, Calif.	Pan American World Airways, New York, N.Y.	Fifty-seven desk top displays, called SD 1110s, and associated control units which are being integrated into the PANAMAC system at the airline's headquarters reservations office in the Pan Am Building	$1.3 million
Princeton University, Princeton, N.J.	National Science Foundation (NSF)	Advancing campus computing facilities; plans include acquisition of an IBM System/360 Model 91 computer, related equipment and construction of new building to house computing equipment and personnel	$1.2 million
Honeywell Computer Control Division, Framingham, Mass.	American Airlines	Twenty DDP-516 computer for use in its passenger reservation system	over $1 million
Data Products Corp., Culver City, Calif.	Electro-Mechanical Research Inc., Computer Division, Minneapolis, Minn.	Model 4500 and 4300 Line/Printers to be used in conjunction with EMR's 6100 Series computers	over $503,000
Datatron, Inc., Santa Ana, Calif.	NASA's Goddard Space Flight Center	One hundred precision timing instruments for use to facilitate data reduction in NASA's world-wide tracking stations for Apollo and STADAN (Satellite Tracking And Data Acquisition Network)	$450,800
Ampex Corp., Redwood City, Calif.	Data Products Corp., Culver City, Calif.	Follow-on contract for continued delivery of Model TM-7 digital magnetic tape transports for use by Data Products in digital print-out systems	$300,000
Univac Federal Systems Div., Sperry Rand Corp., Salt Lake City, Utah	United States Post Office, Bureau of Research and Engineering	A mail-handling modernization study	$243,000
Lockheed Missiles and Space Co.	National Aeronautics and Space Administration, Washington, D.C.	Computer software required to operate a remote-console information retrieval system	$178,844
COMNET (Computer Network Corp.), Washington, D.C.	Forman Brothers, Washington, D.C.	Computerization of entire inventory and invoicing operation; firm is one of Washington's largest wholesale wine and spirits dealers	$176,000
Bell Aerosystems Co., A Textron Company, Tucson, Ariz.	Dept. of Health, Education and Welfare, Tucson, Ariz.	Automation of all medical, environmental and sociological files for each of 8500 members of the Papago community on a central computer located at Bell Aerosystems Computer Center in Tucson	$160,000
McDonnell Automation Co., a division of McDonnell Douglas Corp., St. Louis, Mo.	U.S. Army	Development of a master plan for use in designing numerical control manufacturing facilities for spare and repair parts	$125,000
Sperry Systems Management Division of Sperry Rand	Bureau of Public Roads, Federal Highway Administration, Dept. of Transportation	Development of specifications and installation plans for a highway traffic control test site for use in Federal Highway Administration's Urban Traffic Control System (UTCS) project	—
Sperry Rand Corporation's Univac Federal Systems Div.	Lockheed Missiles and Space Co., Sunnyvale, Calif.	Ten computer systems, each with a UNIVAC 1230 computer, to be used as part of the Advanced Data System for the Air Force Satellite Control Facility	—
Computer Usage Development Corp. (CUDC), Washington, D.C.	National Cancer Institute	Development and documentation of pilot EDP system to aid processing information from third national cancer survey	—

NEW INSTALLATIONS

OF	AT	FOR
Burroughs B300 system	Fiduciary Trust Co., Boston, Mass.	Management of personal trusts
	Manchester Memorial Hospital, Manchester, Conn.	Expediting patient/revenue accounting; storage of medical records; on-line service to second hospital (system valued at almost $200,000)
	Somerset Trust Co., Somerville, N.J.	On-line use for savings and mortgage accounts; service to institutions in parts of N.J., N.Y. and Penn. (system valued at over $525,000)
Burroughs B340 system	Harlandale State Bank, San Antonio, Texas	Automating bank's proof and transit, demand deposit, savings and installment loan operations (system valued at over $180,000)
Control Data 1700 system	American Can Co., Naheola, Ala.	Production-line control, and processing of engineering data in its Naheola paper-bleaching plant
Control Data 3300 system	Petty Geophysical Engineering Co., San Antonio, Tex.	Processing records obtained during seismic exploration
Control Data 6400 system	Kaman Nuclear, a div. of Kaman Sciences Corp., Colorado Springs, Colo.	A broad range of analytical studies in support of government research and development contracts
	Lehigh University, Bethlehem, Pa.	Educational, research and administrative needs
	McMaster University, Hamilton, Ontario, Canada	Furnishing a central computer service to all areas of teaching, research, and administrative operations
	Standard & Poor's Corp., New York, N.Y.	Availability on an on-line basis to the nation's financial and industrial communities
Control Data 6500 system	TRW Systems Group, Redondo Beach, Cal.	Use principally in scientific work
Control Data 6600 system	SIA (Societe d'Informatique Appliquee) Ltd., London, England	Providing complete information processing service
GE-405 system	Central Casting Corp., Hollywood, Calif.	Calculating gross/net daily earnings of about 3,000 extra players and other accounting functions
GE-415 system	Ross Laboratories, a div. of Abbott Laboratories, Columbus, Ohio	Handling diverse promotional and service mailings and processing normal business data and reports
Honeywell Model 120 system	AGS Service Corp., New York, N.Y.	Keeping track of 4,000 employees (temporary office help) in 21 states out of 70 branch offices
Honeywell Model 1200 system	Cyril Lord Ltd., Rathgael, Ireland	Reducing wastage in the cutting of carpets; also maintenance of firm's 150,000 credit accounts, sales forecasting, inventory and production control
	Florida Technological University, Orlando, Fla.	Cataloging library; student registration; administrative chores; a teaching laboratory
Honeywell Model 2200 system	Singer Manufacturing Co. Ltd., Clydebank, Scotland	Production planning and control, and inventory control; replaces Honeywell Model 400
IBM System/360, Model 40	Applied Data Research, Inc., Princeton, N.J.	Primary use on a service bureau basis to handle increasing number of customers in Washington area
IBM 1130 system	Royal Crown Bottling Co., Jacksonville, Fla.	Compilation and processing accounting information on route salesman and retailers throughout northern Florida; also internal accounting functions
NCR-Century-100 system	Abu Dhabi Finance Department, Abu Shabi, Trucial States	Part of Sheikh's five-year modernization plan; system will maintain sheikhdom's supply inventory, process payroll, and accounting applications
NCR 500 system	James T. Mullin & Sons, Wilmington, Del.	Automated information system linking sales registers to in-house computer
	Storm's Shoes, Wilmington, Del.	— same as above
	Northampton Commercial College, Northampton, Mass.	A teaching program in data processing
RCA Spectra 70/46 system	Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa.	A number of special time sharing research projects including areas in biology, chemistry, education; and in aeronautical, electrical, and military engineering
SDS Sigma 2 system	University of Illinois, Urbana, Ill.	High-energy physics studies directed toward explanation of nature of elementary particles
	Continental Oil Co., Ponca City, Okla. (two systems and a Sigma 7 system)	Processing oil exploration data, performing variety of seismic research and oil production studies (systems valued at $1.5 million)
SDS Sigma 7 system	Continental Oil Co. (see above)	
	Century Geophysical Corporation of Canada, Calgary, Alberta, Canada	Processing and analyzing seismic exploration data in search for oil, gas, and mineral resources (system valued at $1 million)
UNIVAC 418 system	SITA (Societe Internationale de Telecommunications Aeronautiques), Rome, Italy; Madrid, Spain (4 systems, 2 at each location)	Controlling telegraph and data traffic on over 700 communication circuits in Western Europe, in Africa and between Western Europe and the United States; (systems valued at over $2.5 million)
UNIVAC 1108 system	Computer Sciences Canada, Ltd., Calgary, Alberta, Canada	Linkage to company's existing computing network which includes terminals in Vancouver; will be expanded to other Canadian cities
	French Department of Defense, CCSA (Centre de Calcul Scientifique de l' Armement), Arcueil, France (two systems)	Upgrading present 1108 system to a multiprocessor system; CCSA performs research and scientific work, much of it highly classified (systems valued at about $7 million)
UNIVAC 9200 system	Professional Data Service, Cleveland, Ohio	Use with peripheral equipment in services to professional people such as doctors and lawyers
	Tennessee College of Automation, Knoxville, Tenn.	Training students; some service center work
UNIVAC 9300 system	Crawford County Area Vocational Technical High School, Meadville, Pa.	Teaching students; also school administration applications

MONTHLY COMPUTER CENSUS

The following is a summary made by "Computers and Automation" of reports and estimates of the number of general purpose electronic digital Computers manufactured and installed, or to be manufactured and on order. These figures are mailed to individual computer manufacturers from time to time for their information and review, and for any updating or comments they may care to provide.

Our census has begun to include computers manufactured by organizations outside the United States. We invite all manufacturers located anywhere to submit information for this census. We also invite our readers to submit information that would help make these figures as accurate and complete as possible.

The following abbreviations apply:

(R) - figures derived all or in part from information released directly or indirectly by the manufacturer, or from reports by other sources likely to be informed
(N) - manufacturer refuses to give any figures on number of installations or of orders, and refuses to comment in any way on those numbers stated here
(S) - sale only
X - no longer in production
C - figure is combined in a total (see column to the right)
E - figures estimated by "Computers and Automation"
? - information not received at press time

AS OF AUGUST 15, 1968

NAME OF MANUFACTURER	NAME OF COMPUTER	AVERAGE OR RANGE OF MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTAL-LATIONS	MFR'S TOTAL INSTAL-LATIONS	NUMBER OF UNFILLED ORDERS	MFR'S TOTAL UNFILLED ORDERS
I. United States Manufacturers							
Autonetics (R)	RECOMP II	$2495	11/58	30		X	
Anaheim, Calif.	RECOMP III	$1495	6/61	6	36	X	0
Bailey Meter Co.	Bailey 756	$60,000-$400,000 (S)	2/65	17		3	
Wickliffe, Ohio	Bailey 855	$100,000 (S)	4/68	0	17	15	18
Bunker-Ramo Corp. (R)	BR-130	$2000	10/61	160		X	
Canoga Park, Calif.	BR-133	$2400	5/64	62		X	
	BR-230	$2680	8/63	15		X	
	BR-300	$3000	3/59	18		X	
	BR-330	$4000	12/60	23		X	
	BR-340	$7000	12/63	19	297	X	0
Burroughs (R)	205	$4600	1/54	38		X	
Detroit, Mich.	220	$14,000	10/58	31		X	
	B200 Series, B100	$5400	11/61	800		31	
	B300 Series	$9000	7/65	370		150	
	B2500	$5000	2/67	35		95	
	B3500	$14,000	5/67	24		74	
	B5500	$22,000	3/63	74		12	
	B6500	$33,000	2/68	0		17	
	B7500	$44,000	4/69	0		6	
	B8500	$200,000	8/67	0	1370 E	5	390 E
Control Data Corp. (R)	G-15	$1600	7/55	295		X	
Minneapolis, Minn.	G-20	$15,500	4/61	20		X	
	LGP-21	$725	12/62	165		X	
	LGP-30	$1300	9/56	322		X	
	RPC-4000	$1875	1/61	75		X	
	636/136/046 Series	?	-	29		C	
	160*/8090 Series	$2100-$12,000	5/60	610		X	
	924/924A	$11,000	8/61	29		X	
	1604/A/B	$45,000	1/60	59		X	
	1700	$3500	5/66	100		C	
	3100/3200/3300	$10,000-$16,250	5/64	261		C	
	3400/3600/3800	$18,000-$48,750	6/63	79		C	
	6400/6500/6600	$52,000-$117,000	8/64	63		C	
	6800	$130,000	6/67	0		C	
	7600	$150,000	12/68	0	2107	C	360 E
Digital Electronics Inc. (R)	DIGIAC 3080	$19,500 (S)	12/64	11		1	
Plainview, N.Y.	DIGIAC 3080C	$25,000 (S)	10/67	1	12	1	2
Digital Equipment Corp. (R)	PDP-1	$3400	11/60	59		X	
Maynard, Mass.	PDP-4	$1700	8/62	55		X	
	PDP-5	$900	9/63	114		X	
	PDP-6	$10,000	10/64	22		X	
	PDP-7	$1300	11/64	165		C	
	PDP-8	$525	4/65	1300		C	
	PDP-8/S	$300	9/66	700		C	
	PDP-9	$1000	12/66	85		C	
	PDP-10	$7500	12/67	6		C	
	LINC-8	?	9/66	105	2611 E	C	450 E
Electronic Assoc., Inc. (R)	640	$1200	4/67	42		18	
Long Branch, N.J.	8400	$12,000	7/65	21	63	4	22
EMR Computer Div. (R)	ASI 210	$3850	4/62	C		X	
Minneapolis, Minn.	ASI 2100	$4200	12/63	C		X	
	ADVANCE 6020	$4400	4/65	C		C	
	ADVANCE 6040	$5600	7/65	C		C	
	ADVANCE 6050	$9000	2/66	C		C	
	ADVANCE 6070	$15,000	10/66	C		C	
	ADVANCE 6130	$1550	8/67	19	85	C	18
General Electric (N)	115	$1370-$5000	4/66	620 E		600 E	
Phoenix, Ariz.	130	$4350-$15,000	-	0		C	
	205	$2500-$10,000	6/64	C		X	
	210	$16,000-$22,000	7/60	C		X	
	215	$2500-$10,000	9/63	C		X	
	225	$2500-$16,000	4/61	200 E		X	
	235	$6000-$18,000	4/64	130 E		C	
	255	$15,000-$19,000	10/67	C		C	
	265	$17,000-$20,000	10/65	C		C	
	405	$5120-$10,000	2/68	C		C	
	415	$4800-$13,500	5/64	380 E		70 E	
	420	$17,000-$20,000	6/67	C		C	
	425	$6000-$20,000	6/64	130 E		C	
	430	$15,500-$19,000	-	0		C	
	435	$8000-$25,000	9/65	C		C	
	440	$22,200-$27,000	-	0		C	
	625	$31,000-$135,000	4/65	C		C	
	635	$35,000-$167,000	5/65	C		C	
	645	$40,000-$250,000	7/66	C	1800 E	C	900 E
Hewlett-Packard (R)	2116A	$600	11/66	102		C	
Palo Alto, Calif.	2115A	$412	11/67	103	205	C	50 E

NAME OF MANUFACTURER	NAME OF COMPUTER	AVERAGE OR RANGE OF MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTAL-LATIONS	MFR'S TOTAL INSTAL-LATIONS	NUMBER OF UNFILLED ORDERS	MFR'S TOTAL UNFILLED ORDERS
Honeywell (R)	DDP-24	$2500	5/63	93		X	
Computer Control Div.	DDP-116	$900	4/65	200		30	
Framingham, Mass.	DDP-124	$2050	3/66	64		30	
	DDP-224	$3300	3/65	52		8	
	DDP-516	$700	9/66	155		150	
	H632	$2700	-	0	564	?	218
Honeywell (R)	H-110	$2500	8/68	0		C	
EDP Division	H-120	$3900	1/66	650		240	
Wellesley Hills, Mass.	H-125	$3900	12/67	20		75	
	H-200	$8400	3/64	1130		87	
	H-400	$8500	12/61	120		X	
	H-800	$28,000	12/60	89		X	
	H-1200	$9500	2/66	175		130	
	H-1250	$9500	7/68	0		20	
	H-1400	$14,000	1/64	12		X	
	H-1800	$42,000	1/64	21		X	
	H-2200	$12,000	1/66	78		71	
	H-4200	$20,500	6/67	0		20	
	H-8200	$35,000	4/68	0	2200 E	5	650 E
IBM (N)	305	$3600	12/57	C		X	
White Plains, N.Y.	360/20	$3000	12/65	7200 E		5000 E	
	360/25	$5330	1/68	C		1000 E	
	360/30	$9340	5/65	6600 E		3000 E	
	360/40	$19,550	4/65	3200 E		1500 E	
	360/44	$15,000	7/66	C		C	
	360/50	$32,960	8/65	C		C	
	360/65	$69,850	11/65	C		C	
	360/67	$138,000	10/66	C		C	
	360/75	$81,400	2/66	C		C	
	360/85	$115,095	-	0		C	
	360/90 Series	-	10/67	C		C	
	650	$4800	11/54	C		X	
	1130	$1545	2/66	3400 E		4500 E	
	1401	$6480	9/60	7000 E		X	
	1401-G	$2300	5/64	1600 E		X	
	1401-H	$1300	6/67	C		C	
	1410	$17,000	11/61	C		C	
	1440	$4300	4/63	3600 E		C	
	1460	$10,925	10/63	1400 E		X	
	1620 I, II	$4000	9/60	1500 E		C	
	1800	$4800	1/66	C		C	
	701	$5000	4/53	C		X	
	7010	$26,000	10/63	C		C	
	702	$6900	2/55	C		X	
	7030	$160,000	5/61	C		X	
	704	$32,000	12/55	C		X	
	7040	$25,000	6/63	C		C	
	7044	$36,500	6/63	C		C	
	705	$38,000	11/55	C		X	
	7070, 2, 4	$27,000	3/60	C		X	
	7080	$60,000	8/61	C		X	
	709	$40,000	8/58	C		X	
	7090	$63,500	11/59	C		X	
	7094	$75,500	9/62	C		X	
	7094 II	$82,500	4/64	C	39,600 E	C	16,000 E
Interdata (R)	Model 2	$200-$300	-	0		3	
Oceanport, N.J.	Model 3	$300-$500	3/67	52		110	
	Model 4	$400-$800	-	0	52	5	105
National Cash Register Co. (R)	NCR-304	$14,000	1/60	24		X	
Dayton, Ohio	NCR-310	$2500	5/61	10		X	
	NCR-315	$8500	5/62	700		150	
	NCR-315-RMC	$12,000	9/65	105		50	
	NCR-390	$1850	5/61	1500		6	
	NCR-500	$1500	10/65	2000		580	
	NCR-Century-100	$2645	-	-		C	
	NCR-Century-200	$7500	-	-	4339	C	1050 E
Pacific Data Systems Inc. (R) Santa Ana, Calif.	PDS 1020	$550-$900	2/64	145	145	10	10
Philco (R)	1000	$7010	6/63	16		X	
Willow Grove, Pa.	2000-210, 211	$40,000	10/58	16		X	
	2000-212	$52,000	1/63	12	44	X	0
Potter Instrument Co., Inc. Plainview, N.Y.	PC-9600	$12,000 (S)	-	-	-	-	-
Radio Corp. of America (R)	RCA 301	$7000	2/61	635		C	
Cherry Hill, N.J.	RCA 3301	$17,000	7/64	75		C	
	RCA 501	$14,000	6/59	96		X	
	RCA 601	$35,000	11/62	3		X	
	Spectra 70/15	$4500	9/65	190		120	
	Spectra 70/25	$6500	9/65	102		57	
	Spectra 70/35	$10,400	1/67	60		135	
	Spectra 70/45	$22,000	11/65	110		85	
	Spectra 70/46	$34,400	-	0		C	
	Spectra 70/55	$34,300	11/66	7	1270 E	14	420 E
Raytheon (R)	250	$1200	12/60	175		X	
Santa Ana, Calif.	440	$3500	3/64	20		X	
	520	$3200	10/65	27		0	
	703	(S)	10/67	43	265	37	37
Scientific Control Corp. (R)	650	$500	5/66	29		1	
Dallas, Tex.	655	$1800	10/66	25		44	
	660	$2000	10/65	5		9	
	670	$2600	5/66	1		0	
	6700	$30,000	10/67	0	60	1	55
Scientific Data Syst., Inc. (N)	SDS-92	$1500	4/65	120 E		10 E	
Santa Monica, Calif.	SDS-910	$2000	8/62	225 E		25 E	
	SDS-920	$2900	9/62	200 E		20	
	SDS-925	$3000	12/64	C		C	
	SDS-930	$3400	6/64	235 E		30	

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Scientific Data Syst., Inc. (cont'd)	SDS-940	$10,000	4/66	C		C	
	SDS-9300	$7000	11/64	C		C	
	Sigma 2	$1000	12/66	80 E		160	
	Sigma 5	$6000	8/67	C		50	
	Sigma 7	$12,000	12/66	C	1000 E	C	330 E
Standard Computer Corp. (N) Los Angeles, Calif.	IC 4000	$9000	7/68	0		2 E	
	IC 6000	$10,000-$22,000	5/67	7	7	12 E	14 E
Systems Engineering Labs (R) Ft. Lauderdale, Fla.	SEL 810	$1000	9/65	24		X	
	SEL 810A	$900	8/66	70		45	
	SEL 810B	?	-	1		9	
	SEL 840	$1400	11/65	4		X	
	SEL 840A	$1400	8/66	35		28	
	SEL 840 MP	?	1/68	5	139	7	89
UNIVAC, Div. of Sperry Rand (R) New York, N.Y.	I & II	$25,000	3/51 & 11/57	23		X	
	III	$20,000	8/62	77		X	
	File Computers	$15,000	8/56	13		X	
	Solid-State 80 I, II, 90, I, II & Step	$8000	8/58	210		X	
	418	$11,000	6/63	135		20	
	490 Series	$35,000	12/61	190		35	
	1004	$1900	2/63	3100		20	
	1005	$2400	4/66	1090		90	
	1050	$6000	9/63	280		10	
	1100 Series (except 1107 & 1108)	$35,000	12/50	9		X	
	1107	$55,000	10/62	33		X	
	1108	$65,000	9/65	105		75	
	9200	$1500	6/67	170		850	
	9300	$3400	7/67	85		550	
	9400	$7000	5/69	0		60	
	LARC	$135,000	5/60	2	5522 E	X	1710 E
Varian Data Machines (R) Newport Beach, Calif.	620	$900	11/65	75		0	
	620i	$500	6/67	180	255	420	420
		I. U.S. Manufacturers, TOTAL		—	63,000 E		23,300 E
II. Non-United States Manufacturers							
A/S Regnecentralen (R) Copenhagen, Denmark	GIER	$2300-$7500	12/60	37		1	
	RC 4000	$3000-$20,000	6/67	1	38	1	2
Elbit Computers Ltd. (R) Haifa, Israel	Elbit-100	$4900 (S)	10/67	19	19	37	37
English Electric Computers Ltd. (R) London, England	LEO I	-	-/53	3		X	
	LEO II	-	6/57	11		X	
	LEO III	$9600-$24,000	4/62	39		X	
	LEO 360	$9600-$28,800	2/65	8		X	
	LEO 326	$14,400-$36,000	5/65	11		X	
	DEUCE	-	4/55	32		X	
	KDF 6	-	12/63	17		X	
	KDF 8-10	-	9/61	12		X	
	KDF 9	$9600-$36,000	4/63	28		X	
	KDN 2	-	4/63	8		X	
	KDF 7	$1920-$12,000	5/66	8		X	
	SYSTEM 4-30	$3600-$14,400	10/67	3		C	
	SYSTEM 4-40	$7200-$24,000	5/69	-		C	
	SYSTEM 4-50	$8400-$28,800	5/67	9		C	
	SYSTEM 4-70	$9600-$36,000	1/68	2		C	
	SYSTEM 4-75	$9600-$40,800	9/68	-		C	
	ELLIOTT 903	$640-$1570	1/66	52		C	
	ELLIOTT 4120	$1600-$4400	10/65	82		C	
	ELLIOTT 4130	$2200-$9000	6/66	23	348	C	110
GEC-AEI Automation Ltd. (R) New Parks, Leicester, England	Series 90-2/10/20/25/30/40/300	-	3/63-1/68	12		C	
	S-2	-	1/68	1		0	
	S-5	-		0		C	
	S-7	-		0		C	
	GEC-TRW130	-	12/64	2		X	
	GEC-TRW330	-	3/63	9	25	X	8 E
International Computers Limited (R) London, England	1200/1/2	$900	-/55	62		X	
	1300	$3000	-/63	79		X	
	1301	$5000	-/61	127		X	
	1500	$6000	-/62	125		X	
	1100	$5000	-/60	23		X	
	2400	$23,000	-/61	4		X	
	Atlas 1 & 2	$65,000		6		X	
	Orion 1 & 2	$20,000	-/63	17		X	
	Sirius	-	-/61	22		X	
	Mercury	-		19		X	
	Pegasus 1 & 2	-	-/56	33		X	
	1901	$4000	9/66	328		112	
	1902	$4800	7/65	189		24	
	1903	$6500	7/65	99		20	
	1904	$12,200	5/65	58		5	
	1905	$13,000	12/64	31		3	
	1909	$5500	8/65	17		1	
	1906	$28,000	12/66	4		1	
	1907	$29,000	12/66	9		0	
	1904E	$16,000	1/68	8		34	
	1905E	$16,500	1/68	4		15	
	1904F	$17,000				9	
	1905F	$17,500				12	
	1906E	$29,300				2	
	1907E	$30,300	3/68	1		1	
	1906F	$31,200				2	
	1907F	$32,500				2	
	1901A	$3700	3/68	1		102	
	1902A	$6300				72	
	1903A	$10,600	9/67	2		7	
	1904A	$18,600				1	
	1906A	$54,000			1268	1	426
Japanese mfrs.	Various models	-	-	C	2074	C	500 E

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The Marconi Co., Ltd.	Myriad I	£36,000-£66,000	3/66	26		19	
Chelmsford, Essex, England	Myriad II	£22,000-£42,500	10/67	3	29	9	28
N.V. Philips' Computer Industrie Apeldoorn, Netherlands	P1000	?	6/68	0	0	5 E	5 E
Saab Aktiebolag (R)	DATASAAB D21	$5000-$14,000	12/62	31		3	
Linkoping, Sweden	DATASAAB D22	$8000-$60,000	5/68	1	32	10	13
Siemens Aktiengesellschaft	2002	54,000 (Deutsche	6/59	42		-	
Munich, Germany	3003	52,000 Marks)	12/63	34		-	
	4004/15	19,000 "	10/65	60		23	
	4004/25	32,000 "	1/66	29		5	
	4004/35	46,000 "	2/67	57		57	
	4004/45	75,000 "	7/66	45		40	
	4004/55	103,000 "	12/66	3		3	
	301	2000 "	-	-		-	
	302	4000 "	9/67	8		10	
	303	10,000 "	4/65	65		8	
	304	12,000 "	-	1		25	
	305	14,000 "	11/67	17	361	22	202
USSR	Various models	-	-	C	2500 E	C	700 E
		II. Non-U.S. Manufacturers, TOTAL —			6600 E		2000 E
		Combined, TOTAL —			70,600 E		25,300 E

BOOK REVIEWS AND NOTICES

Neil Macdonald
Assistant Editor
Computers and Automation

We publish here citations and brief reviews of books and other publications which have a significant relation to computers, data processing, and automation, and which have come to our attention. We shall be glad to report other information in future lists if a review copy is sent to us. The plan of each entry is: author or editor / title / publisher or issuer / date, hardbound or softbound, number of pages, price or its equivalent / comments. If you write to a publisher or issuer, we would appreciate your mentioning *Computers and Automation.*

Reviews

Mambert, W. A. / Presenting Technical Ideas: A Guide to Audience Communication / John Wiley & Sons, Inc., 605 Third Ave., New York, N.Y. 10016 / 1968, hardbound, 216 pp., $6.95

This book is a "practical, how-to guide designed to answer most of the important questions that confront the trained specialist in getting his ideas ready to present and in ultimately delivering them to an audience as a technical presentation." The fourteen chapters are: "Acquiring a Communicator's Perspective"; "Acquire the Characteristics of an Effective Communicator"; "Understanding an Audience"; "Analyzing the Specific Audience-Situation"; "How to Develop a Presentation Objective"; "Gathering Data for a Presentation"; "Principles of Outlining"; "Integrating and Composing the Presentation"; "How to Prepare 'Aids' "; "Preparing to Face an Audience"; "Preparing Notes for Delivery"; "Rehearsing the Presentation"; "Delivering the Presentation"; "Optimizing the Principles." Index. There is a bibliography at the end of each chapter.

Awad, Elias M. / Business Data Processing, Second Edition / Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632 / 1968, hardbound, 459 pp., $8.95

This book is an up-to-date introduction to the field of business data processing, and discusses punched card data processing, and electronic data processing. The book asks to provide a "full non-technical mastery of modern data processing principles and methods, with no prior background beyond a knowledge of simple algebra."

The book covers the history and the service to business of modern data processing.

The four basic parts are: Data Processing — An Overview; Punched-Card Data Processing; Electronic Data Processing — Systems and Procedures; and Data Processing Management. It contains 23 chapters. At the end of each chapter is a glossary and review questions.

Uttal, William R. / Real-Time Computers / Harper & Row, Publishers, Inc., 49 East 33 St., New York, N.Y. 10016 / 1968, hardbound, 338 pp., $?

Written for graduate and advanced undergraduate students, this book aims at the problems of the changing methodology of experimentation in the behavioral sciences. Part I: "Technological Foundations of Real-Time Computers," consists of six chapters: "Introduction," "Introduction to Codes and Number Systems," "Logical Building Blocks," "Logical Functions," "Computer Systems Organization," and "Real-Time Computers." Part II: "Real-Time Applications in Experimental Psychology" consists of four chapters: "Introduction to Real-Time Computer Applications," "Real-Time Data Analysis of Bioelectric Systems," "Computer Applications in the Psychological Laboratory," and "Computer Teaching Machines." Part III: "Appendices" consists of "A Review of the Fundamentals of Passive Electrical Circuit Components," "An Introduction to Active Circuit Components," a Bibliography and an Index.

Rogers, Hartley, Jr. / Theory of Recursive Functions and Effective Computability / McGraw-Hill Book Co., 330 West 42 St., New York, N.Y. 10036 / 1967, hardbound, 482 pp., $14.75

This book is intended for use as a senior undergraduate or first-year graduate text. It assumes a knowledge of basic set-theoretical terminology and techniques such as might be obtained in an undergraduate course in modern algebra. Some knowledge of Logic is helpful. The sixteen chapters include: "Recursive Functions"; "Unsolvable Problems"; "Recursive Invariance"; "Reducibilities"; "Post's Problem; Incomplete Sets"; "The Recursion Theorem"; "Degrees of Unsolvability"; "The Arithmetic Hierarchy"; "The Analytical Hierarchy." There is a bibliography, an index of notations, and a subject index.

Baron, Robert C., and A. T. Piccirilli / Digital Logic and Computer Operations / McGraw-Hill Book Co., 330 West 42 St., New York, N.Y. 10036 / 1967, hardbound, 330 pp., $13.50

This book is an introductory text on computer construction for courses in colleges, secondary schools, and industry. The book employs the logical "building block" method, and discusses how the "blocks" are organized into various elements of the computer. The twelve chapters include: "Number Systems and the Digital Computer"; "Computer Logic"; "Flip-flops and Storage Registers";

"Codes and Decimal Arithmetic"; "Arithmetic Operations"; "Memory"; "Word Organization"; "The Control Element"; "Input-Output Equipment"; "Computer Organization"; "Introduction to Programming." Three appendices. Index.

Gschwind, Hans W. / Design of Digital Computers: An Introduction / Springer-Verlag, N.Y.C., N.Y. / 1967, hardbound, 530 pp., $?

This book concentrates on the theory and practice of digital computer design. Written primarily as an engineering text for the undergraduate and graduate student, the book is also well suited as a basis for self-study and provides even the accomplished computer designer with a ready reference on many specialized topics. The eleven chapters are: 1) Introduction; 2) Number Systems and Number Representations; 3) Boolean Algebra; 4) Logic Circuits; 5) Storage Elements; 6) Computer Circuits; 7) The Basic Organization of Digital Computers; 8) The Functional Units of a Digital Computer; 9) Unorthodox Concepts; 10) Miscellaneous Engineering and Design Considerations; 11) Unusual Computer Components. There is an index. Each chapter contains a bibliography.

The author is Chief, Engineering Development Division, Computation Directorate, Air Force Missile Development Center, and Adjunct Professor of Electrical Engineering, University of New Mexico.

The book is intended as an introductory text concerned with the design of digital computers, and was written by the author to meet his need for an adequate engineering text for teaching computer design to electronic engineers.

Harvey, John, ed. and 12 authors / Data Processing in Public and University Libraries / Spartan Books, 1250 Connecticut Ave., N.W., Washington, D.C. 20036 / 1966, hardcover, 150 pp., $?

This is Volume III of the Drexel Information Science Series.

The purpose of the book is to "link librarianship with the new sciences of information processing and data handling." The two parts include eleven chapters. Part I: Data Processing in Public Libraries includes: "Library Systems Analysis"; "Data Processing in a Cooperative System-Opportunities for Service"; "An Unsophisticated Approach to Book Catalog and Circulation Control," etc. Part II, Data Processing in University Libraries, include: "Concept and Scope of Total Systems in Library Records"; "Systems Analysis and Planning"; "Personnel Requirements for Automation in Libraries"; "Economic Considerations," etc. There is an index.

Langenbach, Robert G. / Introduction to Automated Data Processing / Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632 / 1968, hardbound, 235 pp., $?

The purpose of this book is to acquaint the layman with some of the data processing devices and procedures that are a part of everyone's daily life. Machine technology is not stressed — the book only serves as an "exposure to some of the basic principles and applications of automated data processing."

The five chapters are: Introduction: Interrelationships of Systems and Machines; Integrated Data Processing; Electronic Data Processing; Automated Data Processing Personnel Problems. There is an index.

The author is a professor in the School of Business Administration at San Diego State College.

Luxenberg, H. R. and Kuehn, R. L., editors, and 14 authors / Display Systems Engineering / McGraw-Hill Book Co., 330 West 42 St., New York, N.Y. 10036 / 1968, hardbound, 444 pp., 16.50

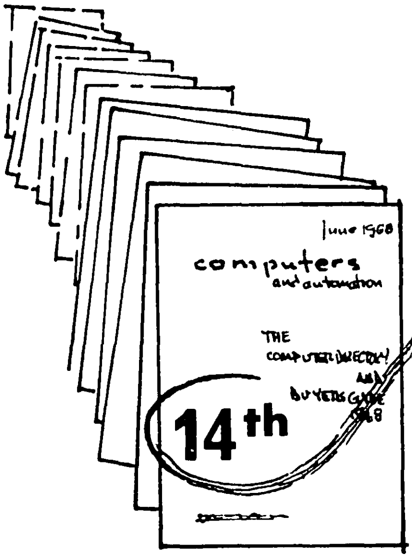
This is a background book for the practicing scientist or engineer seeking an introduction to display systems. The first six chapters comprise much of the essential theoretical foundation of display systems. Chapters 7 through 11 are concerned with technological reductions to practice. The eleven chapters include: "Introduction to Display Systems"; "System Design, Coding, Formats, and Programming"; "Photometry"; "Visual Experience and Colorimetry"; "Image Analysis"; "Optics"; "Recording Media"; "Cathode-Ray Devices"; "Film-Based Projection Systems"; "Light Valves, Lasers, and Electro-Luminescent Devices"; and "Laser Holography." There is a subject index and a name index, and many bibliographies.

Chung, An-min / Linear Programming / Charles E. Merrill, Inc., Columbus, Ohio / 1963, second printing 1966, 338 pp., hardcover, $?

This book "serves as an introduction to the subtle mathematical reasoning that underlies and gives strength to linear programming as an analytical tool. It is assumed that the reader has a knowledge of only elementary algebra."

The ten chapters are: 1) Introduction; 2) Elements of Matrix Algebra and Determinants; 3) Properties of Linear Programming Solutions; 4) The Simplex Method — Theoretical; 5) The Simplex Method — Computational; 6) Variations of the Simplex Method; 7) Optimality Analysis; 8) The Dual Problem; 9) The Transportation Problem; 10) Advanced Topics in Linear Programming. There is a bibliography, and an index.

The author is Professor of Economics, Drexel Inst. of Technology.



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NEW PATENTS

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Long Island City, N.Y. 11101

The following is a compilation of patents pertaining to computers and associated equipment from the "Official Gazette of the U. S. Patent Office," dates of issue as indicated. Each entry consists of: patent number / inventor(s) / assignee / invention. Printed copies of patents may be obtained from the U.S. Commissioner of Patents, Washington, D.C. 20231, at a cost of 50 cents each.

June 11, 1968

3,388,386 / Alan R. Deutermann, Philadelphia, Pa. / Philco-Ford Corporation, a corporation of Delaware / Tunnel diode memory system.

June 18, 1968

3,389,376 / Roger E. Packard, Glendora, Calif. / Burroughs Corporation, Detroit, Mich., a corporation of Michigan / Micro-program operated multiple addressed memory.

3,389,378 / Katsuro Nakamura, Minato-ku, Tokyo-to, Japan / Toko Kabushiki Kaisha, Tokyo-to, Japan, a joint-stock company / Memory system.

3,389,379 / Gerald J. Erickson and Thomas C. Tollefson, St. Paul, Minn. / Sperry Rand Corporation, New York, N.Y., a corporation of Delaware / Floating point system: single and double precision conversions.

3,389,380 / James P. Ashbaugh, James C. Borgstrom, and Thomas C. Tollefson, St. Paul, Minn. / Sperry Rand Corporation, New York, N.Y., a corporation of Delaware / Signal responsive apparatus.

3,389,382 / Donald Mills Hart, Los Gatos, and Joseph Robert Werning, San Jose, Calif. / International Business Machines Corporation, New York, N.Y., a corporation of New York / Electron beam readout of stored information.

3,389,383 / Hubert K. Burke, Schenectady, and Gerald J. Michon, Waterford, N.Y. / General Electric Company, a corporation of New York / Integrated circuit bistable memory cell.

3,389,384 / Glyn Faulkner Jones and George Richard Hoffman, Sale, England / National Research Development Corporation, London, England, a British corporation / Superconductive digital information storage apparatus.

3,389,400 / Winsor Soule, Jr., Berkeley, Calif. / SCM Corporation, New York, N.Y., a corporation of New York / Protective circuit for magnetic storage unit.

June 25, 1968

3,390,276 / Lester M. Spandorfer, Cheltenham, Pa. / Sperry Rand Corporation, New York, N.Y., a corporation of Delaware / One-way transmission logic circuit.

3,390,277 / Lester M. Spandorfer, Cheltenham, Pa. / Sperry Rand Corporation, New York, N.Y., a corporation of Delaware / Logical devices.

3,390,279 / Merwyn E. Hodges, Broomall, Pa. / General Electric Company, a corporation of New York / Logical control means utilizing time delay and knockout "and" circuits.

3,390,380 / Edmund Harry Cooke-Yarborough, Murray Hill, N.J., and Ivor Noel Hooton, Cassington, Oxford, Stanley Alfred Hickman, West Compton, near Shepton Mallet Somerset, and Gilvert Maurice Prior, Chewton Mendip, near Bath, Somerset, England / United Kingdom Atomic Energy Authority, London, England, and Electric & Musical Industries Ltd., Hayes, England / Binary-information analysing arrangements.

3,390,382 / Ryo Igarashi, Tokyo, Japan / Nippon Electric Company Limited, Tokyo, Japan / Associative memory elements employing field effect transistors.

3,390,383 / Richard L. Snyder, Fullerton, Calif. (4625 Van Kleek Drive, New Smyrna Beach, Fla. 32069) / ---------- / Cylindrical thin film magnetic core memory.

July 2, 1968

3,391,390 / Bently A. Crane, Morris Plains, and John A. Githens, Morristown, N.J. / Bell Telephone Laboratories, Incorporated, New York, N.Y. a corporation of New York / Information storage and processing system utilizing associative memory.

3,391,394 / Gerald H. Ottaway, Hyde Park, N. Y., Helmut Painke, Sindelfingen, Germany, Thomas Ragland, New York, N. Y., Titus Scheler, Boblingen, and Helmut Will, Sindelfingen, Germany, and William V. Wright, Poughkeepsie, N. Y. / International Business Machines Corporation, Armonk, N. Y., a corporation of New York / Microprogram control for a data processing system.

3,391,395 / Tung C. Chen, Villanova, Pa. / Sperry Rand Corporation, New York, N. Y., a corporation of Delaware / Coincident current memory utilizing storage diodes.

3,391,396 / Joseph C. McAlexander, Jr., Center Valley, Pa. / Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York / Magnetic wire memory and core access switch array.

3,391,398 / Akira Matsushita, Hoyamachi, Japan / Toko Kabushiki Kaisha, Tokyo-to, Japan, a joint-stock company of Japan / Woven-type magnetic memory device.

ADVERTISING INDEX

Following is the index of advertisements. Each item contains: Name and address of the advertiser / page number where the advertisement appears / name of agency if any.

On the occasion of the Postal Cheque and Clearing Service's 50th anniversary the Netherlands PTT has organised an

International Automation Contest

A method is sought by which it is possible to interpret handwritten numerical information direct by machine.

The Netherlands Postal Cheque and Clearing Service is an institution that facilitates money traffic by offering a quick, simple and easy manner to make payments. Its customers make cashless money transactions by means of transfers.

For some years the booking process has been completely automatised. But the handwritten data provided by the account-holders on their transfer cards (account-number and amount) have to be converted by coding-typists before being processed by machine. For the over 1,500,000 account-holders (one third of all families and almost all enterprises) a method is sought by which the numerical information can be supplied on the transfer cards in such a way by pen or ballpoint that these cards - there are nearly one million a day - can be read direct by machine, that is, without human interference.

Participants are invited to write for a free brochure that contains detailed information about the problem and its backgrounds, general regulations, owners' rights and the criteria for the judgement of designs, to be applied by the jury. The brochure is available in the English language at PTT-headquarters, 12, Kortenaerkade, The Hague, Netherlands, if desired with a supplementary French or German translation of the most essential facts.

Entries that are of a sufficient quality and meet the general regulations may be awarded with the first prize of Dfls. 25,000.-, the second prize of Dfls. 15,000.- or the third prize of Dfls. 5,000.-. Entries should be dispatched before 1st July, 1969; the jury's decision will be communicated to the senders of entries within seven months after that date.

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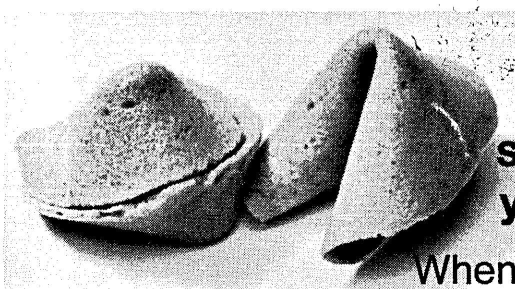
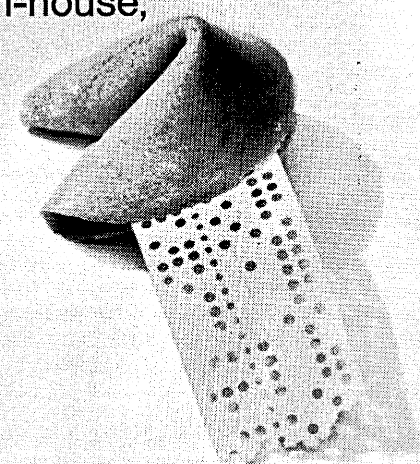


A computer is only as good as its software. You're fortunate. Ours makes your life easier.

When you buy your computer, you expect it to work—quickly, accurately and easily. That's why Hewlett-Packard software packages are written—and proved—in-house, by people who are intimate with the hardware. You don't have to be. Just take your choice of FORTRAN, ALGOL or Conversational BASIC. You're on the air fast.

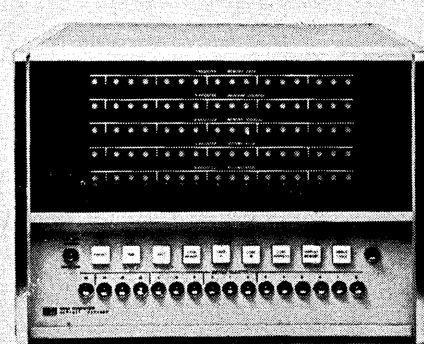


All HP software is delivered with your computer. Fully documented. Not only three high-level programming languages, but an Assembler, a Basic Control System and utility routines. Even a special Data Acquisition Executive.

These programs are convenient, readily useable and efficient. And they aren't tied to a particular machine configuration. If you change your hardware set-up—say to handle more input/output devices—you don't have to re-program. You just enter the modular software driver for each unit. The Basic Control System will incorporate succeeding I/O operations.

Hewlett-Packard will teach you how to use the software package in two weeks of free classroom training. The same programs and techniques work with any computer in the HP family. We hope you'll join our customers who keep telling *us* about *their* good fortune. Prices start at $9,950.

For more information about HP computers and our proved software, call your local HP field engineer. Or write Hewlett-Packard, Palo Alto, California 94304; Europe: 54 Route des Acacias, Geneva.



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