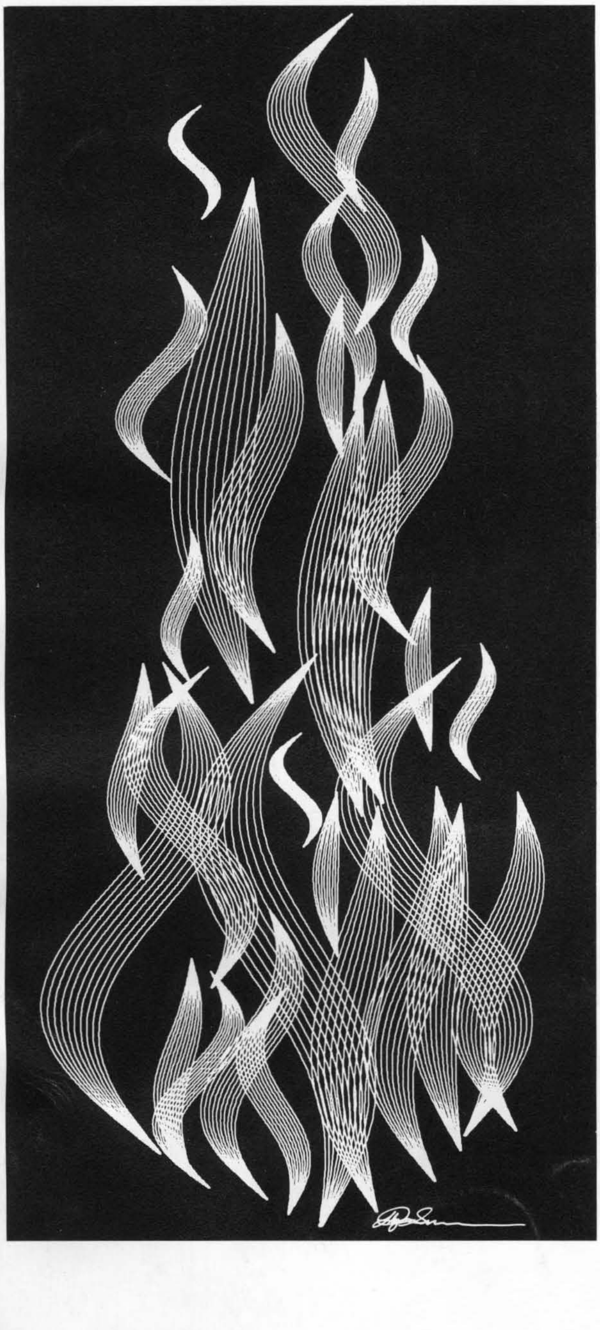
August, 1973

Vol. 22, No. 8

computers and automation

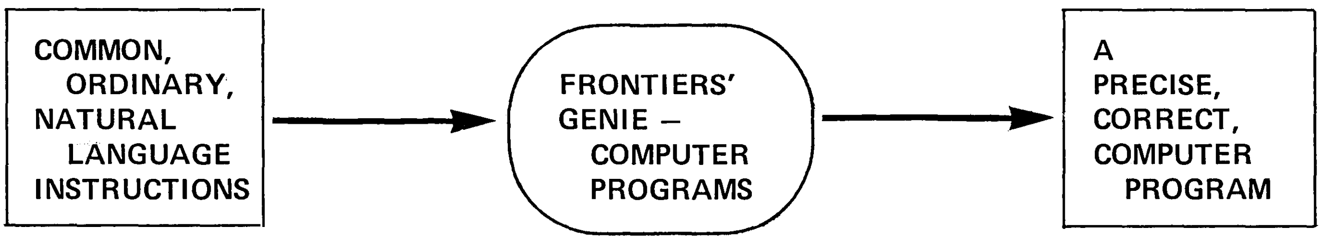
and people



"FIRE"

11th Annual
Computer Art Exposition

ARE YOU INTERESTED IN NATURAL LANGUAGE PROGRAMMING?



We believe we have discovered a set of automatic computer programs (we call them **FRONTIERS' GENIE**) that will take in natural language in the form of common, ordinary instructions for making a calculation regarding an application for computers, and will automatically convert those natural language instructions into a precise, correct computer program. The resulting program will work correctly on several or many sample problems illustrating the application, and an indefinite number of similar problems implied by the samples.

The same methods, we believe, ought to be expandible into many varieties of automatic translation from any programming language, any machine language, and any natural language to any other language within certain broad conditions. We are aware that the current consensus is that such translation is not possible (and not economic even if it were possible). But we think we have found some significant paths around the obstacles.

For more information about **FRONTIERS' GENIE,** please see the three articles on "Computer Programming Using Natural Language" published in the June, July, and August issues of *Computers and Automation.*

For testing **GENIE,** please send us manager's instructions, worked example(s), and calculation layout, according to the specification in the articles.

This discovery, we believe, has considerable implications, to say the least.

We are interested in making a business arrangement with a large, energetic organization, under which we would receive appropriate royalties on resulting sales (estimated to be over $20 million a year), and suitable advances against royalties.

If your organization is interested in further details and in a demonstration, and may be able to market programming in common, ordinary natural language, please write to us, making clear the nature of your interest.

Edmund C. Berkeley
Associate, Frontiers Group
Computers and Automation
815 Washington St.
Newtonville, MA 02160

Vol. 22, No. 8
August, 1973

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NOTE: The above rates do not include our publication "The Computer Directory and Buyers' Guide". If you elect to receive "The Computer Directory and Buyers' Guide," please add $9.00 per year to your subscription rate.

Please address all mail to: Berkeley Enterprises, Inc., 815 Washington St., Newtonville, Mass. 02160.

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computers and automation and people

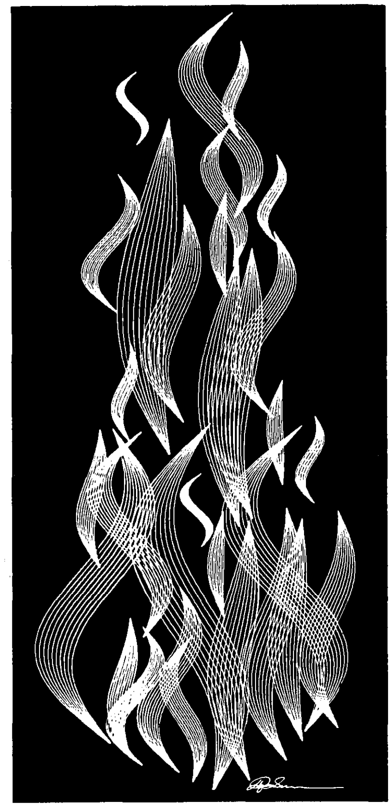
Computer Art – Graphic

Computer Art – Literary

The Computer Industry

The magazine of the design, applications, and implications of information processing systems — and the pursuit of truth in input, output, and processing, for the benefit of people.

NOTICE: The official name of this magazine throughout 1973 is *Computers and Automation.* We expect to change the name officially as of January 1, 1974, to *Computers and People.* During 1973 from time to time, unofficially, and irregularly, we plan to use the name *Computers and Automation and People* as a way of informing our subscribers and readers of the intended change on January 1, 1974.



Front Cover Picture

"Fire" by Lloyd Sumner.
For other entries in the 11th Annual Computer Art Exposition, see pages 8-21.

Departments

Key

- [A] — Article
- [C] — Monthly Column
- [E] — Editorial
- [F] — Forum
- [NT] — Not Technical
- [T] — Technical

NOTICE

*D ON YOUR ADDRESS IMPRINT MEANS THAT YOUR SUBSCRIPTION INCLUDES THE COMPUTER DIRECTORY. *N MEANS THAT YOUR PRESENT SUBSCRIPTION DOES NOT INCLUDE THE COMPUTER DIRECTORY.

EDITORIAL

SKEPTICISM

The dictionary defines skepticism as:

- the doctrine that true knowledge, or knowledge in a particular area, is uncertain
- the method of suspended judgment, systematic doubt, or criticism characteristic of persons who hold this doctrine
- a disposition towards doubting
- lack of sureness about someone or something
- unwillingness to believe without conclusive evidence

There is hardly anything I find more stimulating and challenging than frank and open-minded skepticism, because I seem to be faster at accepting new ideas than most people I know, but, like most people, I enjoy arguing to try to convince somebody else to accept a new idea that I have accepted.

Unfortunately, the skepticism of most people seems to be largely unexpressed, and rather "closed-minded". As the old proverb says, a man convinced against his will is of the same opinion still. Most people have a strong tendency to be skeptical of new ideas even in this rapidly changing, modern world.

Let us consider, for example, a novel proposition. It is based on three articles published in *Computers and Automation* in the June, July, and August issues, entitled "Computer Programming Using Natural Language". This proposition is:

- Computer programming using unrestricted natural language has been demonstrated, is feasible, and may well be practical in a great many areas.

This proposition implies at least four predictions:

- A great many people will be able to program computers to solve many kinds of problems without learning BASIC or any other kind of regular programming language.
- The need for programmers, for programming instructions, and for programming languages will greatly diminish.
- A great deal of the mystique of programming will disappear.
- Supervision by top management of work in computer programming will become a great deal easier.

All of these predictions are disturbing to many people, even if welcome to others, and rouse skepticism.

A skeptic may well say: "Well, I doubt that it really has been demonstrated. I doubt that it is feasible. It seems to me unlikely that it can be practical." And for many people just to utter this viewpoint is sufficient for them to adopt it, because it is a "normal" and "conservative" viewpoint.

There are basically four kinds of skepticism, resulting from two cross-classifications: professional and not professional (i.e., general); institutionalized and not institutionalized (i.e., independent).

Professional skepticism comes from persons who know a subject thoroughly, and who regularly are unwilling to accept a new idea unless it fits in with demonstrated or received knowledge in the area in which the subject belongs.

General skepticism comes from persons who do not know a subject thoroughly but do know rather thoroughly the world, the environment, the setting, in which events occur, and who regularly are unwilling to accept a new idea unless it seems reasonable on general considerations.

Institutionalized skepticism derives from groups of people, both professional and not, who have developed a vested interest in certain idea patterns, or world-views, and the resulting advantages that accrue to institutions and establishments. The persons who have absorbed loyalty to an institution of almost any kind, find themselves torn when confronted with a new idea that is disturbing to that institution.

Therefore many persons who are general skeptics take refuge in alibis: "Well, my professional adviser says so and so – who am I to disagree?" or they say, "Well, everybody knows that such and such is the case + who am I to think differently?"

Now regularly a new idea should be judged on its merits, what can really be demonstrated about it and about its setting or environment. And the idea should not be judged on any other basis. For regularly an idea is true or not true based on the test of its conformity or coherence with the real world.

The first question of an honest professional who is a skeptic should therefore be, "What proof is offered? Is the proof adequate?"

The first question of an honest nonprofessional who is a skeptic should be, "What is the setting or environment of this idea? Suppose this idea is true: how much alteration in ideas about the setting or environment is needed? are these alterations in ideas about the environment reasonable? are they perhaps even probable?"

Never should a skeptic use what is really the lazy man's alibi, "Who am I to think differently?" For over and over again a new idea that may not seem to be true or even probable, can nevertheless be demonstrated or proved. A great number of new ideas occur along the path of development of an innovative society. And so it becomes necessary for many people to take control over their skepticism and not let their skepticism control them.

Edmund C. Berkeley

Edmund C. Berkeley
Editor

Computer Poems

From "Computer Poems", gathered by Richard W. Bailey from computer-assisted literary works executed in Britain, Canada, the Netherlands, and the United States. Published by and copyright 1973 by Potagannissing Press, Drummond Island, Mich. Copies of "Computer Poems", 64 pp, are available from Potagannissing Press, 1609 Cambridge Rd., Ann Arbor, MI 48104, at $2.25 each (postpaid). Excerpts reprinted here with permission.

DUNETUNE

Leaving no footprints on water she sleeps with
  shadows prescience passed future
Starlike in youth dunelike in age my freedom is hers
Spacespectre walking on planets undreamed of
her eyes sing fire melodies.

Essence of dreams
Walking on planets undreamed of she awaits the return
  of waves
She remembers no one
Essence of dreams parted in some long forgotten seed
her eyes sing fire melodies

Born of a universal stalemate
joining joy with repose a time for inconsequence
my freedom is hers
Walking on planets undreamed of leaving no footprints
  on water
her eyes sing fire melodies.

Clutching at dreams I whisper her name
clutching at dreams   her name
      dreams clutching at name her I dream
      dreams I dream clutching at clutching   her
            clutching at her dreams

— Gus Garside and Robin Shirley

HAIKU ARE LIKE TROLLIES
(There'll Be Another One Along in a Moment)

WANDERING IN MIST
REACHING OUT TO SOFT SUNLIGHT
BLUE-SCALED DRAGONS PAUSE.

MOON LOW OVER SEA
GLIMPSE OF DISCARDED COCOON
SMALL FISH SWIMMING IDLY.

FISHERMAN'S BOAT DRIFTS
MEDITATING ON LILIES
FIREFLIES LISTENING.

QUAIL AGAINST WATER
WALKING AND SEEING WOODSMOKE
LONELY CITY, DARK.

WHITE KITTENS PLAYING
REACHING OUT TO PLUM BLOSSOMS
MIST BEYOND RIDERS.

ARRIVING IN MIST
THOUGHTS OF WHITE POINSETTIAS
SNOW LEOPARDS WATCHING.

MOON LOW OVER SEA
SUDDEN VISION OF MOONRISE
WHITE MANDARIN DUCKS.

* * *

— Robert Gaskins, Jr.

PAVAN FOR THE CHILDREN OF DEEP SPACE

* * *

Ice worlds,
Haunted by the legend of planets. Ice worlds —
Arcturus Andromeda Vega — orbiting,
Lost among stardust through aeons of crystal.

Your seed has dispersed, lit by the jewels of infinity,
Lost in the empty ocean;
In time with the measured dance of the universe
      orbiting . . . orbiting . . .

I am a child of eternity:
      down is a lifetime in every direction.
Through aeons of crystal your seed has dispersed
on a journey to no destination.
      sunburst starburst
      Mars Venus Jupiter Saturn . . .
Down is a lifetime in every direction.

Born out of darkness:
Lost in the palaces of eternity;
Lit by the jewels of infinity
      of the land of nowhere,
Your seed has dispersed in the dark light-years.
      (Sunburst starburst)

I am a child of eternity;
I travel with comets . . .
      born of some other, lost among stardust.
Lit by the jewels of infinity
      down is a lifetime in every direction.

Mars Venus Jupiter Saturn: lost
      in the empty ocean.
Orbiting: on a journey to no destination.
      . . . Procyon Eridanus Rigel . . .

Lit by the jewels of infinity,
I travel with comets.

* * *

— Robin Shirley

MARGARET

Margaret, are you saddening
Above the windy jumbles of the tide.

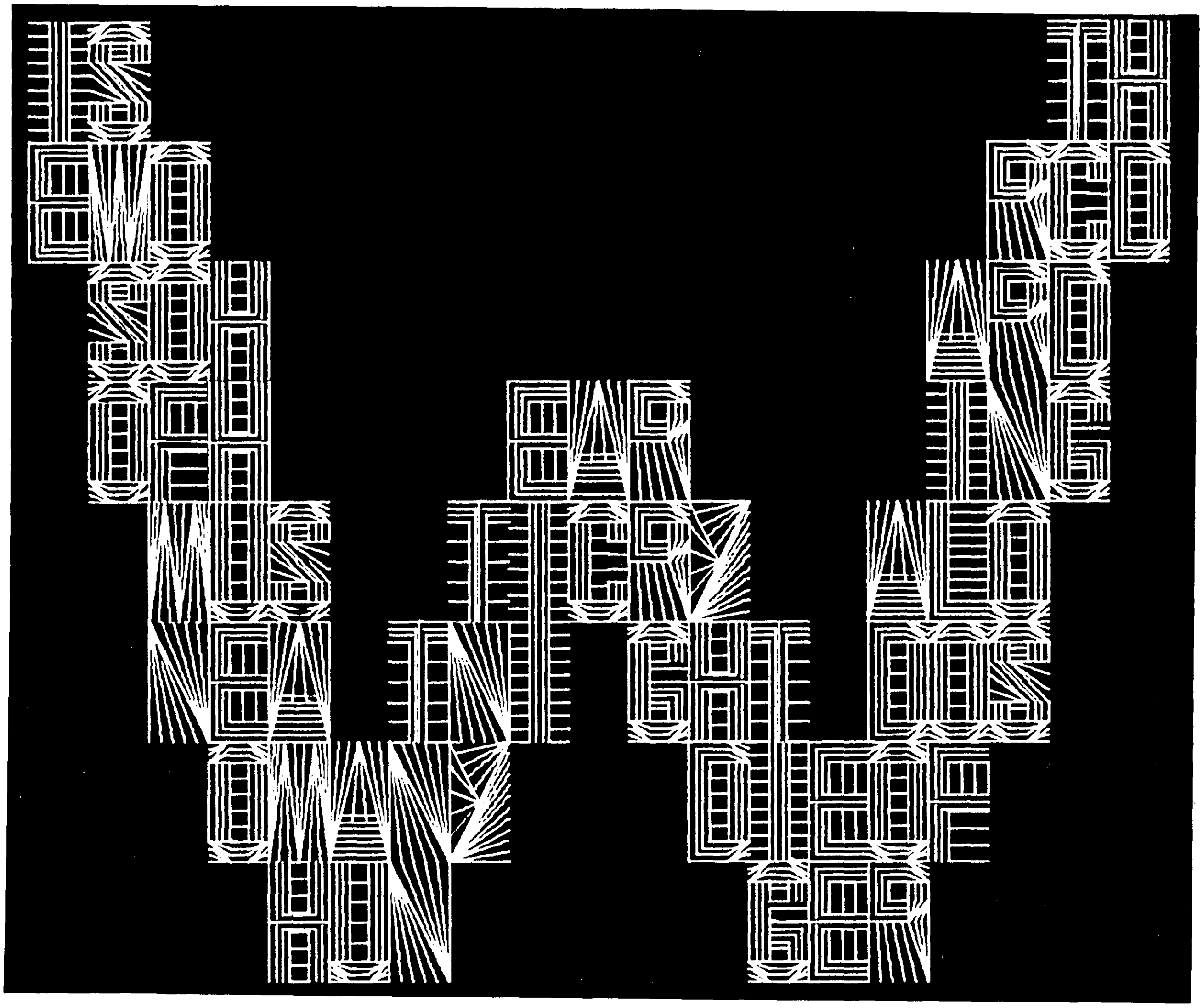
Wave to me in the peace of the night.
Jealousy is not all: It is not refreshment nor water.

Return to me in the pause of the shade,
Darling, because my spirit can chime.

Above the early flounces of the stream
Margaret, are you saddening?

— Louis T. Milic

ELEVENTH ANNUAL COMPUTER ART EXPOSITION
1973



A BEGINNING TO "WHY?" — Lloyd Sumner

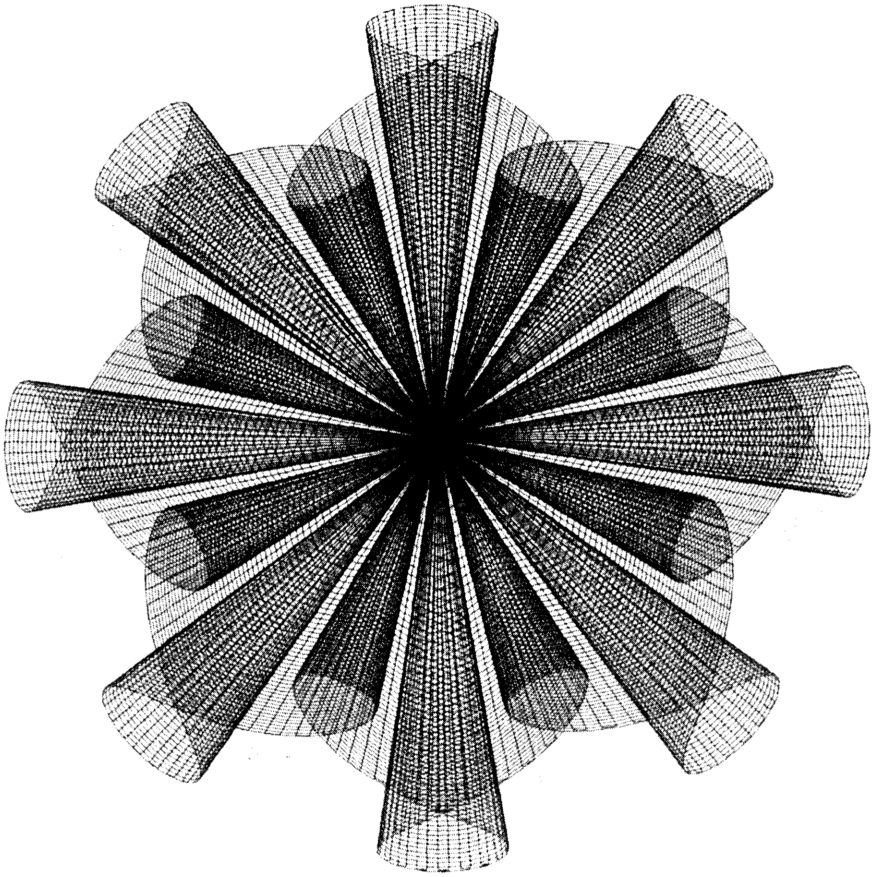
For ten years in the pages of our August issue we have held computer art contests. With the temerity of personal preferences, and the pressure of a printing deadline close at hand, we have "judged" the computer art and chosen this or that as first prize, and awarded honorable mention to the others.

The rather arbitrary standards which we have used have been called into question by more than a few of our professional friends. So as of August, 1973, we have changed the Computers and Automation "Art Contest" to the Computers and Automation "Art Exposition," and we have descended from the platform of the judges, and joined the throng who look at and may or may not enjoy the computer art which we present in the exposition. We have told the management to take the judges' platform away.

For some of the computer art, the explanation is obvious or can be inferred easily; for others, explanations are given. In a number of cases, the computer and the peripheral equipment which produced the drawings have not been specified as much as we would like, because that information did not reach us by the deadline. We would, of course, like to identify the equipment that produced the art. Supplementary information of this kind should be sent to us for publication in a future issue.

The response to our Eleventh Annual Computer Art Exposition was good. We received over 75 drawings from all over the world. We are grateful to all those persons who sent us entries. A complete alphabetical listing of the names and addresses of all persons who submitted entries in this year's exposition appears on the last page of the art section of this issue. In forthcoming issues of Computers and Automation, we hope to publish some of the art we were not able to include in this issue.

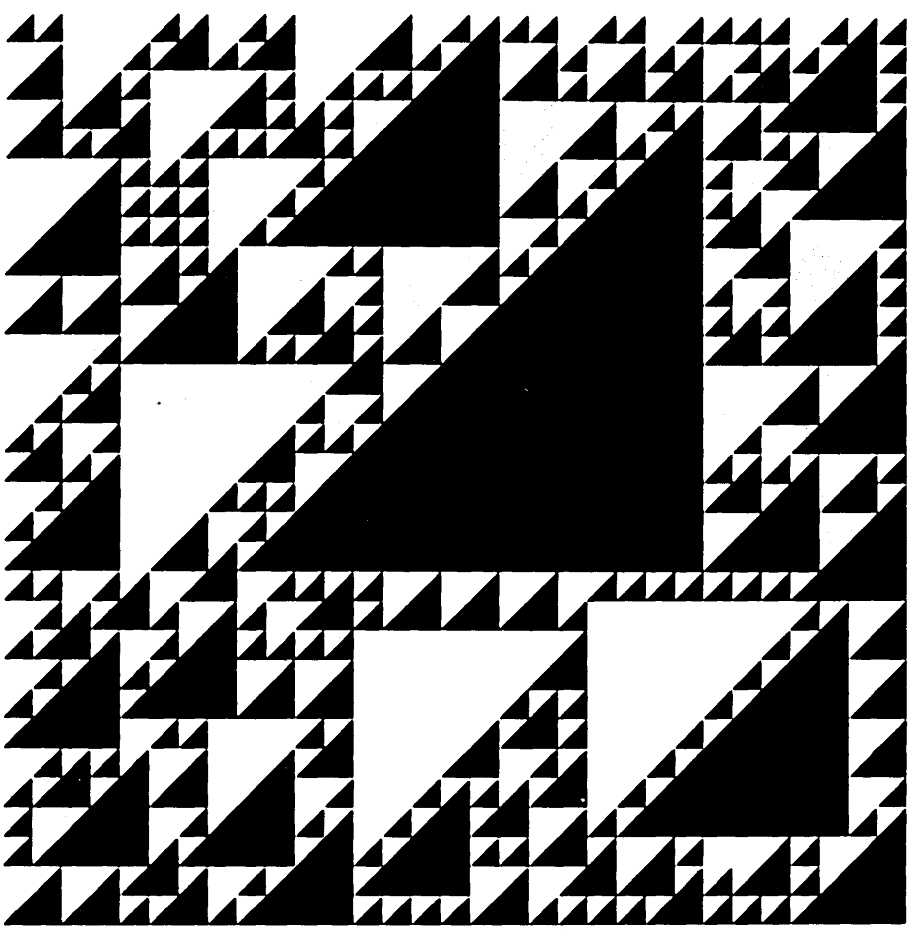
For August, 1974, we plan our Twelfth Annual Computer Art Exposition, and we cordially invite contributions of computer art from all our readers and others who are interested in computer art.



HARMONIC VARIATION, 5

— Norton Starr (U.S.A.)

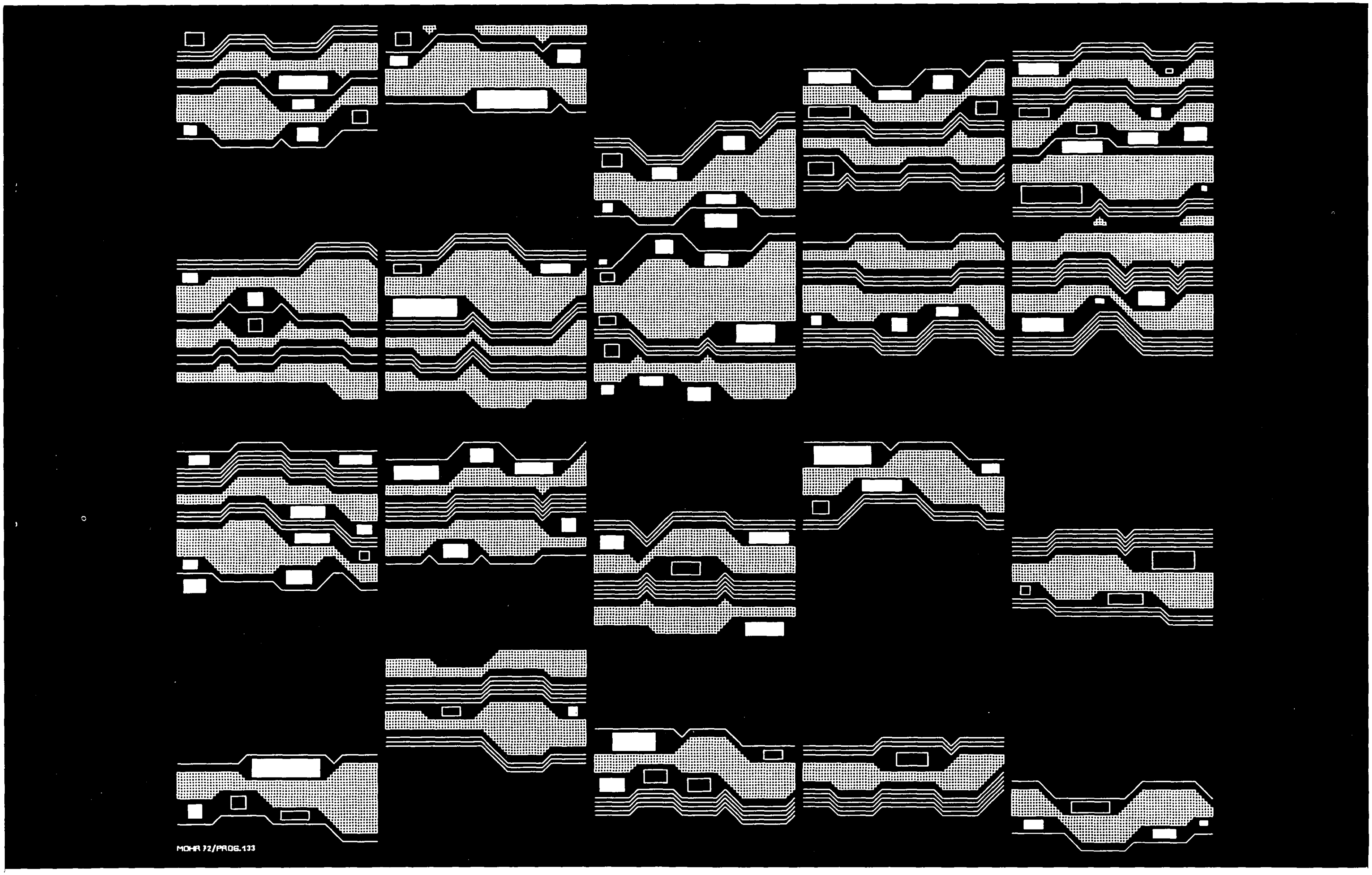
Produced in a Calcomp 30" drum plotter, this drawing was prepared on an IBM 360-75 programmed in WATFIV. All the harmonic variations arise from a common formula, which appears to represent a new class of plane curves. They grew out of attempts to realize certain shading effects.



COALESCED TRIANGLES

— Leo Geurts and Lambert Meertens (The Netherlands)

This drawing grew out of a regular pattern completely built up of black and white triangles of the smallest size. Gradually, at random spots, as many triangles as possible were clustered into larger ones (of size 2, 4, 8 or 16) until no more clustering was possible. The ALGOL 60 program was executed on a Honeywell-Bull time-sharing teletype terminal, and the drawing was rendered visible by hand from outputted coordinates.



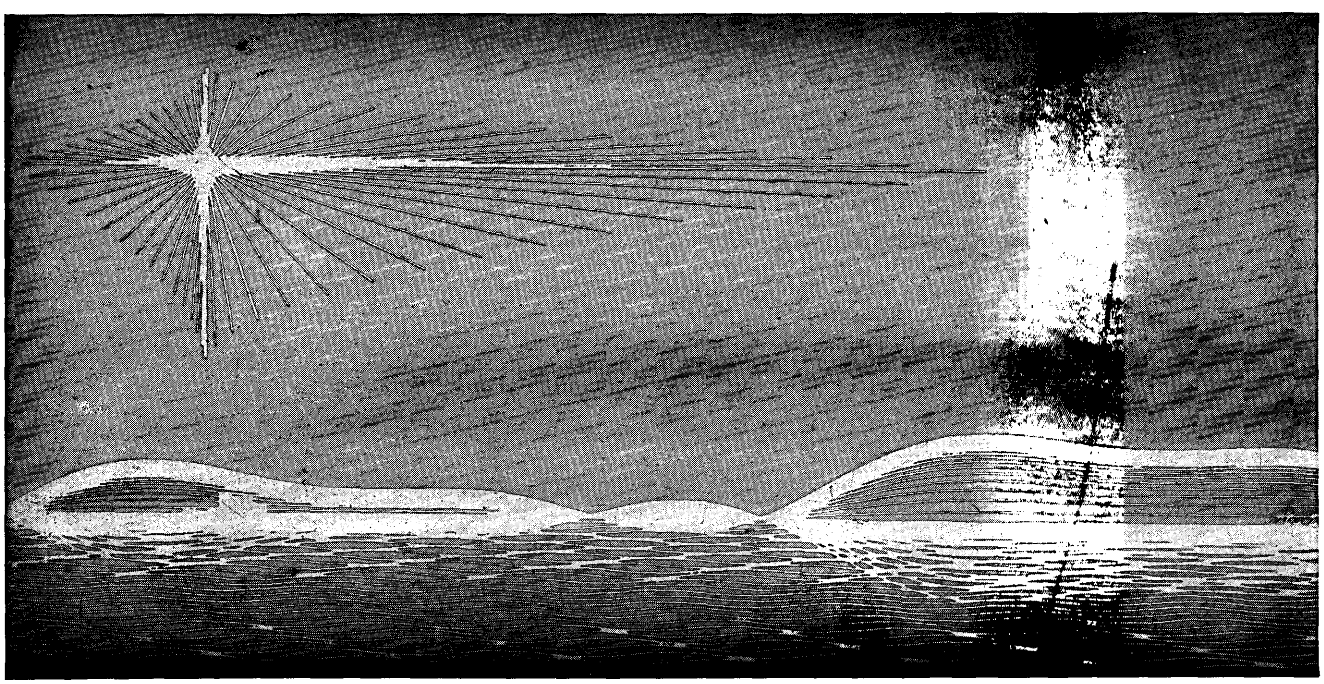
"CLUSTER – PHOBIA" – Manfred Mohr (France)

The idea of a printed circuit is basic to this program. The aesthetical rules are primary to any real (technical) functionings. The forms of the 20 matrices and their placement are based on probabilities. All forms created by each matrix are interdependent. The program was written in FORTRAN IV and run on a CDC 6600 computer. The drawings are plotted with an x,y incremental plotter.

A PICASSO DERIVATION

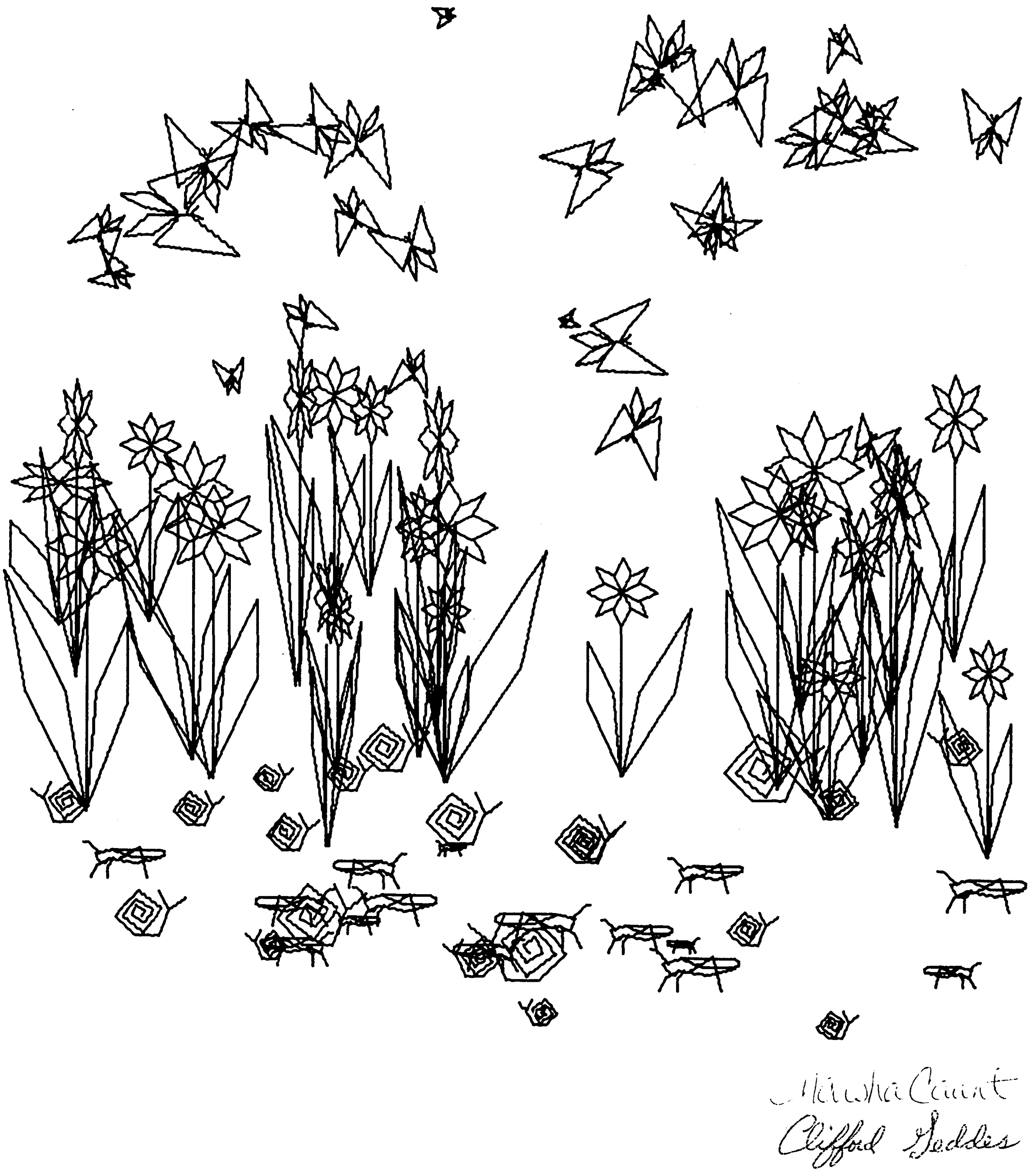
— Grace C. Hertlein

This black and white illustration from the AUTOMATED MAN SERIES, is a Picasso derivation, randomized.



NUMERICAL NOEL — Thomas J. Huston

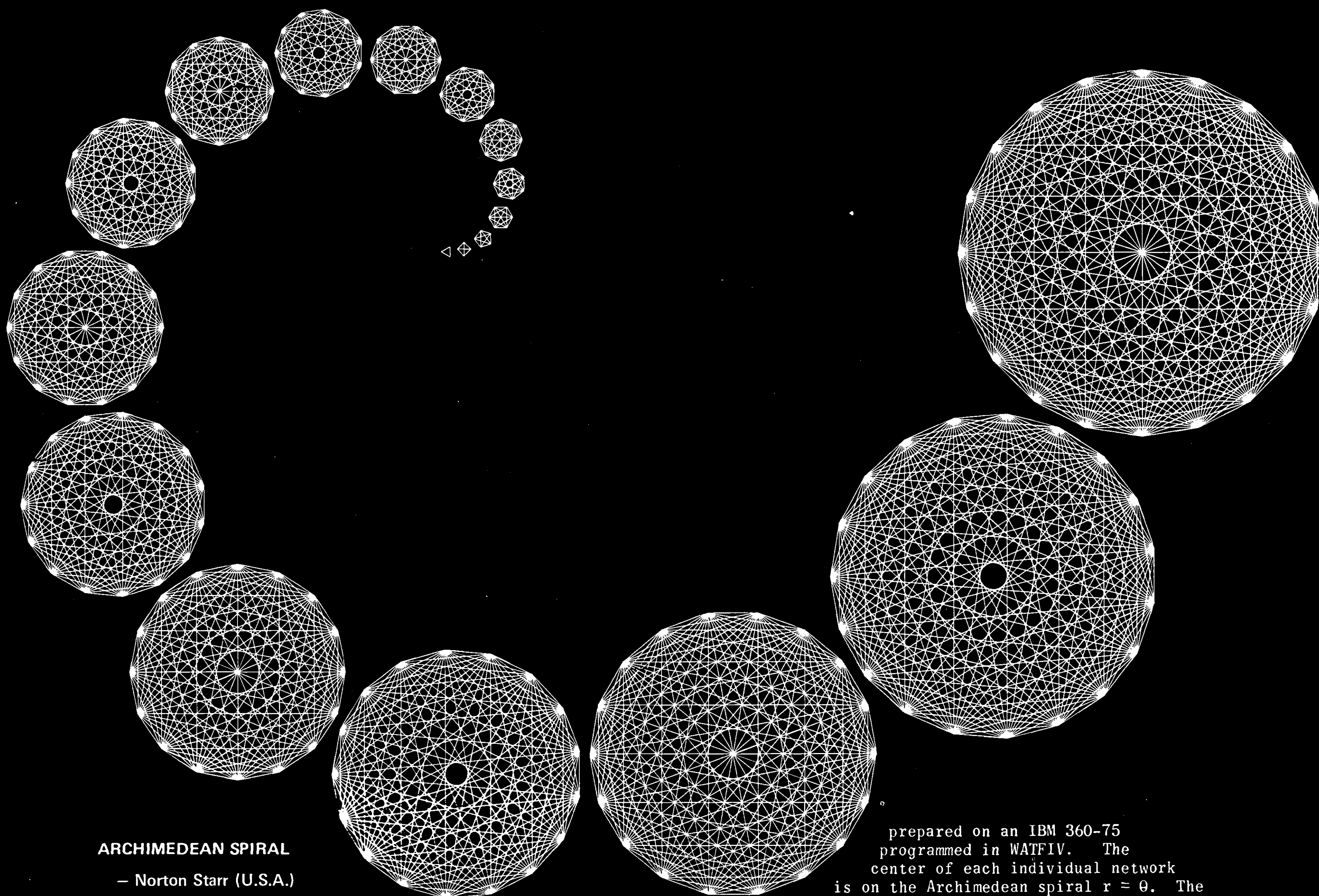
Utilizing the "Reflections" drawing with the addition of a star, the design is of a Christmas nature without a specific religious connotation. It was programmed in FORTRAN and drawn on an IBM/1130-Cal Comp plotter.



IN NATURE'S REALM

— Clifford Geddes and Marsha Caunt (U.S.A.)

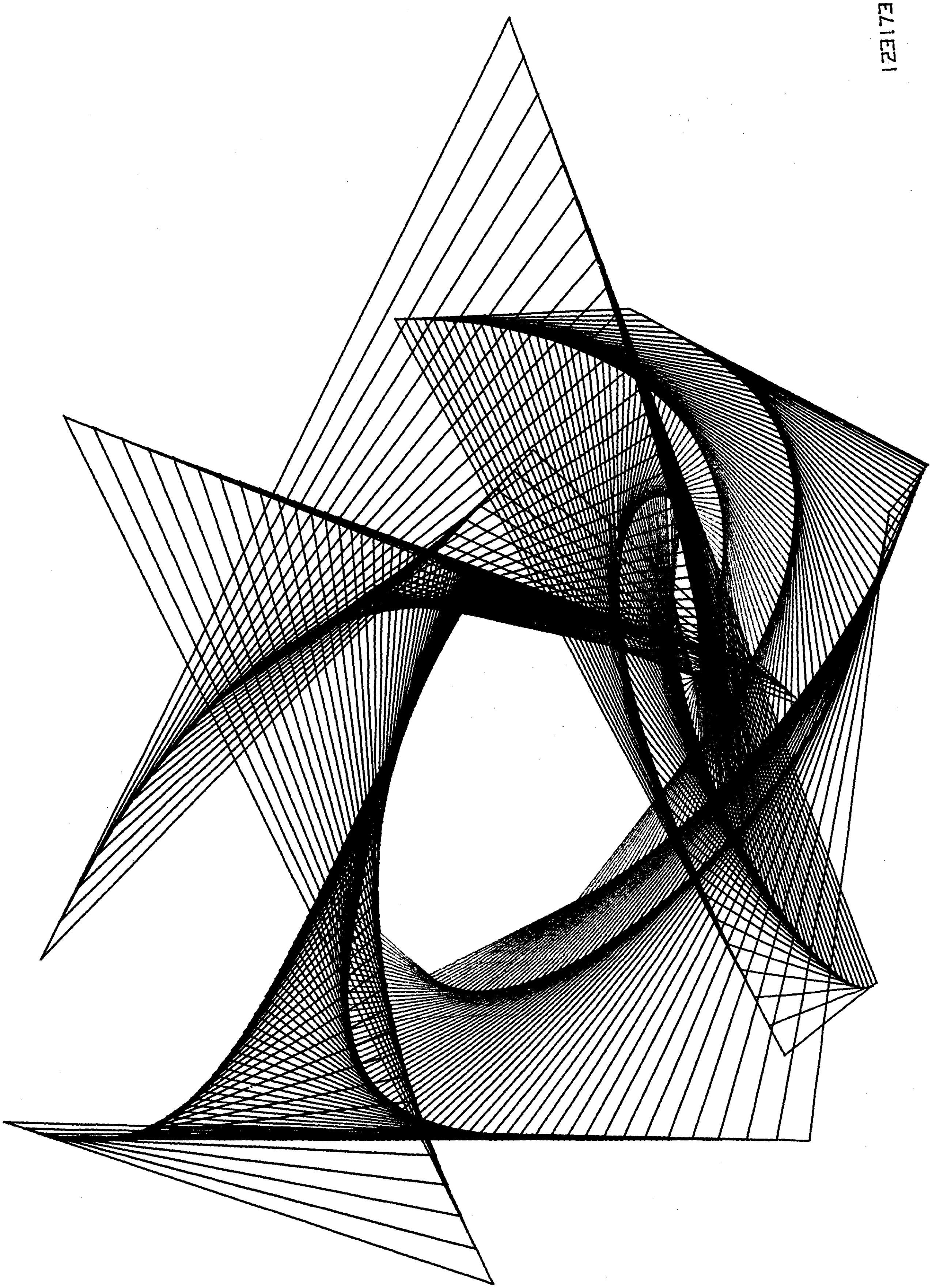
This drawing is from a beginning class in computer art at California State University, Chico, and is a response to the problem: "Continuous line designs with combinations of related components. These may be combined and varied within other design states."



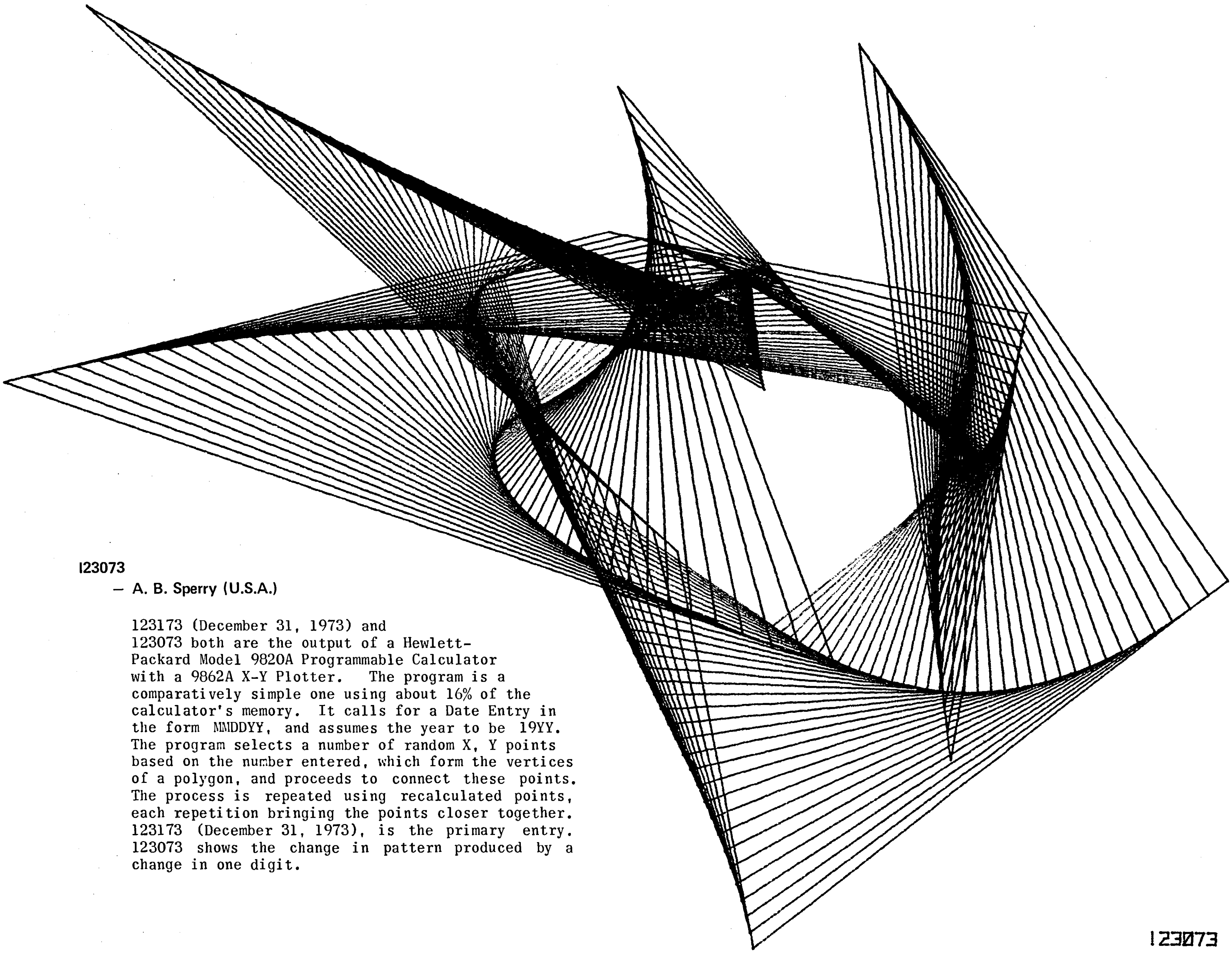
ARCHIMEDEAN SPIRAL

– Norton Starr (U.S.A.)

This drawing was produced at the University of Waterloo (Ontario) Computing Centre using a Calcomp 30" drum plotter from instructions prepared on an IBM 360-75 programmed in WATFIV. The center of each individual network is on the Archimedean spiral $r = \theta$. The triangle is centered at $x = y = 0$, while the largest network is centered at $x = 2\pi$, $y = 0$. Each network is the complete graph on n vertices, where n runs from 3 through 20, inclusive.



123173 (December 31, 1973)
– A. B. Sperry (U.S.A.)

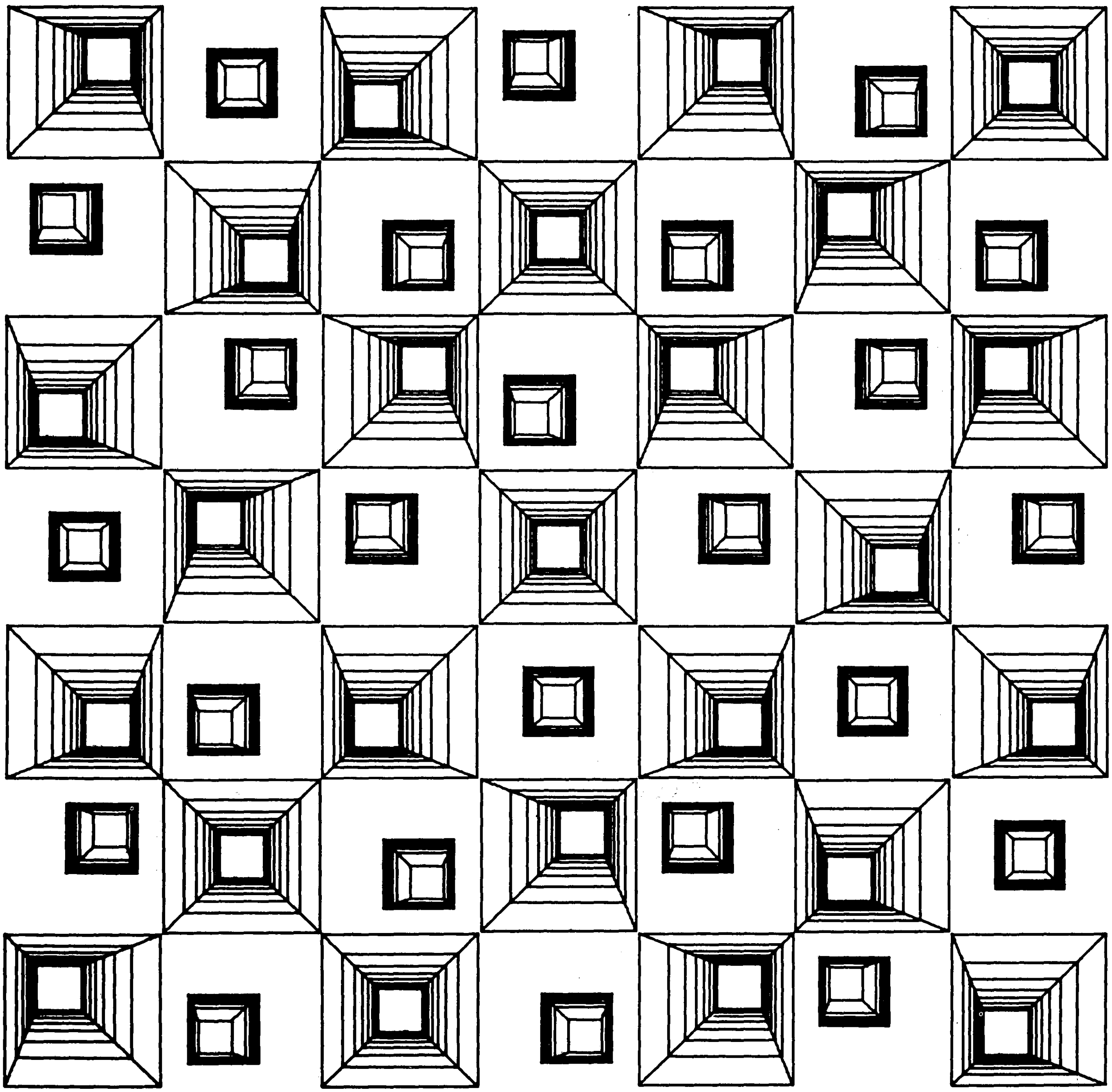


123073

123073

— A. B. Sperry (U.S.A.)

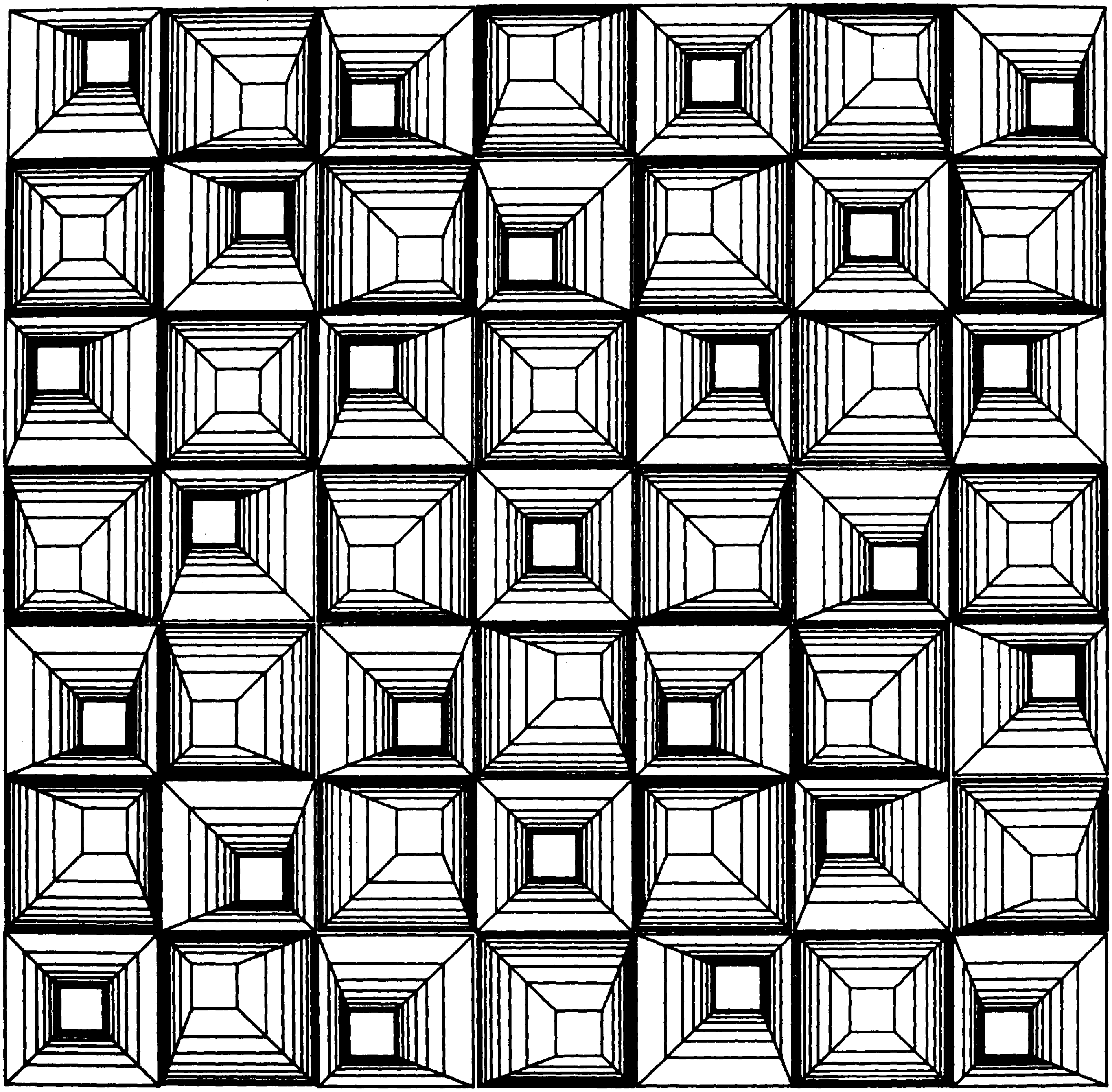
123173 (December 31, 1973) and 123073 both are the output of a Hewlett-Packard Model 9820A Programmable Calculator with a 9862A X-Y Plotter. The program is a comparatively simple one using about 16% of the calculator's memory. It calls for a Date Entry in the form MMDDYY, and assumes the year to be 19YY. The program selects a number of random X, Y points based on the number entered, which form the vertices of a polygon, and proceeds to connect these points. The process is repeated using recalculated points, each repetition bringing the points closer together. 123173 (December 31, 1973), is the primary entry. 123073 shows the change in pattern produced by a change in one digit.



DY SIU

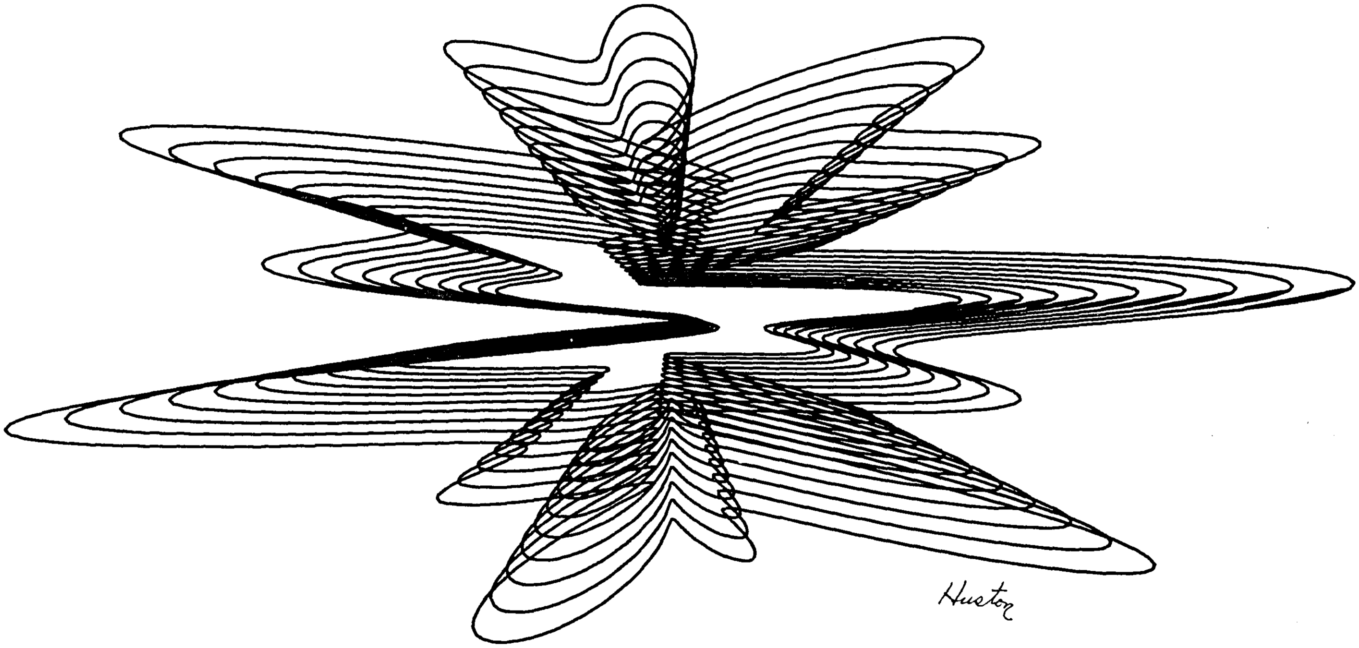
— Kenneth F. Dunker and Paul Shao (U.S.A.)

Both drawings, "Chin Hou" and "Dy Siu," are multiple perspectives of two square tube modules. Variations in modules are generated by varying the location of the viewing points for individual perspectives. These drawings were created through the use of PICS, a Fortran IV program. An IBM System/360, Model 65 and Calcomp Incremental Plotter processed the program and drawings.



CHIN HOU

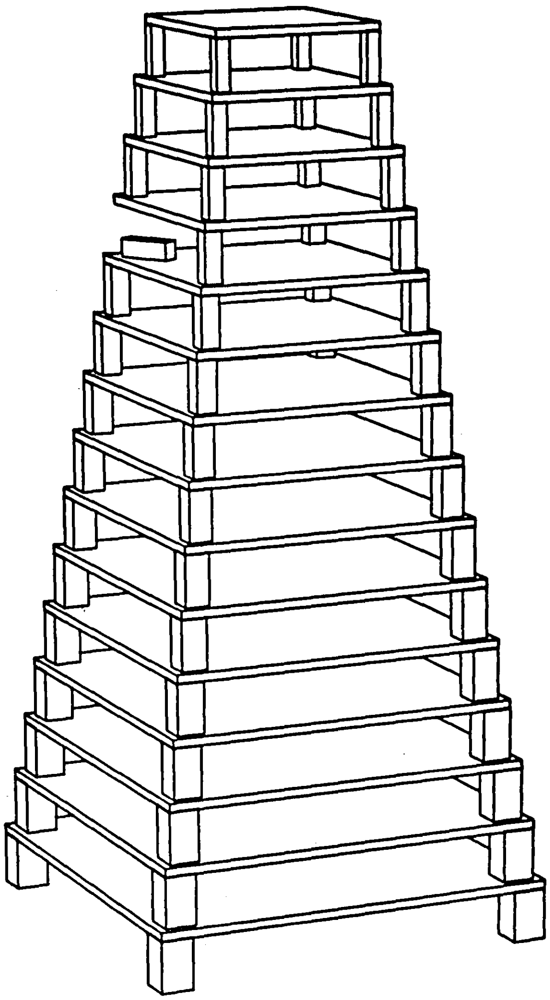
— Kenneth F. Dunker and Paul Shao (U.S.A.)



SONIC BOOM

— Thomas J. Huston (U.S.A.)

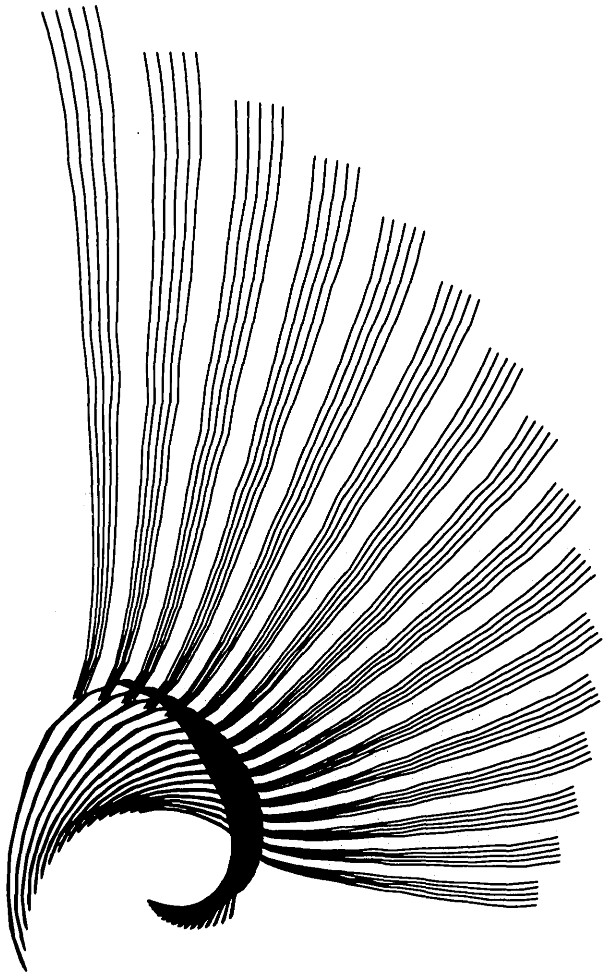
This drawing expresses our modern age of jet transportation. The design is created through the use of trigonometric functions and polar plotting methods. Multiple iterations are used to complete the illusion of depth and motion. The design was programmed in FORTRAN and drawn on an IBM 1130-CalComp plotter.



AUTOMATED CONSTRUCTION

— Daniel VanArsdale (U.S.A.)

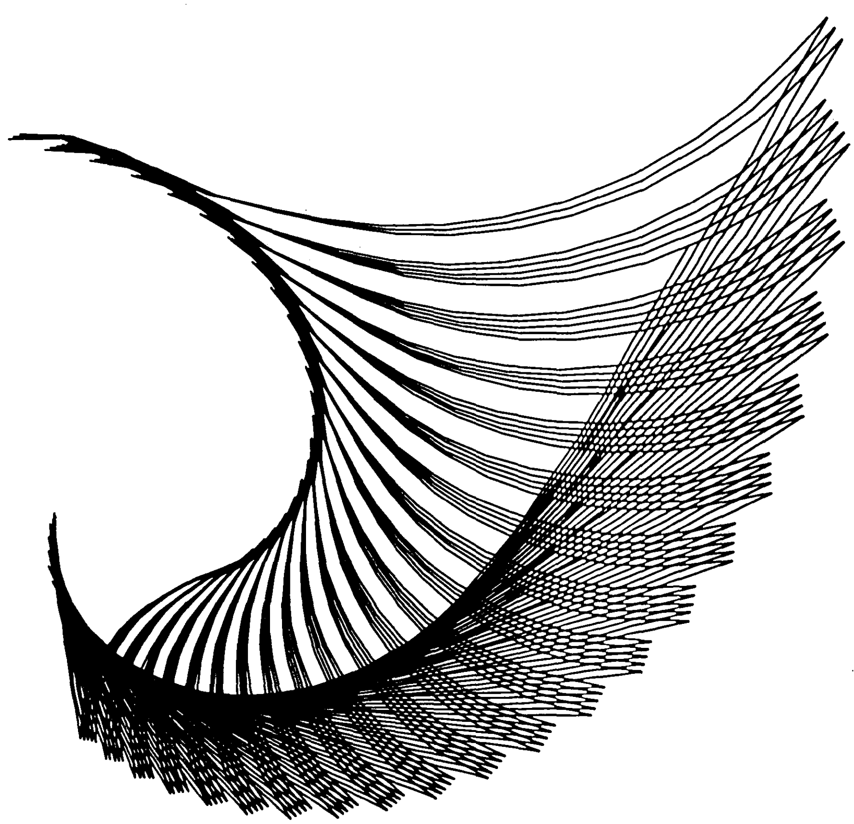
Starting with the uppermost figure in this design, identical horizontal dilations and vertical translations are effected with one exception. "Automated Construction" was produced with a DatagraphiX 4460 COM Recorder and an IBM 7094 computer and was coded in FORTRAN using general geometrical subroutines.



HELMET

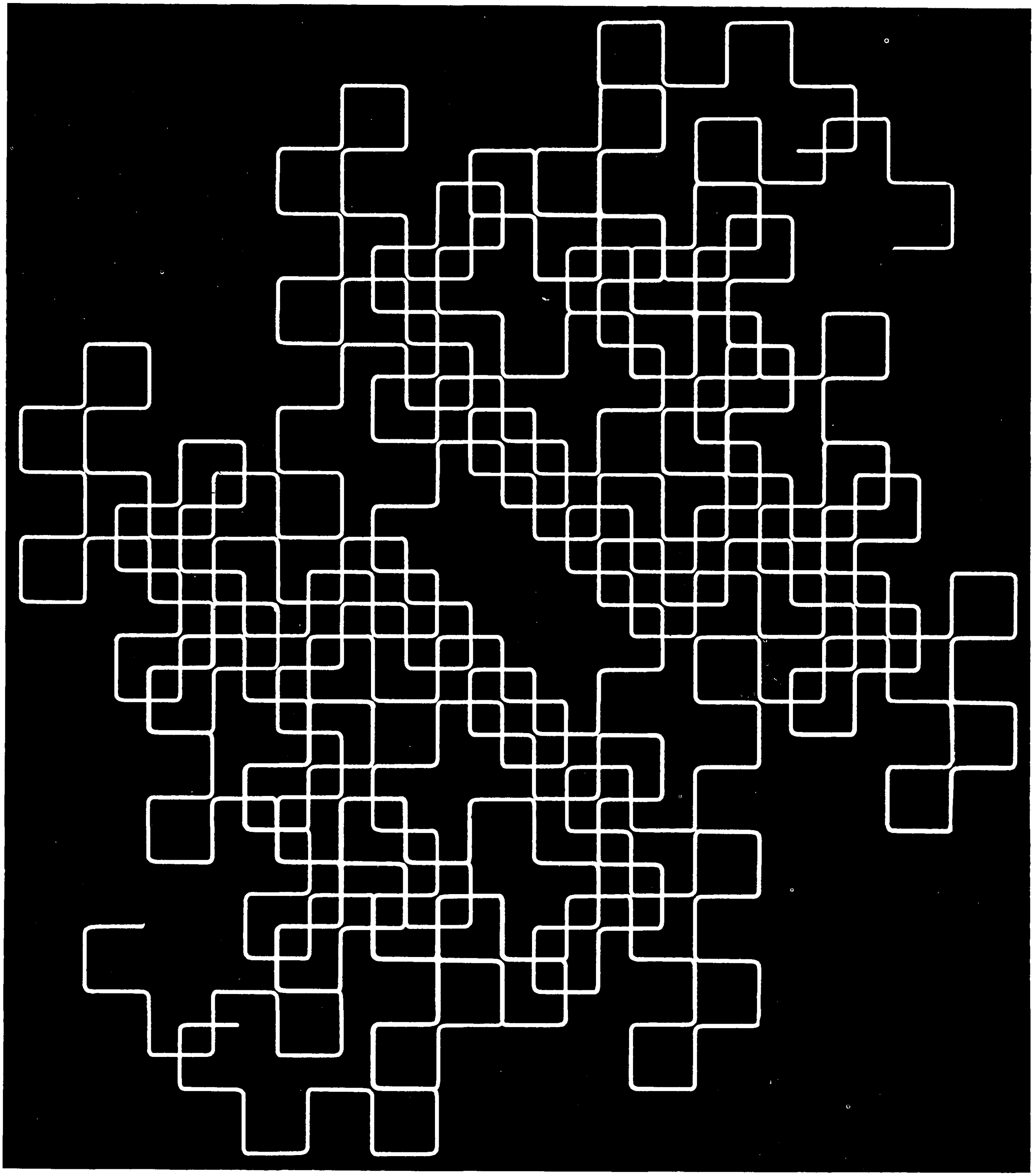
— Wade D. Shaw (England)

"Helmet" and "Waveform", shown here, were produced on an SD 4020 microfilm recorder. The program was written in FORTRAN on a PDP-15 and makes use of nested matrix transformations on hand-drawn input from a spark tablet.



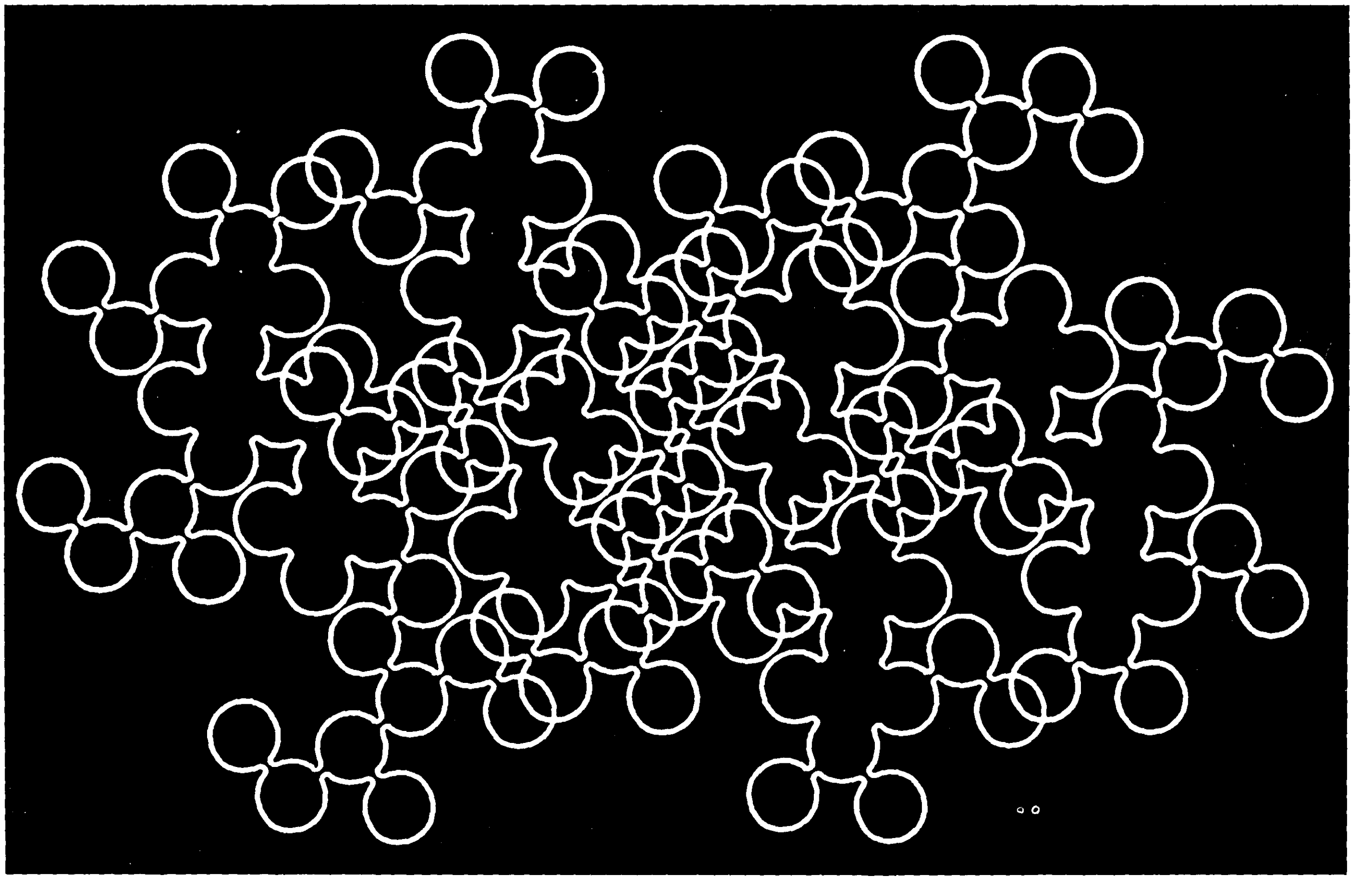
WAVEFORM

— Wade D. Shaw (England)



SQUARE AFFAIR

— H. W. Franke (West Germany)



Copyright 1972 Computra

A BIT OF THE BUBBLY

— H. W. Franke (West Germany)

"Square Affair" (page 20) and "A Bit of the Bubbly" are digital graphic productions as pen and ink drawings from a plotter and computer. These designs are of the Drakula Series.

COMPUTER ARTISTS

The following is an alphabetical listing of all persons who submitted entries in the Eleventh Annual Computer Art Exposition of Computers and Automation. The names of persons whose drawings are published in this issue are marked with an asterisk (*). We are planning to publish in the future some of the drawings we were not able to include in this issue.

*Caunt, Marsha, California State University, Chico, CA 95926

*Dunker, Kenneth F., Engineering Annex, Dept. of Architecture, Iowa State Univ., Ames, IA 50010

Eastwell, D., 14404-87 Ave., Edmonton, Alberta T5R 4E2, Canada

*Franke, Dr. Herbert W., 8191 Puppling Nr. 40, West Germany

*Geddes, Clifford, California State University, Chico, CA 95926

*Geurts, Leo J. M., Mathematisch Centrum, Tweede Boerhaavestraat 49, Amsterdam, Holland

Groener, E. John, Jr., Bldg. N51-336, Center for Space Research, M.I.T., Cambridge, MA 02139

Hashimoto, Sozo, 2-28-2 Komazawa, Setagaya-Ku, Tokyo, Japan

*Hertlein, Grace C., Computer Science Dept., California State University, Chico, CA 95926

*Huston, Thomas J., Computra, Box 608, Upland, IN 46989

*Meertens, Lambert, Mathematisch Centrum, Tweede Boerhaavestraat 49, Amsterdam, Holland

*Mohr, Manfred, 58 Bld. Latour-Maubourg, Paris - 7, France

Molnar, Vers, 54, Rue Halle, Paris 14e, France

*Shao, Paul, Engineering Annex, Dept. of Architecture, Iowa State Univ., Ames, IA 50010

*Shaw, Wade D., Basic Software Group, Science Research Council, Atlas Computer Laboratory, Chilton, Didcot, Berkshire, England

*Sperry, A. B., Editor, HP Keyboard, Hewlett Packard, P.O. Box 301, Loveland, CO 80537

*Starr, Norton, Mathematics Dept., Amherst College, Amherst, MA 01002

*Sumner, Lloyd, Computer Creations, Rt. 1, Box 38A, Draper, VA 24324

Tengstrand, Tord, Research Inst. of Swedish National Defence, SEKT. 466, Linnegatan 89, S-11523 Stockholm, Sweden

*VanArsdale, Daniel W., 5361 Perkins Rd., #5, Oxnard, CA 93030

Wu, Peter, California State University, Chico, CA 95926

Competitive Restructuring of Monopoly Situations

Dan L. McGurk, President
Computer Industry Association
16255 Ventura Blvd.
Encino, Calif. 91316

"Improvements possible in the American industrial machine by breaking open the concentrated industries to a greater interplay of competitive and entrepreneurial forces should contribute strongly to a new era of industrial expansion in the United States."

My subject consists of two basic points: first, whether the Industrial Reorganization Act addresses a real problem in the American economy; second, whether all concentrated industry structures are economically necessary, or whether we could significantly improve our economy and its performance by making a conscious, systematic effort to create more competitive industry structures and practices in specific, selected areas where one-firm or few-firm dominance has been persistent for decades, and produces major effects in the market.

An Open Competitive Economy

Let me state my basic position at the outset. My experience as a salesman, manager and chief executive in one of the most dynamic of American industries, as an individual now responsible for work with numerous companies in this industry, and as an active participant in the economic, social, and political life of this country, impels me to believe that an open, competitive economy is likely to be a strong economy, and that this economy and this society could be significantly better if it were more competitive in some of its basic industries. This experience also leads me to believe that the current state of affairs is not unchangeable. It is a construct of the men engaged in economic and political affairs in this country. The corporate structures that exist today can be altered, shuffled, and reorganized with a facility which might amaze some, if the need and an incentive were clear to the senior management of the corporations involved.

Background for the Views Here Presented

Perhaps I should state the background that leads me to these conclusions. I do this only to indicate my business involvement; this background is not unrepresentative of a number of other people in many respects, particularly people in the computer industry.

After attending West Point and later teaching economics there, and after service experience in the Air Force, I began my business career in the computer industry in 1958 with a small joint-venture company (TRW Products, Inc.) which developed a product for the utilization of computers in control of industrial processes. This small company pioneered the application of modern digital techniques to analyzing, controlling and improving the performance of continuous and batch-process plants in the oil, petrochemical, cement, electric power generation, and metal working industries. We introduced one of the first digital computers made entirely from solid-state components.

In 1962, I became associated with Scantlin Electronics, a small publicly-held company. This company developed a unique on-line, real-time, special-purpose, time-sharing information system for the stock brokerage industry. Although utilizing standard commercial digital computers, we created a unique time-shared system with direct communications facilities to over 1,000 locations simultaneously, at a user cost that was extremely attractive. In addition, the company developed an on-line typesetting system for stock market tables, which was distributed throughout the United States by United Press International.

In 1964, I joined Scientific Data Systems, a new small company which during 1964 shipped $20 million worth of general-purpose, digital computer systems. By 1968, this company was manufacturing at the rate of over $100 million per year, and successfully and profitably delivering a whole line of advanced, scientifically oriented general-purpose digital computers, along with a complete line of peripheral equipment. In 1969, SDS merged with the Xerox Corporation.

I had the responsibility of being chief executive officer for SDS before and immediately after its acquisition by Xerox. I left Xerox Data Systems in 1970. In 1972, I became President of the Computer Industry Association.

The 15-year period described above provided considerable opportunity to see the American free enterprise system at work, and to see some of the limitations which hinder it today. Put another way, the industry in which I have been fortunate enough to spend my career demonstrates very clearly both the potentials for a competitive industry, and the problems of industry concentration.

Source of Major, Fundamental, Technical Innovations

To illustrate: most of the companies in the computer industry today were started by a small group of technically competent individuals with a relatively limited amount of capital and an innovative idea for the production of computer systems or some component thereof. Many of these earlier companies

Based on a statement regarding the Industrial Reorganizational Act made before the Subcommittee on Antitrust and Monopoly of the United States Senate, May 7, 1973.

were acquired by larger corporations, and were the foundation of their computer activities.

I suspect that most Americans are not aware that the skill and entrepreneurial drive of these small organizations have introduced major, fundamental technical innovations to the computer industry.[1]

This active upthrust of smaller companies has propelled technical innovations into the market and into user hands. We have greater capacity and lower cost[2] in data processing in substantial part because of this process and the continuous formation of new ventures to exploit innovation.

Capital Requirements

It hasn't taken massive concentrations of capital. It has required no major federal subsidies. The process has imposed no major strain on the financial institutions of the country. We have been blessed with the absence of a federal regulatory body attempting to make a non-competitive "utility" out of the industry. But to properly exploit these innovations does require large sums of capital, because of the market factors described below.

One Company Dominance

Despite these many innovations, and the great ferment among new companies, we have become all too familiar with a market structure problem which might be termed "hangover concentration". The major application of digital computers (in dollar volume and number of machines, if not in technologically interesting areas) has been in the traditional business data processing, or accounting, functions. These functions had been carried out by punched-card accounting machines prior to the invention of electronic data processing. The punched-card accounting machines business has been characterized by concentration since before 1932, when the Government first sued the International Business Machines Corporation for monopoly and restraint of trade.

Control of the Market Place

Put simply, the enormous dominance of IBM in business accounting machines has carried over into a comparable dominance of the business computer industry. As a result of this dominance, enterprising and innovative companies have often found a ceiling on their size of around 2% of the applicable market, or have been acquired by very large companies. By its control of the market place — not by superior technical or productive skill — the dominant firm in this industry has been able to make strong competitive counter moves to any company that begins to threaten its installed base of products.

Insertion of New Technology so as to have Maximum Impact on Competition

We do not wish to suggest that the dominant company is entirely lacking in technical skills. Not by any means. It has been adept at adopting technological innovations at the point where they started to receive widespread customer acceptance. Its development budget is clearly larger than those of all the other firms in the industry put together. Notwithstanding this, those within the industry know that the company with the largest market share has not usually been the leader in the actual introduction of new technology. The explanation of this is partly the lower efficiency of development in a large company, partly the fact that new technology is only inserted into the market place when and if it has minimum impact on installed equipment and maximum impact on competition.

On the other hand, the smaller companies in the industry must introduce any technical advance they are able to discover, in order to enhance their market position at the earliest possible time. Without the prestige and market control of the dominant firm, others have to play all their cards as soon as available; thus new technology introductions per dollar of development are higher in the smaller firms.

The Problem of Market Control

The problem, in substantial part, is and has been a problem of market control. Let me illustrate briefly just one aspect of this problem so that the committee gets at least a little insight into what market control can mean. The computer industry is a capital goods industry. In most capital goods industries, the ordinary transaction is a sale. Not so in this industry.

The user of business data processing machines has been accustomed to renting his equipment, since that is the mode of equipment acquisition that the dominant firm has been promoting within the accounting machine industry since its early days. Despite 1956 Consent Decree provisions aimed at putting purchase of machines on an equivalent basis with lease, the dominant firm has been able to maintain a market environment favoring renting rather than purchase. A major result of this factor in the market is to slow down any increase in market share by smaller firms. As a new, small firm increases in size, it must raise relatively large amounts of capital to finance the ownership and lease of the increasingly large number of machines which it is shipping. Both it and its financial backers must be aware that the dominant firm can have a big impact on its plans. The net effect is to make it difficult for dynamic firms to get the capital to finance growth at a rate justified by customer acceptance of their products. As a matter of fact, the dominant firm paid out in dividends last year more money than the rest of the industry was able to raise in capital.

Orientation to Leasing

Any new firm in a market must deal with a number of factors to expand its participation in the market. I do not mean to suggest that every new firm will or should succeed, or will make it big. We all know there are many trials and errors in any line of business. The experience of those in this industry is that but for the orientation of the market to leasing, acquiring adequate capital and increasing market participation would be substantially easier. An unnecessary capital barrier to growth, and to a competitive industry, exists.

I am aware that other witnesses before you have suggested that whenever a firm is big, or dominant — the two terms are not necessarily the same — it is always because the industry requires large amounts of capital for relatively few production facilities, or the dominant firm just does a better job for customers than everyone else. You would have a hard time getting agreement on this from technically progressive firms facing a firm possessing an entrenched market position and determined to hold that position with a wide variety of ingenious marketing strategies. Doing a job on your competitor is sometimes, but, let me assure you, not always the same thing as doing a good job for the customer.

Economics of Scale, and Dis-Economies

From my industrial experience, economies of scale in computers are possible in these areas: production, development and marketing/financing. Production economies are largely associated with semiconductors, since long runs are necessary to lower costs; however, most smaller manufacturers are able to design standard (common use) components into their products to overcome this problem. Development economies are possible because amortization can be spread over more units of production — which is of course true in many industries, although development costs tend to be higher (5% to 8% of revenues) in the computer field. Two billion dollars in cash and equivalents and a sales force larger than all others put together is the key to scale economies for the dominant firm in this industry, however. Whether the ability to get users to take a particular item of equipment with easy financing can be considered a user benefit or value is open to question in my opinion.

On the other side are the dis-economies of scale in administration. The larger an industrial organization the more expensive it is to administer; Parkinson's law is a real law. The fact that these dis-economies are real appears to be indicated by the fact that the price differential between the dominant firm and the smaller competitors in this industry is approximately equal to the profit differentials between them.

Dynamic Technology Funneled into an Old, Concentrated Industry Structure

So, in this industry, at least, we have had a new and dynamic technology inherited by and funnelled into an old, concentrated industry structure. Forces of change are at work in the industry. But they are changing the industry structure very slowly, and against powerful resistance. Concentration of control and market power in the industry create constant turmoil and outcry in it. Voices call for a change in the single-firm dominance situation, or strict government regulation. As a business man dedicated to the free-enterprise system, I am unalterably in favor of any course other than Government regulation. It is my earnest hope that a solution to the problem of concentration in this and other industries can be established in such a way as to minimize detailed, specific governmental interference in the economic system.

Thus far, I have been speaking primarily as a participant in industry. Even a short-sighted player in the daily hurly-burly cannot help occasionally asking himself whether the things so important to him really matter to the country. In this case, and, I presume to say, in the case of other major industries such as are listed in the Industrial Reorganization Act, the answer, I think, is this: the market structures and the performance of these industries are very important to our economy. Just one of the industries the bill addresses illustrates this. People who use computers now pay about $13 billion annually for electronic data processing goods and services. The uses of computers expand at a rate of about 20% per year.

The Largest Industry in the World

Professional forecasters and other types of visionaries confidently predict that the computer industry will become the largest industry in the world within the next decade. In addition to its giant predicted size, the data processing function is becoming a kind of central nervous system in the economic body of our country. At the present time, the American computer industry also enjoys world technological leadership in the computing art.

Serious Inefficiencies

Whatever other witnesses have suggested, my own experience and observation have led me to believe that the very large corporations that are characteristic of concentrated industries normally have serious inefficiencies in production, development, administration and distribution. These inefficiencies invite foreign industries to compete effectively both in the United States and throughout the world. In the United States, the effects are often hidden by the market power held by those large companies, or in some cases by economies of scale in production, development or marketing. That is, a large producer can produce less or price his product higher than a fully competitive market would dictate, and protect his position to a significant extent by the use of his strong market power against smaller, perhaps more efficient, competitors. The dominant firm or firms may even succeed in bringing smaller firms in line with its own "don't-rock-the-boat" policy.

Eventual Large-Scale Importation

While this might be successful for some period of time, eventually such concentrated industries tend to be hit by large-scale importation from other countries. Three of the industries mentioned in this Bill appear to fall within the class of such mature domestic industries: motor vehicles, iron and steel, and electrical machinery and equipment. Another three of the industries mentioned would appear not to have been impacted by imports because of the relatively high transportation costs involved. The computer industry, although concentrated, is still not sufficiently mature, and is sufficiently advanced technologically that imports are not yet an important factor. Some day, if structural changes are not made, imports will be significant. The less we have developed our market, the more our rivals from abroad will develop it.

In the computing field, the proportion of domestic shipments which result in a positive trade balance appears to be about 20% at the present time.[3] The dominant firm reports less than that, since it has almost as much of its production overseas as in the United States. But the smaller firms tend to have a higher percentage of revenues generating exports since they have been unable to move as much production overseas.

Whether these concentrated industries have a harmful effect on America's balance of payments, as I suggest, it is clear that their inefficiencies and rigidities have harmful effects on our domestic economy.

In short, I suggest that the stakes are too high to trust that the usual inefficiencies of size and the rigidities which appear to flow from excessive economic concentration would not do damage to the growth and performance of the data processing industry of the United States, and to other industries within the purview of your bill.

But can anything be done about concentrated industry situations — either those listed in the Industrial Reorganization Act or others?

Reduction in Concentration in the Computer Industry

There is no question in my mind but that a reduction in concentration in the computer industry, and so far as I can see, in other industries named in the bill or within its purview, is technically feasible. You should recognize that the corporate form of business organization, and the particular outlines of specific corporations, can be considered as a kind of frame work for productive enterprise. What is important is the work done. You can adjust the supporting corporate structure in numerous ways.

For example, almost every large corporate enterprise goes through cycles of centralization and decentralization as it attempts to grapple with the problems of growth. The centralization phases are always associated with attempts better to control and administer a corporate entity so that all parts will be pulling in the same direction, and the total corporate goals are harmonized. This is often followed by a cycle of decentralization, where the large corporation attempts to create the advantages inherent in smaller corporate structures, by putting top management closer to the real production, development and marketing problems, and thus bring about an increase in efficiency. An industrial organization of large size tends to be a changing compromise between the advantages of centralized control, and the efficiencies of decentralized administration.

Restructuring

Put another way, corporate managers regularly construct, dissolve, alter, and adjust corporate structures. If the inventive genius of American entrepreneurship could be unleashed to solve the problem of viable restructuring (a decentralization without a corporate overseeing shell) in selected situations, then there is no question but that viable economic entities could result. The result of antitrust actions in the past (the Standard Oil, DuPont, and Clorox cases) indicate that such a restructuring can be economically sound. And the alternates — Government regulation or continued economic concentration — are far more onerous than a restructuring of industry.

This Bill proposes that an administrative organization would attempt to restructure these industries from the outside when a rebuttable presumption of monopoly has been proved in the courts, or when some other test of monopoly has been proven.

One of the problems with our current antitrust activities is that such a proof of monopoly takes an inordinate amount of time, and at this point in our history such time is not available. Having statutory definitions of monopoly is helpful, but would not appear to significantly reduce the size of the legal effort required for court proof. This is particularly true when one considers the enormous legal power available to, and used by large corporations to delay, obfuscate and resist the efforts of the Justice Department to win large antitrust cases.

Incentives to Organize Restructuring

It would appear preferable that the management of the companies in the concentrated industries be given incentives to organize the restructuring themselves, so that the restructuring would be taking place from the inside rather than from the outside. I would suggest that you consider means of establishing incentives which would make a restructuring more palatable to the management of these concentrated companies than the alternatives available to them. I might suggest, for example: tax incentives such as the graduated corporate income tax recommended by Justice Brandeis many years ago; a more firmly administered restriction against the total size of undivided profits, such that management would be faced with the choice of restructuring or paying out so much of their earnings to the stockholders that continuous tapping of the capital markets would be necessary; even an administrative designation of monopoly with the requirement of restructuring might accelerate the solution and leave the details to the management of the entities involved.

A very important point is that restructuring should not be considered a punishment; unless it creates serious dis-economies of scale, customers, employees and stockholders are either as well or better off than before. Only the very top management loses some personal power and perhaps prestige.

A New Era of Industrial Expansion in the United States

In conclusion, let me say that we believe the problem you address to be of considerable importance. We know that any legislative device that might be fashioned would have to be carefully fitted in with existing law, and should utilize natural economic forces to assist in the performance of its task. On the other hand, improvements possible in the American industrial machine by breaking open the concentrated industries to a greater interplay of competitive and entrepreneurial forces should contribute strongly to a new era of industrial expansion in the United States.

As men who give our work lives to American industry, supporters of families whose welfare depends on American industry, and participants in the economic life of this great and growing nation, we have all our assets tied up in the success of the competitive, free enterprise system. We should not settle for less than the most productive organization of markets which we can attain. We understand that this, basically, is what you are about. We hope you pursue this effort carefully and constructively. We will give you any support and assistance within our means.

Footnotes

1. Among these commercial innovations were:
   1) First general-purpose electronic digital computer — Eckert-Mauchly Associates (later Univac)
   2) First magnetic drum memory — Computer Research Corp. (later NCR)
   3) First magnetic tape auxiliary memory — Eckert-Mauchly Associates (later Univac)
   4) First commercial solid-state computer production — CDC
   5) Linear programming — Bonner & Moore
   6) First commercial integrated circuit computer — Scientific Data Systems (later Xerox)
   7) Commercial keyboard-to-tape or disc-data-entry — Mohawk Data Sciences, Computer Machinery Corp.
   8) Generalized time sharing — Rand Corp., Mass. Inst. of Techn., Dartmouth College
   9) Virtual memory — Burroughs Corp.
   10) Digital plotting of computer output — California Computer Products

2. Another very large — perhaps the most important — factor in the reduced cost of computing, particularly in the last ten years, is the amazing cost reductions in solid-state components made by the semiconductor companies. Aside from architectural innovations, which have maximized the use of these modern circuits, the cost of semiconductors has been reduced about 30% each year for the last decade. This reduction in cost of components is what has made possible the enormously reduced cost of "hardware". The cost of "software" has moved in the opposite direction.

3. Department of Commerce figures for 1971 indicate $1.143B positive trade balance for electronic data processing, out of a total estimate of $5.6B of industry domestic shipments. □

How to Read by Computer

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"There were three statistically significant shifts in the subjects which film critics discussed during those 35 years."

"Read faster," say the ads. "Double or triple your speed. Understand and remember more." Well, you can do that, if you like, or you can let your computer do your reading. A computer can "read" faster and "understand and remember" more than the average person who has not taken a speed reading course. This use of the computer has important potential — not for reading Love Story or Jonathan Livingston Seagull (which you do for pleasure) but for a different type of reading — getting certain kinds of information from texts.

Analysis of Film Criticism

I analyzed the contents of film criticism which appeared in national magazines (Newsweek, The New Republic, Commonweal, The New Yorker, The Christian Century) during the years from 1933 through 1967. These 175 articles contained 5,536 sentences with 131,066 words. I wanted to find out what film critics for these five magazines said about films in their articles and whether their interests changed over the years.

Identification of Themes

Earlier, I had conducted a pilot study which identified these themes (or subjects discussed by the critics): "Audience Reaction," "Inter-media Comparisons" (films compared to other media, such as books), "Intra-media Comparisons" (films compared to other films), "Plot Description," "Theme" (in the literary sense), "Technical Effects," "Star," "Direction," "Producer," "Writer," "Acting," "Film Company," and "Genre".

I read all the articles (selected as a random sample) for the purpose of confirming the continuing existence of these themes and the absence of others. At one point, it seemed that "Cost" might be useful, but I later discovered it occurred only six times in the entire corpus and it was thus discarded.

Identification of Terms by Tags

Assuming that these thirteen tentative theme categories were appropriate ones, I began to assemble a dictionary, that is, a list of words (called tags in computerized content analysis) used by critics in discussing these themes. The dictionary for the theme category "Technical Effects," for example, was begun by compiling a list of technical terms, such as, close-up, long shot, zoom, found in Raymond Spottiswoode's standard work, The Grammar of Film (University of California Press). Additional terms were found by examining the text and glossaries of other books written about the technical aspects of film and by consulting a thesaurus.

This process was repeated for each theme, using different sources, so that the final dictionary listed all possible terms in each theme category. All variations of a word had to be listed. Other criteria for the selected tags were that no single tag appears in two or more theme categories, and that no tag is included which does not appear at least once in the corpus.

Coding

I then began to code the articles. Coding means to insert a symbol into the text in order to simplify the computer program. For example, to list in the dictionary category, "Star," the names of thousands of movie stars from Bud Abbott to George Zucco would have made a dictionary of cumbersome size. Therefore, it was simpler to code the corpus by placing a symbol before each star's name or before a pronoun referring to him. Thus, I used the number (1) before the name of an actor and the number (2) before the name of an actress. Although I made no study of the numbers of actors versus the numbers of actresses, the information is there for future study, if and when I choose to use it. Thus, I tried to think ahead so that I would never have to do the coding over. To assure accuracy, I had another person re-do a random sample; the results were the same. The numbers chosen were simply a typographic device; any other symbol available to the keypunch operator would have done as well.

Pilot Test

When the computer encountered this coded number, it was programed to record this tag under an appropriate category, such as "Star". Similar methods of coding were used for "Plot"; the antagonist was coded (7) and the protagonist was coded (8). I punched up some sample articles and the operator ran the program through the computer on a trial run to "de-bug" it.

Keypunching

Satisfied with the results, I proceeded on to the full study. Filmak and Xerox copies of the magazine served as work sheets. After these were coded, their contents were copied verbatim on IBM cards by keypunch operators and the cards were verified. This process was expensive for I received estimates from keypunch services ranging upwards to $5,000. Finally, I hired operators on my own for $3.00 an hour although not many wanted the job — it apparently is easier to punch numbers than letters. The final cost for keypunching was $1,600.

Running

Ready at last for the final run, program cards were fed into the IBM 360 computer first. The computer translated their instructions (written in COBOL) into computer language. This was done by a programmer who worked with me through the entire study (the total cost for his services was $500). I was impressed at this point that computer studies are not one-man operations; many experts in many areas are needed.

Second, the dictionary cards were fed into the computer and stored on a disc for easy random accessibility.

Third, the cards containing the material from the articles were fed into the computer, which "read" every word (that is the group of letters preceded and followed by a space) on each card and compared it with the tags in the dictionary. A match between a word on the card and a word in the dictionary resulted in a tally being marked under the appropriate category such as "Star" or "Producer".

This matching process took about one second for each card containing ten words. The entire program took 5½ hours of computer time including the expected "blow-ups" when minor bugs occurred. Since the average high school graduate reads at the rate of about 250 words per minute, the computer not only "read" the cards faster (600 words per minute) but made decisions and calculations as well. Further, there was no fatigue factor; the last card was done in precisely the same manner as the first card.

Counting by Sentences

In developing the design of the program and its result, the suggestions made in The General Inquirer (The MIT Press) were invaluable; however, we took liberties with the systems described there and our program is dissimilar to the ones described in that excellent work. One of the areas in which I found good advice was in the selection of the unit of measurement. Since some parts of speech occur more frequently than other parts of speech, the count of sentences was (as suggested in The General Inquirer) used rather than a count of words as the unit of measurement for statistical purposes. This procedure makes use of more equal units of measurement. For example, a sentence may contain only one verb but many nouns, not as evidence of thematic interest but simply because nouns occur more often than do verbs.

A tag for each theme could occur more than once in a sentence, but the sentence would only be counted once under that category. For example, the sentence, "1John Wayne and 1William Holden were good in the film" (note the coding — 1), would be counted once under the theme category "Star".

However, a sentence could be about more than one theme. For example, "The close-ups of 2Irene Dunne were exquisite" refers to both "Star" and "Technical Effects"; it was counted under both theme categories.

Frequency of Themes

At the end of each article (signaled to the computer by an asterisk), the computer printed out a listing of the frequency of occurrences of each theme in each article. These calculations were compared by the use of a standard chi-square test in order to see if differences which occurred over the years were statistically significant.

The results proved interesting. There were three statistically significant shifts in the subjects which film critics discussed during those thirty-five years. As time went by, film directors were mentioned more often; film producers and film companies were mentioned fewer times with the passing of years. The number of words and the number of sentences increased over the years while the number of films discussed in each article decreased.

Advantages and Disadvantages

Why couldn't I have discovered that simply by reading the articles? If I had done so, I would have saved a lot of money. This type of analysis is too expensive for the individual investigator, if he has to develop the research design.

But once the program is written, the analysis of material is relatively quick and less expensive. In addition, the computer-assisted study has less possibility of error in matching items and making calculations; in counting the tags, I would have been more readily susceptible to error because of fatigue caused by a dull and tedious task.

Future Applications

Perhaps more important than gaining knowledge of what film critics wrote about was the development of a style of analysis which can be used to describe the contents of literature other than film criticism. The computer has been used in some few studies which range from an examination of the content of Presidential acceptance speeches to the content of suicide notes. Some studies have also been made of literary style. But the potential value of teaching the computer to "read" is not yet fully realized. □

Computer Programming Using Natural Language — Part 3

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"A proper response for a well-brought-up computer should be 'I hear and will obey — could I ask a couple of questions first to make sure that I understand?'"

Part 3 — Contents

1. A Computer Program to Understand a Manager's Instructions to a Clerk

This article is Part 3 in a series of articles "Computer Programming Using Natural Language" which are being published in "Computers and Automation". The first two articles were published in the June and July issues. This August article has been written independently so that reference to Parts 1 and 2, though desirable, is not necessary.

The subject we are dealing with here is a part of the subject of "computer programming using natural language," and consists of a certain task. The task that we have set ourselves is called "Task F"; and it may be described as follows:

> Produce a definite, efficient, and rather small computer program (let's name it GENIE) which will take in ordinary natural language specifying any one of many kinds of computer application problems, and which will put out automatically a computer program in a specified regular programming language, which will correctly handle any simple problem of that kind.

The name GENIE comes from the famous genie or jinni of the Arabian Nights tales, who whenever summoned out of his bottle by his master, the possessor of the bottle, replied, "I hear and obey," without requiring translation of the commands into any other language!

The input that so far we give to the computer program GENIE consists of:

(1) a manager's instructions to a clerk in ordinary natural language;
(2) one or more worked numerical examples, and
(3) a calculation layout form.

The two outputs that we obtain from GENIE are:

(4) a description of the algorithm to be used, expressed in what we call Level Two Language;
(5) a computer program in a regular programming language such as BASIC or FORTRAN or machine language.

Level Two Language is very close to what may be called Calculation Layout Language. This is a language which is extensively used in the business world in forms and on calculation sheets, to tell the relations of items on a form and columns on a calculation sheet. For more information about these two languages see particularly page 19 in Part 2 (in the July issue).

There are a number of divisions or parts of GENIE. Two of the important parts are:

(1) the Statement Analyzer, which takes in the words of the manager's instructions, and produces or should produce Level Two Language; and

(2) the Program Maker which takes in Level Two Language from the Statement Analyzer and produces the program expressed in a regular programming language which runs on a given computer.

In other words, the output of the Statement Analyzer expressed in Level Two Language goes into the Program Maker. There it is compiled into a regular computer program in machine language; and this compiled program handles or should handle all the problems of the class defined by the manager's instructions to the clerk.

Not much is new or interesting about the Program Maker as a compiler, except that it makes no distinction between items (single numbers) and columns (a series of single numbers), but makes a program that is able to decide which is which when the data comes in at run time.

An example of a program produced by the Program Maker is shown in Part 1 (see the June issue, p. 12). This program is expressed in the programming language BASIC. Several more programs produced by the Program Maker (Edition of June 1973) are expressed in machine language for the PDP-9 computer (Digital Equipment Corporation) and are running on our PDP-9 computer. (For examples of what these programs produce for results in particular cases, see Appendix 3 of this article.)

The work described in Part 1 (June), Part 2 (July), and Part 3 (August), of this series of articles is an offshoot of work done under a contract with the Office of Naval Research, N00014-70-C-0225, for research on computer-assisted documentation of Navy computer programs.

2. The Statement Pattern, "Type 50," in Ordinary Language

One of the problems which we are faced with in achieving computer programming using natural language is understanding the natural language that may be used by a manager in giving instructions to a clerk. And according to what he wants to say, there will certainly be a great variety.

But among all the statements which a manager may give as instructions are statements of a pattern which we call "Type 50". Type 50 is so named because we estimate that at least 50% of a manager's statements will have a meaning something like this general pattern:

(1) Take some piece X of information from some place.
(2) Maybe, take some other piece Y of information from some other place.
(3) Perform some operation F on those one or two pieces of information.
(4) Put the result Z of that operation in a third place.

Some of the time there will be no second independent variable Y, and so the Type 50 statement will mention just one piece of incoming information, and not two pieces. This however just makes the Type 50 statement easier to handle.

We have not studied enough examples of a manager's instructions to clerks to be sure that 50% of the statements to be found are of this form. But this does seem likely, if we presume some leeway, and if we either join or separate statements using ordinary language so that this concept is expressed.

One of the parts of GENIE is the Statement Analyzer. One of the important problems of the Statement Analyzer is to deal with the Type 50 statement. This article concentrates on this problem.

3. This Statement Pattern in Mathematical Language: z is f of x and y

If this type of statement were expressed mathematically, it would be:

$$z = f(x,y)$$

where x̲ and y̲ are independent variables, f̲ is a function or a formula, and z̲ is a dependent variable. z̲ however may be either an ordinary variable or the label of another expression or formula.

Maybe y̲ is missing, and then $z = f(x)$ would apply.

4. This Statement Pattern in Any Regular Programming Language

If this type of statement were expressed in any regular computer programming language, it would be something like:

(1) Load the acumulator with data from memory location X.
(2) Maybe, load an auxiliary register (which sometimes might be called the "MQ" register, standing for "multiplier or quotient" register) with data from memory location Y.
(3) On these one or two pieces of data perform some specified operation or subroutine F.
(4) When the result is obtained, store it in memory location Z.

If the concept F expressed as a subroutine takes some 10 to 100 to 500 machine language instructions to be expressed, then it is likely to be thought of or treated as a "module" or "concept module" or "macro" of a computer program. In general there are two kinds of concept modules, elementary, like addition, and advanced, like logarithm.

5. Calling Advanced Concept Modules with Ordinary Natural Language

The Statement Analyzer has the problem of dealing with Type 50 statements, and recognizing concept modules.

There will in general be two cases, the recognition of an advanced concept module, or rare concept such as "logarithm," and the recognition of an elementary concept module or common concept, such as "addition".

It is regularly true in English and in many other natural languages that rare concepts usually have only one word (or very few) words for expressing them, and that common concepts usually have a great many words and phrases for expressing them. So the problem facing the Statement Analyzer to recognize what is being said, is relatively easy in the case of advanced concept modules and relatively difficult with elementary concept modules.

In the case of logarithm, more than 99% of all references to this idea in manager's instructions to clerks can probably be found in the following two words "logarithm, log". And more than 99% of all occurrences of modifying phrases (if any) can be found in the list "natural, base e, Napierian, common, base 10, Briggsian" and so these modifiers if they occur, can easily be recognized and handled also.

So the Statement Analyzer can rather easily tell the Program Maker what it needs to know, and since the Program Maker has been properly educated, it can rather easily call the prefabricated module for logarithm out of the library of subroutines.

So we no longer need to know or remember in the case of logarithm and similar concepts what 300 or more regular programming languages may have adopted for code, together with spacing, punctuation, positioning, and any other fussy details.

6. Calling Elementary Concept Modules with Ordinary Natural Language

In the case of an elementary concept module, such as "addition," recognition of the concept is much more difficult. There will be many more ways of expressing the concept. The concept of addition in fact may be expressed in any of the following words phrases, and signs (and perhaps more):

ACCUMULATE	ADD UP	TOGETHER
ACCUMULATING	AND	TOGETHER WITH
ACCUMULATION	CUMULATIVE	TOTAL
ADD	PLUS	TOTAL NUMBER
ADDED	SUM	, (comma)
ADDING	SUMMATION	+ (plus sign)
ADDITION	SUMMED	
ADD TO	SUMMING	

Furthermore some of the expressions in this list (such as "AND" and comma) have many other meanings and much ambiguity. What will very largely remove the ambiguity is the framework of natural language around them, the context.

However it is a most useful fact that there is essentially not a vast amount of variation in the Type 50 statement, as it occurs in ordinary natural language written by a manager in good English and understandable to an ordinary clerk. All we have to do is make the program clever about recognizing natural language variations in this context, and finding the essential meaning.

In other words, as we untangle the meaning of Type 50 statements expressed in words, at the same time we untangle the calling of the elementary concept modules, and thus we obtain a Statement Analyzing program that works.

At this time the evidence for this assertion is shown in the 65 proffered examples of the Statement Analyzer working, contained in Appendix 1 of this article.

7. The Structure of the Statement Analyzer at Present and in the Future

Our present Statement Analyzer, the June edition, is of course rather limited. It is defined approximately as being a program which is probably able to understand all Type 50 statements made out of the words and phrases shown in Table 6, "Probably Acceptable Vocabulary".

We keep finding a percent of examples of Type 50 statements made out of these words that the June edition of our Statement Analyzer does not handle correctly. As we find them, however, we discover the places where we need to modify the Statement Analyzer program so that it will work correctly on the new cases. This is a classic learning (or feedback) situation, which if we had a large computer, might be converted into computerized learning as with the developing chess-playing programs.

Even so, it seems evident that a substantial part of the work of analyzing Type 50 statements has been done, and has been incorporated into the Statement Analyzer.

Among the changes which are planned on in order to develop the Statement Analyzer further are the recognition of the following: greater and less; conditions; jumps; loops; string expressions (probably through the use of the quotes signs); more functions; forward reference; recursion.

8. Criticism: Competence of the Statement Analyzer

<u>Question</u>: How does the Statement Analyzer work on statements of Type 50?

<u>Answer</u>: The description of how it works is intricate, and there is not space here to explain. Furthermore, it still does not work as well as it should, and until we have it working with say 99% effectiveness, it would be reasonable to delay explanation.

<u>Question</u>: How does the Statement Analyzer deal with statements in a manager's instructions to the clerk, which do not belong to Type 50, such as a statement of data?

<u>Answer</u>: At the present time, we are not satisfied with the crude provisions in the Statement Analyzer for this purpose; we have more work to do.

In regard to data, to fill in the present gap, usually we simply assume that the Statement Analyzer produces Level Two Language of the form: (n) = DAT where <u>n</u> is a number for identifying a variable, and DAT stands for given data or information.

9. Criticism: Problems for Which a Natural Language Description of the Algorithm is Lacking

<u>Question</u>: How do you propose to deal with problems for which the calculating rule or algorithm is not expressed in "a manager's instructions to a clerk, worked examples, and a calculation layout form"?

<u>Answer</u>: It would be necessary to: (1) get hold of persons who understand the calculating rules, (2) interview them to obtain the calculating rules, (3) express those rules on paper completely in natural language, and (4) verify the rules on a suitable number of examples. Then this problem would be reduced to the previous case, and thereby GENIE could produce a computer program using natural language.

10. Criticism: Correctness of the Program produced by GENIE

<u>Question</u>: Can you rely on GENIE — the Statement Analyzer and the Program Maker — to produce the correct program for a class of problems?

<u>Answer</u>: You can't. But GENIE when developed will be far more likely to produce a correct program in far less time than a human being. Both kinds of programs will be verified in the same way: by testing them on examples, and thus making sure that the programs produced are correct.

11. Criticism: Feasibility of Computer Programming Using Natural Language

<u>Question</u>: So far you are only dealing with numerical calculations and very simple ones at that. What

makes you believe that your methods can be expanded further — in fact, are not essentially trivial?

Answer: Let us consider the following facts.

- Many office clerks are only moderately intelligent, and yet they can understand and carry out a manager's instructions.
- All the words being used in instructions to tell clerks what to do, constitute a very limited vocabulary (probably less than 300 words; this count of course leaves out all special names of variables such as "Social Security Deduction," etc.).
- All the concepts needed for computer programming constitute a very limited set (probably less than 70 concepts such as "instruction, instruction location, memory location, machine word, addition, condition, jump, skip, conditional skip, instruction label, subroutine, loop, ..." — probably less than 70 concepts).
- The worked examples and the calculation layout form both provide specifications and context for what the manager may not explicitly say with his words.
- By postulate, all the information needed for making the calculation is present in the manager's instructions, the worked examples, and the calculation layout.
- A computer program for deciding what all this means should be able to be as clever as a chess-playing program; but the task here is far easier than playing chess.
- We, the three authors of this article, have demonstrated the construction of computer programs using natural language; and from little acorns there may grow great oak trees.

Therefore we don't believe that what we have done so far is essentially trivial. In fact, we believe that we are at the beginning of a clear road, in fact, a high-speed turnpike.

Question: If your claim is true that computer programming using natural language is possible, how do you account for the fact (or the possibility) that you three investigators have done this when so many very competent and able programmers for 25 years have considered this goal impossible?

Answer: In the first place, we came at the problem from a new direction, the problem of deducing documentation for a working binary program with operating instructions but no documentation. This new direction was a result of a contract from the Office of Naval Research to Berkeley Enterprises for research on computer-assisted documentation of Navy computer programs. (This contract terminated on April 30, 1973). Second, the development of competent chess-playing programs persuaded us that our goal analyzing what was being said in computer programming using natural language was attainable. Third, one of us some time ago wrote a long essay called "The Discussing Computer," which constituted Part 2, pages 85 to 134 in "The Computer Revolution" by Edmund C. Berkeley published by Doubleday and Co. in 1962 (now out of print at the publisher but still available from Berkeley Enterprises). Fourth, the "Programming Establishment," consisting of perhaps 100,000 persons in the computer field, could not feel in the least happy or cheerful at seeing a large part of computer programming, perhaps as much as half, disappear into the maw of a robot computer program; so why should they work on such ideas?

Question: Do you think that could really happen?

Answer: It could happen, and it ought to happen, and it probably will happen. A comfortable and easy relation of people to computers implies that instructing a computer should be just as easy as instructing a clerk. It ought not to be necessary to learn a special language, even BASIC, to do it. It ought not to be necessary to master the fussy details of making approximately correct BASIC into BASIC sufficiently accurate so that it will run on a computer. For example, we struggled with one version of BASIC for a couple of hours to try to get the program to put out "STANDARD DEVIATION" in two words with a space between; finally, we gave up and settled for having the program produce "STANDARDDEVIATION" written as a single word with no space.

A proper response for a well-brought-up computer should be "I hear and I will obey — could I ask a couple of questions first to make sure that I understand?"

Appendix 1
Successful Recognition and Translation of Statements by the Present Statement Analyzer – 65 Examples

This appendix shows 65 examples of Statements of Type 50 put into the Statement Analyzer (June 1973 edition), and what each one gives. The statement that was typed in is shown at the left; to the right and underneath is shown the output in Level Two Language.

A person can sit at the console of our PDP-9 computer and insert any one of these 65 statements and any one of an unlimited number of similar statements into the Statement Analyzer, and these statements may be inserted in any sequence. When he presses the key CONTROL L on the keyboard, the Statement Analyzer will analyze the input statement, and print out what it calculates.

At the present time about 80% of randomly chosen statements of Type 50 are handled correctly. The remaining 20% of random input is not handled correctly, in that the Statement Analyzer produces incomplete or erroneous answers. Nearly all of these errors reveal tiny imperfections that can be easily removed, and we expect that nearly all of these errors will disappear in the next edition of the Statement Analyzer program.

An examination of the input statements in these 65 examples shows a number of things. For example, it shows that all variables are identified by numbers either in parentheses, or not in parentheses, or referred to by English words for cardinal or ordinal numbers. The present edition of the Statement Analyzer does not handle named variables; but an easy change will enable the Statement Analyzer to handle any named variable which in at least one place in the manager's instructions occurs set in quotes designating the name as special. In fact, a prior version of the Statement Analyzer did just this.

Further examination of the input statements shows no confusion between numbers designating variables and numbers not denoting variables. It surprised us to find out that this distinction was not hard to program, provided the statement gave unambiguous information to the clerk.

The arrangement of these 65 statements into five tables according to the kind of function is purely for ease in reading. The Statement Analyzer contains no requirement that it has to be told "addition" or "subtraction" or anything else in regard to any statement put in. The Statement Analyzer does have the requirement that a statement must begin with a statement label consisting of a letter and a number and either a period or a colon, and that it must end with a period, followed by a carriage return.

Table 1
Addition Statements — Recognition and Translation

```
A2. TO FIND ITEM 3, TAKE ITEM 1 AND ADD
  IT TO ITEM 2.

                    A2. (3) = (1) + (2)

A13. ADD THE EIGHTH ITEM TO THE SECOND ITEM
  AND PUT THE RESULT IN THE THIRD ITEM.

                    A13. (3) = (8) + (2)

A4. TAKE THE SECOND NUMBER, WHICH IS .Ø15,
  AND ADD IT TO THE FOURTH NUMBER, NAMELY,
  .142. STORE THE SUM IN TABLE 7. THE
  ANSWER IS .157.

                    A4. (7) = (2) + (4)

A9. ADD ITEM 3 TO ITEM 4, AND DEPOSIT THE
  RESULT IN ITEM 12.

                    A9. (12) = (3) + (4)

A7. FIGURE OUT THE SUM OF ITEM 3 AND ITEM
  5, WHICH WE SHALL REFER TO AS ITEM 6.
  IT IS 1Ø5, THE FIRST ANSWER.

              A7. (6) = (3) + (5) = ANSWER (1)

F8. NOW, TAKE ITEM 5, 34, AND ADD IT TO
  ITEM 4, 6. THE ANSWER IS 40 WHICH IS
  CALLED ITEM 9.

                    F8. (9) = (5) + (4)

B1. ADD ITEM 1 TO ITEM 2, AND PUT THE
  RESULT IN ITEM 4.

                    B1. (4) = (1) + (2)

K4. ADD COLUMN (2), 2, AND COLUMN (3), 4,
  AND PUT THE RESULT IN COLUMN (4).

                    K4. (4) = (2) + (3)

K1Ø. TO CALCULATE COLUMN 2Ø OF THE TABLE,
  FIND THE SUM OF COLUMN 3, NAMELY 175Ø.ØØ,
  AND COLUMN 15, 1Ø3.92, WHICH EQUALS 1853.92.

                    K1Ø. (2Ø) = (3) + (15)

N6. ADD COLUMN (14) TO COLUMN (9), 39ØØ.
  PUT THE RESULT, 915Ø, IN COLUMN (15).

                    N6. (15) = (14) + (9)

Z2. TO FIND COLUMN 1, ADD COLUMN 4 TO
  COLUMN 12.

                    Z2. (1) = (4) + (12)

T6. TAKE THE SIXTH NUMBER, WHICH IS .Ø98,
  AND ADD IT TO THE TENTH NUMBER, NAMELY .982.
  NAME THE SUM ITEM 7.

                    T6. (7) = (6) + (1Ø)

Z5. PUT THE SUM OF COLUMN 4 IN ITEM 9.

                    Z5. (9) = SUM (4)

Z3. TO CALCULATE ITEM 2, TOTAL COLUMN 3.

                    Z3. (2) = SUM (3)

T8. FIGURE OUT THE TOTAL OF COLUMN 8.
  CALL IT NUMBER 3. THIS IS ANSWER 4.

              T8. (3) = SUM (8) = ANSWER (4)

A2. SUM TABLE (13), AND CALL IT VALUE (14).

                    A2. (14) = SUM (13)

T2. SUM TABLE 13, AND CALL IT VALUE 14.

                    T2. (14) = SUM (13)

C1Ø. TOTAL COLUMN (3), AND PUT THE RESULT,
  226.2, IN BOX (6).

                    C1Ø. (6) = SUM (3)

A1Ø. FIND THE TOTAL NUMBER OF COLUMN 1,
  AND PLACE THE RESULT IN COLUMN 12.

                    A1Ø. (12) = SUM (1)

A11. FIND THE TOTAL OF COLUMN 2, AND WRITE
  THIS IN ITEM 3.

                    A11. (3) = SUM (2)
```

Table 2
Subtraction Statements — Recognition and Translation

```
Z1. MOVE ITEM 1 MINUS ITEM 2 TO ITEM 3.

                    Z1. (3) = (1) - (2)

A3. PUT THE DIFFERENCE BETWEEN NUMBER 1,
  WHICH EQUALS 7.34, AND NUMBER 2, WHICH
  IS 1.96, IN THE THIRD BOX. THE RESULT
  EQUALS 5.39.

                    A3. (3) = (1) I- (2)

T3. PUT THE DIFFERENCE BETWEEN NUMBER 1
  AND NUMBER 2 IN THE FOURTH BOX.

                    T3. (4) = (1) I- (2)

K1. NEXT, TO OBTAIN COLUMN 9, FIND COLUMN 8,
  33, MINUS COLUMN 7, 14. THE RESULT IS 19.

                    K1. (9) = (8) - (7)

F9. THEN, TAKE ITEM 1, SUCH AS 12, AND
  SUBTRACT IT FROM ITEM 2, NAMELY 48. THE
  ANSWER IS 36 WHICH IS CALLED ITEM 3.
  THIS IS THE NINTH ANSWER.

              F9. (3) = (1) I- (2) = ANSWER (9)

C16. TO GET ITEM (11), SUBTRACT ITEM (1Ø),
  81.8663, FROM ITEM (9), 82.2248, WHICH
  IS .3585.

                    C16. (11) = (1Ø) I- (9)

A5. SUBTRACT ITEM 3 FROM ITEM 5, AND
  IDENTIFY IT AS ITEM 7.

                    A5. (7) = (3) I- (5)
```

A4. SUBTRACT ITEM 1 FROM ITEM 3, AND CALL IT ITEM 99.

A4. (9) = (1) I- (3)

Abbreviations

- \- minus, less
- I- inverse minus, subtracted from

Table 3
Multiplication Statements — Recognition and Translation

K4. TAKE COLUMN 11, .7917, TIMES COLUMN 13, .Ø75, AND PUT THE RESULT, .05938, IN COLUMN 14.

K4. (14) = (11) * (13)

N2. TO CALCULATE COLUMN (9), TAKE COLUMN (7) TIMES COLUMN (8), WHICH IS 15Ø.

N2. (9) = (7) * (8)

K5. TAKE COLUMN 3, 175Ø, AND MULTIPLY IT BY COLUMN 14, .05938. THE PRODUCT IS IN THIS CASE, 1Ø3.92. PUT THAT IN COLUMN 15.

K5. (15) = (3) * (14)

A1. MULTIPLY ITEM 3 BY ITEM 4. THE PRODUCT IS IN THIS INSTANCE, 12. NAME IT RESULT 5.

A1. (5) = (3) * (4)

Z6. TO FIND ITEM (3), MULTIPLY ITEM 1 BY ITEM 2.

Z6. (3) = (1) * (2)

T1. MULTIPLY ITEM (3) BY ITEM (4). THE PRODUCT IS IN THIS INSTANCE 12. NAME IT RESULT (5).

T1. (5) = (3) * (4)

N5. NOW, TO FIGURE OUT COLUMN (14), FIND COLUMN 13 TIMES COLUMN (8), 15Ø, AND THE RESULT IS 525Ø.

N5. (14) = (13) * (8)

N4. FOR COLUMN (13), TAKE COLUMN (1Ø), NAMELY 14Ø, MULTIPLIED BY COLUMN 12 WHICH IS .25. THE RESULT IS 35.

N4. (13) = (1Ø) * (12)

C5. TAKE THE FIRST NUMBER IN COLUMN (1), NAMELY 8.1, AND MULTIPLY IT BY THE FIRST NUMBER IN COLUMN (2), NAMELY 2, AND ENTER THE RESULT, 16.2, IN COLUMN (3).

C5. (3) = (1) * (2)

C15. TO GET ITEM (1Ø), MULTIPLY ITEM (8), 9.Ø48, BY ITEM (8), 9.Ø48, WHICH IS 81.8663.

C15. (1Ø) = (8) * (8)

C7. THEN, TAKE THE FIRST NUMBER IN COLUMN (3), NAMELY 16.2, AND MULTIPLY THAT BY THE FIRST NUMBER IN COLUMN (1), NAMELY 8.1, AND PUT THAT RESULT, 226.2, IN COLUMN (4).

C7. (4) = (3) * (1)

B2. MULTIPLY COLUMN 3 AND COLUMN 4, AND PUT IT IN ITEM 5.

B2. (5) = (3) * (4)

A12. TO OBTAIN ITEM 4, DOUBLE ITEM 3.

A12. (4) = 2 * (3)

A8. TAKE ITEM 2 AND DOUBLE IT. PUT THE RESULT IN ITEM 4.

A8. (4) = 2 * (2)

Abbreviation

- * times

Table 4
Division Statements — Recognition and Translation

C14. FOR ITEM (9), DIVIDE ITEM (7) BY ITEM (5). THE RESULT IS 82.2248.

C14. (9) = (7) / (5)

A8. FIND ITEM 8 DIVIDED INTO ITEM 9, AND PUT THE RESULT IN ITEM 22.

A8. (22) = (8) I/ (9)

C13. FOR ITEM (8), DIVIDE ITEM (6) BY ITEM (5). THE RESULT IS 9.Ø48 AND THIS IS THE FIRST ANSWER.

C13. (8) = (6) / (5) = ANSWER (1)

A6. NOW DIVIDE ITEM 4 BY ITEM 5, AND ENTER IT IN ITEM 9.

A6. (9) = (4) / (5)

N7. FOR COLUMN (16), TAKE COLUMN (5), 11ØØ, DIVIDED INTO COLUMN 15, 915Ø. THE ANSWER IS IN THIS CASE 8.31.

N7. (16) = (5) I/ (15)

K3. TAKE COLUMN 4, 7.5, AND DIVIDE IT BY COLUMN 12, NAMELY 1ØØ, AND PUT THAT INTO COLUMN 13, IN THIS CASE .Ø75.

K3. (13) = (4) / (12)

K2. THEN, DIVIDE COLUMN 9, 19, BY COLUMN 1Ø, WHICH IS 24, AND PUT THE ANSWER IN COLUMN 11.

K2. (11) = (9) / (1Ø)

F7. TAKE COLUMN 5, 485, AND DIVIDE IT BY COLUMN 12, FOR INSTANCE 123, AND PUT THE RESULT IN COLUMN 13.

F7. (13) = (5) / (12)

A7. NEXT, DIVIDE ITEM 7 BY ITEM 8, AND PUT IT IN ITEM 11.

A7. (11) = (7) / (8)

Abbreviations

- / divided by
- I/ inverse division, divided into

Table 5
Miscellaneous Statements —
Recognition of Meaning, and Translation

K9. PUT COLUMN 15, IN THIS INSTANCE, 1Ø3.92, IN COLUMN 19.

K9. (19) = (15)

A6. MOVE BOX (4), IN THIS CASE, 45.6, TO BOX (6).

A6. (6) = (4)

N1. MOVE COLUMN (3), IN THIS CASE, 31Ø8, TO COLUMN (6).

N1. (6) = (3)

B3. TAKE ITEM 1 AND PUT IT IN ITEM 23.

B3. (23) = (1)

K8. MOVE COLUMN 6 TO COLUMN 18.

K8. (18) = (6)

K6. MOVE COLUMN 1 TO COLUMN 16, NAMELY 1Ø5.

K6. (16) = (1)

T5. FIND HALF OF ROW 2, WHICH WE CALL VALUE 5. THIS IS THE SEVENTH ANSWER.

T5. (5) = HLF (2) = ANSWER (7)

A9. FIND HALF OF THE THIRD ITEM, IN THIS INSTANCE, 8. THIS IS ITEM (5), IN THIS CASE, 4.

A9. (5) = HLF (3)

N3. TAKE COLUMN (3), AND PUT IT IN COLUMN (11).

N3. (11) = (3)

T5. FIND THE SQUARE OF THE FIRST ROW, WHICH WE SHALL CALL NUMBER 3.

T5. (3) = SQR (1)

A1Ø. FIND THE SQUARE OF VALUE(2), 1.414, WHICH WE SHALL CALL NUMBER(3). THIS IS 2, THE THIRD ANSWER.

A1Ø. (3) = SQR (2) = ANSWER (3)

Z9. FIND THE SQUARE ROOT OF COLUMN 18, AND PUT THE RESULT IN COLUMN 12.

Z9. (12) = SRT (18)

C17. TO OBTAIN ITEM (12), TAKE THE SQUARE ROOT OF ITEM (11), .3585, WHICH IS .599. THIS IS THE SECOND ANSWER.

C17. (12) = SRT (11) = ANSWER (2)

A5. NEXT, TO CALCULATE ITEM 22, TAKE THE SQUARE ROOT OF ITEM 14, FOR EXAMPLE, 121. THIS SQUARE ROOT EQUALS 11, AND IT IS THE SECOND ANSWER.

A5. (22) = SRT (14) = ANSWER (2)

Abbreviations

HLF 1/2 of
SQR square of
SRT square root of

Appendix 2
Present Statement Analyzer —
Probably Acceptable Vocabulary

Following are the words, phrases, and other expressions which the present edition of the Statement Analyzer portion of GENIE will probably accept. We say "probably" because we have not yet investigated adequately all the combinations that these words may provide. But we believe that at least 80% of all ordinary statements of Type 50 (1) that are expressed in correct English, (2) that could reasonably be a manager's instructions to a clerk to make a calculation, and (3) that contain only these words and expressions, should be acceptable and correctly translated.

This table is not as extensive as the table of "Probably Acceptable Vocabulary" shown in Part 1. That table represents an objective for the Statement Analyzer edition of April 1973; and at time of writing Part 1, that Statement Analyzer had not been finished. The present table is related to the Statement Analyzer edition of June 1973 which has been completed and is running currently at time of writing.

For an example of changes, in the prior table "difference" and "between" occurred. In this table, "difference" and "between" do not occur. This is because we noticed that the expression "the difference between a and b" was being regularly translated into "b - a," and not "b - a or a - b, whichever is positive," and the discrepancy is not justified.

Part 1. Words and Phrases

add	in this instance	store (verb)
and	is	subtract
answer (noun)	it	subtracted from
box	item	such as
by	minus	sum (verb)
calculate	move	table
call	multiply	take
column	name (verb)	tenth
deposit	namely	that
divide	next	the
divided by	(conjunction)	then
divided into	ninth	third
double	new	this
eighth	now	times
enter	number (noun)	to
equals	obtain	to find
fifth	of	total (verb or
figure	place (verb)	noun)
find	product	total number
first	put	twice
for	refer to as	two times
for example	result	value
for instance	row	which
fourth	second	which is called
from	seventh	which we call
get	sixth	which we shall
half	square	call
identify as	square root	write
in		

Part 2. Digits, Digit Combinations, and Signs

1, 3, 16 ...	positive whole numbers
2.7, ØØ2, 3.1416	numbers with decimal fractions
Ø, -3, -7.6	negative numbers
( )	parentheses, used around a positive whole number, for naming a column, item, etc.

Appendix 3
Computer Output for Three Illustrative Problems

In Parts 1 and 2 three illustrative problems were discussed:

> Calculating Mean and Standard Deviation;
> Calculating Interest and Amount to be Repaid;
> Calculating Advertising Effectiveness.

The Program Maker, edition of June 1973, constructed a program for each of these three illustative problems. Then these three programs were tested on at least two cases for each illustrative problem. The results are shown below. 3113 is the octal starting address; and the apostrophe is a command to the supervising program (called DDT) to start the program at the just-mentioned address.

It can be seen that the Program Maker is still slightly defective: it has not yet learned to round off!

Problem 1, Calculating Mean and Standard Deviation

```
3113'
 MEAN: 9.Ø48
 STANDARD DEVIATION: .598747271

3113'
 MEAN: 73.8666667
 STANDARD DEVIATION: 4.12Ø96463
```

Problem 2, Calculating Interest and Amount to be Repaid

```
3113'
 LOAN: 1Ø1
       1Ø2
       1Ø3
       1Ø4
       1Ø5
 NAME: 777
       444
       555
       666
       777
 DUE DATE: 8Ø172
           7Ø172
           111572
           121572
           51573
 INTEREST: $6Ø.15625
            1Ø2
            38.25
            348.333333
            1Ø3.9Ø625
 TOTAL REPAYMENT: $181Ø.15625
                   37Ø2
                   638.25
                   8348.33333
                   1853.9Ø625
```

Problem 3, Calculating Advertising Effectiveness

```
3113'
 MONTH: 8
        9
 ADVERTISEMENT KEY: 31Ø8
                    311Ø
 EXPECTED ORDERS INCOME: $525Ø
                          7Ø5Ø
 EXPECTED TOTAL GROSS INCOME: $915Ø
                               1455Ø
 FACTOR OF GAIN: 8.31818182
                 7.275
```

□

NUMBLES

Neil Macdonald
Assistant Editor
Computers and Automation

A "numble" is an arithmetical problem in which: digits have been replaced by capital letters; and there are two messages, one which can be read right away and a second one in the digit cipher. The problem is to solve for the digits.

Each capital letter in the arithmetical problem stands for just one digit 0 to 9. A digit may be represented by more than one letter. The second message, which is expressed in numerical digits, is to be translated (using the same key) into letters so that it may be read; but the spelling uses puns or is otherwise irregular, to discourage cryptanalytic methods of deciphering.

We invite our readers to send us solutions, together with human programs or computer programs which will produce the solutions. This month's Numble was contributed by:

> Casper Otten
> Newton South High School
> Newton, Mass.

NUMBLE 738

```
          B E T T E R       D = H
  x             O N E
  -------------------
        R R A N W N T
      T T R N T W W
  R N O T F R W
  -------------------
  E T E D F N F B T
```

8421 7354 2361 0961 2330 5632 8021

Solution to Numble 737

In Numble 737 in the July issue, the digits 0 through 9 are represented by letters as follows:

U = 0	Q = 5
D = 1	B,F = 6
Z = 2	W,I = 7
O = 3	T,L = 8
S = 4	E = 9

The message is: Too soft will be squeezed.

Our thanks to the following individuals for submitting their solutions – **to Numble 735:** John A. Koziol, Chicago, Ill. – **to Numble 736:** Edward A. Bruno, Cliffside Park, N.J.; T. P. Finn, Indianapolis, Ind.; John F. Gugel, Arlington, Va.; Abraham Schwartz, Jamaica, N.Y.

Lessons of Watergate — Part 7

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"The secret team proposes actions upward, which are condoned or allowed to happen either by the turning of the head of the President and his higher-level staff members and his cabinet, or else through sheer ignorance of what the secret team is up to. . . . There is an order of magnitude more important and more horrible set of crimes involved however: . . . . the control of the entire free world and of the American people by the use of clandestine, constitutionally illegal, and immoral activities."

Outline

This is the seventh in a series of articles on the events known as Watergate.[1] On the date this article was going to press, July 8, 1973, the testimony of Jeb Stuart Magruder and John Dean III had been presented to the Ervin Committee. Doubts about Richard Nixon's involvement in the cover-up and his knowledge of the original crime, had begun to fade. Impeachment or resignation talk was strong. Haldeman and Ehrlichman seemed to be fighting so hard to keep their own reputations from being damaged, that they might be forced to reveal the truth about Nixon's involvement. Experience with witnesses like Gerald Alch and Maurice Stans showed it is impossible to lie to the Ervin Committee and not get caught later.

Some estimates now are that the showdown for the President will come before the end of July. Whether or not Watergate has by then brought about his resignation, the impact of the event has become so all encompassing and pervading that it has reached nearly every walk of life in America.

We can all benefit from the lessons of Watergate. The Senate can profit by paying attention to these lessons, the House and the Judicial branch of Government can also benefit. The news media have already learned a lot, and the American people, while seemingly bored and saturated, can heave a sigh of relief about it, for we came very close to Nazi-style fascism.

However, a word of caution is in order for all Americans: Do not ignore the lessons of Watergate. Keep up the process that has now begun. Do not consider the Watergate exposures as the end, but rather the beginning of our path toward the light at the end of a long tunnel.

What are the specific lessons and how can we all benefit by them? Lesson number one is that high-level conspiracies are very complex.

The Watergate Style Conspiracy

Watergate has demonstrated that high-level conspiratorial types of actions can take a very complex form involving various individuals at various levels of government. The conceptually simple conspiracy in which a group of people at the top plot a clandestine operation, and then pass along orders and instructions to subordinates down the line is not realistic enough to cover the essence of what happened. First, there were many plots and sub-plots all interacting and occurring at varying times, with perhaps a form of very loose coordination at an organization level a few rungs down from President Nixon. At least four major plots can now be detected: the Segretti program of espionage and sabotage; the Watergate team's plans for Washington D.C., Miami, San Diego, and perhaps other bugging locations; the anti-security leaks; Ellsberg-Pentagon Papers plot; and the 1970 Espionage plan. The motives were somewhat different, but with one common theme, anti-Communism, and the support of the Nixonian version of national security against "Communists and leftists" like McGovern, Ellsberg and the like.

Second, the plotting, especially the detailed operational portions, was initiated at middle levels and executed by lower level conspirators. The various upper level echelons, including Nixon, Haldeman, Ehrlichman, Colson, Dean, Magruder, Mitchell, et al., reacted to many of the actions, rather than directing them. The scenario was more like this: Nixon told Haldeman, Mitchell, Colson and Ehrlichman to take whatever general overall steps they deemed necessary to insure his re-election and to use Re-election committee funds to do it. The second level people laid out a general strategy for winning the election, including the possibility of helping McGovern and deterring his opponents.

The next level including Liddy, Hunt et al., devised the clandestine, illegal tactics to implement the strategy, and brought in CIA methods and equipment. Segretti did the same thing with Chapin's approval. Whenever an illegal act was proposed, the intermediate echelons either turned their heads or took the attitude of, "go ahead and accomplish the mission but don't tell me how you did it". The psychological point of view here is important to understand in order to see how highly moral, very upstanding, religious men could allow these immoral, illegal acts to occur. The point of view can best be called, "I won't authorize this but if I don't know about it, and the end objective is achieved, then it will be O.K.". In the case of the burglary of Daniel Ellsberg's psychiatrist's files by Hunt, Liddy and the Cubans, John Ehrlichman shrugged it off by saying, "Just don't do it again".[2]

The shortest description of this mental state of mind is, "Don't sponsor, but don't stop, and look the other way". Under this philosophy, a conspiracy with multiple levels can be expected to fit a certain pattern. A model might be constructed in which the middle levels push for clandestine, illegal actions; the upper levels look the other way; the middle levels convince themselves they have approval; the lower levels are told the upper levels approve. The act is carried out with the operating people committing the crime, actually under the impression that it is for the good of the country and national security, and believing it has high-level approval. Lesson number two is that the Watergate type of conspiracy may have occurred before.

The Secret Team Model

A model of high level conspiracy is described in some detail in the book The Secret Team, by Fletcher Prouty.[3]

However, rather than being applied to an American election strategy and crimes like bugging and burglary, the model is shown by Prouty to fit the entire United States Government and foreign policy for the last twenty-six years. The "Secret Team" is the CIA plus its planted former employees and friends in nearly every part of the U.S. Government and in foreign countries. In this book, the "Secret Team" fits into the model in the same way that Hunt, Liddy and Segretti fit into the Watergate version of the model.

The team proposes actions upward which are condoned or allowed to happen either by the turning of the head of the President and his higher level cabinet and staff members, or else through sheer ignorance of what the "Secret Team" is up to.

There is an order of magnitude more important and more horrible set of crimes involved however. The ultimate crimes carried out by the United States through the tactics of the "Secret Team" have been the control of the entire free world and of the American people by the use of clandestine and constitutionally illegal and immoral activities. The end objective of these crimes has always been the "patriotic" one of fighting Communism around the world and at home. High-level "turn the head" style support has taken place because the end objective has been considered good and admirable. All Presidents since Truman, with one exception, have fit the model. John Kennedy did not, and he was murdered because he did not.

The third lesson is that the splits in America between left and right, between hawks and doves, between young and old, between crew cuts and long hairs, between liberals and conservatives, have had a great deal to do with the Watergate crime and many other crimes.

Two Extreme Points of View

The psychological backgrounds of Americans prior to Watergate, biasing their attitudes toward their Government, seemed to be polarizing them into two extreme groups. The young people of America and selected older people from the liberal ranks tended to believe the entire Government to be completely corrupt and capable of nearly any form of crime. The majority of people over the age of thirty believed their Government to be basically honest and incapable of willful criminal activity.

The older point of view was that men in higher positions, while perhaps cheating a little now and then, would not and could not stoop to the kinds of crimes and violence characterized by the Watergate and related conspiracies, and by the assassinations and attempted assassinations of the last decade. Certainly, men of honor, men of high moral standards, religious men, and groups of these men, would never conspire to cover up crimes of this nature.

Coupled with this attitude was the feeling that a faith in American institutions of long standing was absolutely essential to preserve our way of life. Faith in the higher echelons among government, industry, education, religious and social organizations, was important to prevent the crumbling of an entire society. It seemed necessary to fight against the antiwar groups and new leftists.

The young believed that institutions were corrupt and obsolete along with the man at the top. They took the attitude that anything and everything should be done to shake all of them to their very foundations. They trusted no one, not even their own organizations, if they took on too much form. The young point of view was that most of the men at the top of government were quite capable of everything from assassination on down, and certainly very likely to cover up all of their own crimes. The viewpoint was that to straighten out America, all of it had to be brought tumbling down by revolutionary means.

Watergate has changed the thinking of some of the older generations and shocked many others. It may delight some of the young and disappoint others. The lessons it brings to both groups must be carefully thought out and understood, and then acted upon. The event, while isolated in some respects from the rest of American history, should teach all of us that neither of the extreme points of view is totally valid, but that some portions of the point of view of the young were, and are, valid.

Watergate should teach us in lesson four that men of "honor, high moral standards, very religious backgrounds — good red, white and blue patriotic Americans" — can and do commit crimes and cover them up. They do so for what they interpret to be the "good of the U.S.," or for reasons of "national security".

The young point of view that the crimes, the cover-up, and the conspirators must be exposed and cleaned out is valid. However, the point of view that the entire organization must be brought to a state of collapse is not necessarily valid.

On the older side, the point of view that faith in institutions must be preserved to the point where the people and contemporary groups occupying those institutions are not questioned, is not valid. Men of all religious faiths, of all heroic performances, of all honorable backgrounds and reputations, must be questioned and checked just as thoroughly as the suspected person. In fact, Watergate, the Pentagon Papers, My Lai, and the "Secret Team" revelations have demonstrated that the Super Patriot, the total anti-Communist, the honorable, very religious, red, white and blue flag-waver (like Bernard Barker, E. Howard Hunt, Richard Nixon, and H.R. Haldeman) should probably be checked more thoroughly than anyone else.

Jeb Stuart Magruder, deputy to John Mitchell, is a perfect example: young, attractive, married, good wife and nice children, fine education and background, bright, energetic, dedicated to Mr. Nixon and conservative Republican ideals. He now says he committed crimes, and perjured himself knowingly, to elect the President because he believed men like Wm. Sloan Coffin at Yale were dangerous and subversive. He also saw Coffin breaking laws, by burning draft cards in protest against the war, and felt it would be perfectly justifiable to violate a few laws by burglarizing and bugging to keep men like McGovern and Coffin from taking over the United States. Coffin was Magruder's ethics professor in college. Coffin's reply is a classic, in terms of illustrating what has gone wrong with America and men like Jeb Stuart Magruder (see The New York Times, June 19, 1973).

Various points of view have also developed since 1963 toward possible conspiracies in the major political assassinations of the last ten years. To understand these points of view, it is interesting to examine one of them in detail.

The Salandria Assassination Conspiracy Model

Since 1964, various individuals and groups have conducted investigative research into the assassination of President Kennedy and the cover-up conspiracy which followed. All of the serious researchers have easily reached the conclusion that more than one person fired shots at John Kennedy in Dealey Plaza on November 22, 1963. However, disagreements and arguments, sometimes violent, have occurred among researchers as to who killed Kennedy and why. Various theories and hypotheses have been put forward during the ten years since the assassination. None of them have been proved with court style evidence in the "beyond reasonable doubt" mode.

The number of shots fired, the positions and trajectories of the gunmen and the shots, the timing of the shots, and enough other data about the event have been produced that if there were one, a jury would be convinced that a conspiracy existed and that Lee Harvey Oswald did not fire any shots that day. But there are no definite names yet attachable to the four gunmen, nor any definitely provable motives. Evidence points toward certain groups and individuals, and other evidence points toward a conspiracy being hatched in New Orleans, Mexico City, and Dallas.

There is powerful, strong, factual evidence of a big cover-up initiated and backed by the highest levels of government. There is evidence that President Johnson was involved in the cover-up. But, when it comes to a determination of how high the original assassination conspiracy went, and who was involved in it, all that is available are hypotheses and models.

Vincent Salandria, an early assassination researcher, and lawyer in Philadelphia, suggested an approach toward solving the JFK murder.[4] His idea was to construct a high level conspiratorial model of the assassination and then test its validity by attempting to prove it was wrong. In the Salandria model, the CIA, the Pentagon, and the Military Industrial Complex, with Lyndon Johnson as their willing servant, mapped out the strategy for Kennedy's death. The motives were the continuation in power of the military-espionage establishment and the increase in their clandestine and military activities in Viet Nam, Cuba, and domestically. In this model, simplistic, top down, directed action following a top level decision, is postulated. The gunmen took orders from a tactical operating team. The operating team followed the orders from a planning team who in turn were given the responsibility for the assassination by the highest level conspirators.

Salandria gives as one reason to believe this model the fact that a message was transmitted via Air Force radio channels from the situation room at the Pentagon building to Lyndon Johnson aboard Air Force I, the Presidential jet plane, while it was en route from Dallas to Andrews Air Force Base carrying President Kennedy's body. The message said there was no conspiracy and that Lee Harvey Oswald was the lone assassin. The timing of this message was such that the Dallas police did not even have a way of knowing that Oswald had assassinated the President. There was Dallas police talk at that time of conspiracy and Oswald had only been charged with shooting Policeman Tippitt.

In lesson number five, Watergate has taught us that such a model is undoubtedly oversimplified. If President Kennedy's assassination fits the Watergate style conspiracy or the "Secret Team" model — and there are many reasons to believe that it does — then the Salandria model should be somewhat modified.

Such modifications will not, however, detract from the probability that the model is correct in postulating high-level advance knowledge of the crime, and highest-level direction and sponsorship of the big cover-up. The modifications would follow the Watergate model described earlier in which middle level people initiated the assassination plan, higher level people "turned their heads", other people furnished money with a "don't tell me what happened" attitude, and lower level people followed orders like patriotic soldiers, believing it had high-level approval.

Lesson number six might be called:

The Phenomenon of the "Really Big American Cover-Up"

Several times in America since 1959, it has been considered desirable and necessary to cover up criminal, illegal or immoral activities at the highest levels of government. The Bay of Pigs, My Lai, Pueblo, Watergate, and the assassinations of John Kennedy, Robert Kennedy, and Martin Luther King, are examples. In these "really big cover-ups," a large number of people and organizations have been involved. Until the Watergate exposures, however, the American people have not been privy to the inner workings of the cover-ups, nor have they believed such grandiose conspiracies and cover-ups could actually happen in the United States.

Watergate has shown us clearly how the giant conspiratorial cover-up is organized and accomplished. First, and most important, it must have Presidential approval, if not direction, in order to have any chance of success. The cooperation and participation of the Justice Department, the FBI, the CIA, portions of the Department of Defense, and the White House staff is essential. Only Presidential backing can bring this about.

In the case of the John and Robert Kennedy assassination cover-ups, all of these elements were used with Presidential authority coming from Lyndon B. Johnson. In addition, the Warren Commission was created with high-level, secret conspiratorial agreements among at least four of the Commissioners to cover up the truth about the assassination of the President.

In the case of Watergate, the public now knows that President Nixon supported fully a really big effort to cover up the truth about many events and actions. The President's backing was needed to insure the cooperation in the cover-up of all the principals involved, plus the CIA, the Justice Department, the FBI, the various prosecutors and lawyers, and the indicted seven men. Money and secret arrangements were required to buy the silence of the Watergate 7 and the services of a host of lawyers and prosecutors in the Justice Department. Safe houses, untapped telephones, secret meetings, off the record discussions and many other conspiratorial techniques were used by the President, his entire White House staff, all of the higher-ups in the Committee to Re-Elect the President, and some of the Cabinet members.

The cover-up nearly worked. Had it not been for the perseverance of The Washington Post, the decision of James McCord to turn state's evidence, and the pressures brought on the defendants by Judge John Sirica, the American public might not know today about the giant Watergate cover-up.

Prior to the election, the people really didn't want to know what had happened. The "ostrich syndrome" had taken hold. George McGovern's and Larry O'Brien's warnings about Nixon and the Watergate "caper," as the Republicans preferred to label it, went largely unheeded and ignored. The cooperative de facto cover-up attitudes of Americans very nearly killed the whole issue. Even after the Watergate 7 trial, Nixon's overall cover-up strategy was still working fairly well.

The lesson to be learned here is that there are such things as the "really big American cover-up" and that they are not imaginary or the dreams of some paranoid left-wing students.

Lesson number seven teaches us about the large collection of people and organizations and techniques brought into play in a cover-up.

Elements Involved

The elements involved in "really big American cover-ups" are numerous and widespread. The simplified conspiracy model for cover-ups, imagined by the far left or by the young, is not complex enough nor very realistic. The CIA, the FBI, or the Pentagon alone or in combination cannot achieve the really big cover-ups by themselves. Classification of documents, suppression of evidence, use of the secret grand jury testimony technique, murder of key witnesses and other CIA-FBI-Military methods are important elements, but not nearly all that is needed.

The biggest cover-up project of all, keeping the truth about the assassination of John Kennedy from the public, required all of the following elements.[5] Other cover-up conspiracies, like Watergate, may not have required all of these elements, but did require some of them.

1. The original criminals — at whatever level cooperated or were killed
2. The higher-ups who knew about the crime, cooperated
3. The higher-ups who didn't know in advance about the crime, did decide to cover it up
4. The underlings who knew about the crime or suspected and decided to keep quiet about it
5. The news media "government lackeys and running dogs"
6. The news media generally — "Ostrich Syndrome"
7. Government apologists
8. The Public — "Ostrich Syndrome," de facto cover-up
9. Wall Street and big business supporters of Government
10. The CIA and "The Secret Team"
11. The Justice Department and the FBI
12. The Pentagon and the Military
13. Authors and commentators hired by the Government or writing for the Government
14. Super-patriotic public figures
15. Specially employed teams and people assigned to eliminate or crucify the "kooks" who try to reveal the cover-up
16. Congress — "Ostrich Syndrome"

One of the major issues in a big cover-up is the suppression of unofficial, as well as official investigations. The techniques used involve use of reverse credibility. In other words, the "really big cover-up" is conducted in so pervading a manner that anyone who questions what really happened is automatically classified as "strange". This works like a closed loop servomechanism to reinforce the cover-up. To break through it requires a fantastic amount of courage, fortitude and resources. In the case of Watergate, The Washington Post, The New York Times and Newsweek especially, had the resources, the fortitude, and the courage to ride out the storm.

In the case of the assassination of John Kennedy, the closed loop servomechanism has sunk all but a few diehards. Examples of people who have been clobbered and have all but given up are: Jim Garrison, Congressman Ted Kupferman (now Judge), Leo Sauvage, Ray Marcus, Sylvia Meagher, eight Congressmen headed by William Fitz Ryan, Congressman Drinan and Richard Russell. Russell, a Warren Commission member, said before he died that he had always believed there was a conspiracy in the assassination of the President, even at the time he agreed to sign the Warren Report.[6] He said he had been in the minority group on the Commission, but had insisted on a qualifying statement being put in the Report before he would sign it. The statement in effect said that it was not possible to prove beyond doubt a negative point, and therefore they could not be absolutely certain there was no conspiracy.[7]

What Russell did not know, and probably Cooper and Boggs did not know, was that the other four members — Warren, McCloy, Dulles and Ford — either knew or strongly suspected there was a conspiracy, but decided at Johnson's suggestion to cover it up.

This may be difficult for the average American to believe, unless he has read The Secret Team, which should be required reading for every U.S. citizen. That book shows clearly how Allen Dulles personally controlled and influenced many people and organizations, by a combination of salesmanship, deception and charm. He used secrecy and "National Security" to perfection to influence Presidents, Senators, the Military and many others in creating the "Secret Team". He undoubtedly used the same techniques with Johnson and the Warren Commission when much was at stake. Oswald had been a member of the "Secret Team" since 1959 at Atsugi Air Force Base in Japan. As a minimum, that fact had to be concealed.

Johnson himself said before he died that he had known all along there was a conspiracy and that Oswald was not a lone madman assassin.[8] The statement itself was suppressed by Johnson from his CBS News interview with Walter Cronkite, "on the grounds of National Security," thus continuing the big cover-up. More recently, Johnson's statement was exposed as having been made to a group of people at his ranch.[9]

The cover-ups in the cases of Robert Kennedy and Martin Luther King's assassinations are not as clearly obvious as in the JFK case. There is provable clear-cut evidence of conspiracies in both cases, and since all official statements and most news media coverage of the two assassinations claim no conspiracy and single madman assassins, there were obviously cover-ups. In the King case, the cover-up has involved, as a minimum:[10]

1. J. Edgar Hoover and the FBI
2. Judge Preston Battle — the Ray Trial Judge
3. Percy Foreman — Ray's lawyer
4. Pat Canale — the District Attorney in Memphis
5. The Justice Department, up to and including John Mitchell
6. William Bradford Huie — author of He Slew the Dreamer
7. A series of Judges in Tennessee and Federal Courts who have rejected Ray's appeal for an evidentiary hearing
8. The assassin and his backers

In the Robert Kennedy case, the cover-up has involved as a minimum:[11]

1. Evelle Younger — Los Angeles District Attorney (now California Attorney General)
2. Ed Davis — Los Angeles Police Chief
3. Robert Houghton — Chief Investigator — Los Angeles
4. J. Edgar Hoover and the FBI
5. The Justice Department and John Mitchell
6. Judge Herbert V. Walker
7. Russell Parsons and Grant Cooper, Sirhan's first lawyers
8. Thane Eugene Cesar and the other conspirators and their backers

Robert Kaiser, author of RFK Must Die, has made his contribution to the big cover-up by first making it seem that he believed there was a conspiracy.[12] He then turned around and in an article in the Los Angeles Times Sunday Magazine section, conveyed the impression to the lay reader that there was no conspiracy.[13] Kaiser now works for the Rand Corporation.

The news media in the RFK situation have aided and abetted the cover-up completely by ignoring and refusing to publish or broadcast substantial evidence of the conspiracy. They have continued to refer to Sirhan as the lone madman assassin, and have perpetuated the image of a single revolver firing shots, and the image of a thorough investigation and trial proving beyond a shadow of a doubt that Sirhan did it. This image has been projected so subtly and thoroughly through the five years that have elapsed, that many Americans swear they saw Sirhan shooting Robert Kennedy on TV. They did not. There were no films and no live TV of Sirhan shooting or Robert Kennedy falling. The first still photos taken show Kennedy on the floor surrounded by people and Sirhan with his gun hand pinned down by several people.

Whenever someone describes what actually happened, the average newsman, politician, or American citizen regard him as a "kook". What really happened was that Sirhan fired eight shots and missed Kennedy with all eight. Thane Cesar fired three shots from directly behind Kennedy using his Ambassador Hotel guard pistol which he pulled out of the holster on his guard uniform. All three shots hit Kennedy, and one of the three shots killed him. The autopsy results, at least two witnesses who saw Cesar shoot, sound tracks on TV and film, ballistics evidence, and other evidence confirm this.[14]

To the Senators on the Ervin Committee, these three cover-ups may now seem a little more believable. To researchers in the Committee to Investigate Assassinations, these three cover-ups have been very real for several years. The Watergate lessons should be learned well, and the American mind should be opened to consider the possibility of the "really big American cover-ups" in the assassinations of the Kennedys and King.

Weakness of the "Really Big American Cover-Up"

Watergate has illustrated how difficult it is in the long run, given an aggressive free press, to completely hide the truth in a "really big cover-up". The problem is that there are too many people, too many organizations, and too many actions involved. Someone is bound to talk eventually, or let the cat out of the bag. You can't control or murder everyone involved. There are eventually going to be leaks.

The presence of an Ervin Committee with open, public exposure, subpoena power, and money for investigations surely helps widen these leaks into downpours.

What has been missing in the assassination cover-ups is the latter. There have been plenty of leaks, plenty of people talking, and plenty of goofs exposing bits and pieces of the original crimes and their cover-ups. What is now needed to create the downpour is an Ervin Committee on assassinations, with the subpoena power, the investigative resources, and the public forum.

In the JFK case for example, two CIA informants, three FBI agents, two members of the Warren Commission, several participants in the Dealey Plaza event, and some of the planners can all be subpoenaed, put on the hot seat, and forced to reveal the truth or commit perjury. This is quite a different situation than the one usually pictured by the person unfamiliar with the leaks and the research conducted by private sources. His impression is usually that one must start from scratch to find out whether there was a conspiracy or not.

There are many, many, very specific leads that an Ervin Committee or its equivalent can pick up immediately to get at the complete truth about the assassinations of John and Robert Kennedy and Martin Luther King. The Committee could work its way up a ladder of people involved in each case, right to the top, on the crimes and the cover-ups.

The De Facto American Cover-Up

Lesson number nine is concerned with the psychology of Americans.

The point of view of many American citizens toward the assassination of John F. Kennedy is that even if there was a conspiracy involved, and even if it was a high level conspiracy, they really don't want to know or to think about it. In a very real sense, this attitude was prevalent in America prior to Watergate, on many matters of importance involving the highest governmental levels. It was also true about Watergate up to a point in time which varied with the individual from June 18, 1972 to the present date.

The American people seemed to have a deep-rooted psychological urge to hide the truth from themselves or to bury the sinister or the frightening possibilities where the "really big cover-up" might be involved. The urge has origins that go back at least to World War II and perhaps earlier. What might be called the "ostrich syndrome" can be represented by several, well recognized phrases:

Don't rock the boat.

All those honorable men certainly wouldn't.

It would be very bad for America if the truth were known.

What will happen to <u>me</u> if?

What about my job?

What about my career?

What would happen to the value of my stock?

Let sleeping dogs lie.

I couldn't do anything about it anyway.

What can the average citizen do? — Nothing!

So what!

What difference does it really make?

Everybody does it.

That's politics.

We can never really know the truth about that.

I have seen no evidence that would convince me.

We must preserve the office of the Presidency.

It couldn't happen here.

Whatsa matta, you got no respect for the flag?

America, love it or leave it.

Don't bother me with the facts, I've made up my mind.

The net result of this attitude is a kind of de facto cover-up by the American people which aids and abets the purposeful cover-up at the higher levels. It comes close to resembling the de facto closing of the eyes and minds of the German people as Hitler rose to power.

As long as these attitudes prevail, it will be very difficult indeed to uncover and expose the complete truth about the assassinations of John and Robert Kennedy and of Dr. Martin Luther King. Perhaps Watergate presents the first real opportunity to overcome the de facto American cover-ups in those three crimes.

Surely by the end of July 1973, it will be less likely that these attitudes will prevail with respect to the Watergate crimes and cover-ups.

Lesson number ten is that a well-organized, Presidential level conspiracy can accomplish some almost unbelievable results.

What Watergate Proved

Watergate proved that it is possible in the United States of 1972-73 to get away with many things that most citizens would not have believed possible prior to the revelations of 1973. Watergate proved "It <u>can</u> happen here," and it very nearly happened in a way that would not have been exposed. Watergate proved:

You <u>can</u> rig an election and get away with it

You <u>can</u> suppress investigations

You <u>can</u> control the legal process and the Courts

You <u>can</u> squelch the news media

You <u>can</u> use CIA methods and people to do all of these things

You <u>can</u> disrupt conventions and other political activities using spies and provocateurs

You can shoot a President or a Presidential candidate and make it seem as if a lone assassin had done it

You can get away with a "really big American cover-up"

You can do all of these things and get away with them up, unless the Congress, the press, and the people are wide awake and vigilant.

Most of these things were also done in the case of the assassinations of John Kennedy, Robert Kennedy, and Martin Luther King.

Lesson number eleven is that we had a very narrow miss moving down a completely unacceptable path in the United States.

Where Would We Be Now If Watergate Had Not Been Exposed

Several fluke incidents led to the discovery of Watergate. We would never have known about all of it if Frank Wills, the Watergate guard, had not noticed the tape on the doors, or if the team had not put the tape back on after Wills removed it the first time.

Where would we be today if that tape had not been put back? We would all be sitting here, unknowingly, with plumbers teams operating everywhere, with FBI and CIA activities increasing, with Nixon and Mitchell pouring on the law and order pressure, with Ellsberg probably convicted, with the news media asleep, with probable deaths or injuries at the Miami conventions caused by the activities of Barker, Sturgis, et al., with police state tactics growing and growing, with all of those White House people still very active in forming U.S. policy.

The thought is really staggering when one reflects on it. Where were we really headed? McGovern hinted during the latter stages of the campaign that we were headed for fascism. He was probably right.

This type of reflection is bound to hit the average American squarely between the eyes sooner or later. Hopefully, if it does, he will say, "Let us turn over all the rest of the rocks and see what kind of bugs crawl out. Let's continue this process to make sure we don't slip back to pre-Watergate days because we missed some other 'really big American cover-ups'."

Who should carry this new flag? Who should bear this flushing burden? Who should the counter pumbers be?

The final lesson, number twelve, is that we have at long last in the U.S. a stimulus, a catalyst, and a people's way of discovering and exposing horrible truths.

The Ervin Committee

Senator Sam Ervin's Select Committee on Presidential Campaign Practices should continue its work long after the truth about the specific incident of the Watergate bugging has been revealed. By the time this phase is over, the American public will realize that full disclosure of the crime and its subsequent cover-up was good for the country and not bad. Whether or not Mr. Nixon is impeached or resigns, the net result will be good. The careful truth-searching procedure used by the Committee, working their way up the chain of responsibility from the bottom to the top, has been an important ingredient in the whole affair. No court style evidential-adversary proceeding could have produced the same result, no matter what the claims and protests of Archibald Cox and Spiro Agnew may be.

The only proper way to expose the "really big American cover-up" is to ascertain the truth from each rung of the conspiratorial ladder all the way to the top, and "let the chips fall where they may". If this procedure is followed, with truth and the U.S. Constitution as the sole guiding principles, the country is bound to benefit, no matter what individuals or organizations are guilty.

Watergate is like a flushing of a stopped-up toilet. The country really needed it, and the toilet, once unplugged, should be in as good shape as it once was. However, Watergate flushing alone will not completely unplug the toilet. Additional flushing is needed in the areas of organized crime and political assassinations. Complete truth-letting about who assassinated President Kennedy, Robert Kennedy and Martin Luther King, as well as who covered up the conspiracies and why, is essential for complete U.S. toilet flushing. In addition, a total exposure of the relationships between organized crime, especially the Syndicate and the Mafia, and the executive branch of our Government and the President, is also necessary for total flushing. In the same manner as Watergate, these exposures will also be good for the country and not bad.

Watergate Flushing

The flushing process initiated by Watergate has already touched on a fantastic number of areas, organizations, and people. The following things have been flushed out:

1. The bugging of the Democratic Headquarters
2. Planned bugging of Democratic Convention Headquarters in Miami
3. Attempted bugging of McGovern Headquarters in Washington
4. Bugging of several newsmen
5. Donald Segretti sabotage and espionage projects
6. Burglary of Daniel Ellsberg's psychiatrist's office
7. Tapping of Daniel Ellsberg's telephone
8. Tapping of Morton Halperin's telephone
9. 1970 Nixon spy plan
10. FBI wiretaps of Kissinger's staff
11. CIA domestic activities — clandestine
12. Plumbers team at the White House
13. Plans for disruption, sex and violence at conventions
14. Attack on Daniel Ellsberg at Capitol in Washington
15. Gestapo-like attitudes on part of White House people
16. Presidential involvement in, and authorization of, illegal acts
17. Massive cover-up program led by Nixon
18. Crookedness in large businesses — Robert Vesco, C. Arnholdt Smith, Ed Ball
19. Hidden campaign funds and Presidential rewards to conspirators for silence — blackmail
20. Blackmail of President and others by J. Edgar Hoover
21. Electoral control
22. Spying on, and infiltration of left-wing groups
23. Use of provocateurs by the FBI and the Army

24. Assassination plans for President of Panama
25. ITT crooked actions — kidnapping of Dita Beard and influence on her to keep quiet by White House
26. Provision by CIA of equipment and techniques to Hunt
27. Resignations of Attorney General, Head of CIA, Head of FBI, Head of SEC, entire White House staff
28. CIA operations in Mexico
29. Misuse of Grand Juries
30. Attempts to bribe judges by White House
31. Use of IRS by White House to threaten companies
32. Attempts to use CIA to stop FBI investigations

It is certain there will be many more revelations and cancers exposed during the next few months. As one reviews the list it would seem that assassination inquiries and Nixon's connections with organized crime are about the only things missing. It is a very impressive and unbelievable list.

Do We Need Another Committee?

The Ervin Committee's prime assignment is campaign-related activities. In this sense, the assassination of Robert Kennedy and the attempted assassination of George Wallace should logically fall within their purview. Both men were strong candidates whose elimination from the campaigns influenced the outcome. The Committee's first goal, as it should be, is the complete truth about Watergate and 1972 campaign practices directly related to the Committee to Re-Elect the President. Assassinations and assassination attempts may detract from that goal, if emphasis is shifted away from Watergate now.

Nevertheless, there is no one in the United States who would not admit that the assassination of a Presidential candidate is a far more significant event than political espionage and sabotage. The exposure of a conspiracy to assassinate a candidate, and the exposure of an even larger conspiracy to cover up the murder, must eventually take ultimate priority in any American toilet flushing. Thus the Ervin Committee or perhaps a successor to it, must do this job.

There is no doubt whatsoever from the available evidence that Robert Kennedy was eliminated from the 1968 Presidential race as the result of a well-organized conspiracy, and that Sirhan B. Sirhan did not kill him. There is also no doubt whatsoever that the assassination conspiracy was hidden by a "really big American cover-up" comparable in size and style to the Watergate cover-up. If the Robert Kennedy and the John Kennedy assassination conspiracies and their related "really big cover-ups" are permitted to slip away from us after Watergate is all cleaned up, we will be right back where we were in 1969. Flushing out the Watergate conspirators right up to and including Mr. Nixon does not guarantee that we will have flushed out all of the criminals involved in the assassinations and their cover-ups. In fact, The Secret Team illustrates how those who altered the directions of America in 1960 (Bay of Pigs), 1963 (Assassination of John Kennedy) and 1968 (Assassination of Robert Kennedy), may even take advantage of the Watergate flushing by the Ervin Committee to increase their power.

If the "Secret Team" was involved in the assassinations, and it seems very likely that some of them were, then it follows that they will do everything possible to capitalize on the flushing of Watergate. So far, except for E. Howard Hunt, no high level "Secret Team" members have been exposed in Watergate. The clandestine side of the CIA and its friends in the various branches of government have come out fairly clean, to date. This does not mean they should not be investigated, however. A separate Congressional Committee has already been set up to investigate the Justice Department and the FBI. A Congressional flushing and complete investigation of the "Secret Team" and the CIA is also badly needed.

Perhaps one Congressional Committee is not enough to do all of these cleansing jobs. By far the most critical is the exposure of truth about assassinations.

Let us learn well the lessons of Watergate.

Footnotes

1. The first six articles in Computers and Automation:
   August 1972 — "The June 1972 Raid on Democratic Party Headquarters"
   October 1972 — "The June 1972 Raid on Democratic Party Headquarters (The Watergate Incident), Part 2"
   December 1972 — "The June 1972 Raid on Democratic Party Headquarters (The Watergate Incident), Part 3"
   January 1973 — "President Richard M. Nixon, The Bay of Pigs, and the Watergate Incident, Part 4"
   March 1973 — "The Watergate Crime and the Cover-Up Strategy, Part 5"
   June 1973 — "Watergate: What More is There to Hide, Part 6"
2. Newsweek (May 14, 1973), p. 29.
3. Prouty, L. Fletcher. The Secret Team. Prentice-Hall, 1973.
4. Salandria, Vincent J. "The Assassination of President John F. Kennedy: A Model for Explanation." Computers and Automation (December 1971).
5. Articles on the cover-up of the conspiracy to assassinate John F. Kennedy appeared in Computers and Automation in May 1970, July 1970, November 1970, June 1971, July 1971, August 1971, September 1971, October 1971, November 1971, June 1973.
6. Richard Russell Television Interview — Atlanta, Georgia, May 1971.
7. Warren Report, p. 26.
8. CBS TV News Special with Walter Cronkite and Lyndon B. Johnson; and The New York Times (April 1970).
9. "The Last Days of the President." Atlantic Monthly (July 1973).
10. Evidence of a cover-up of the conspiracy to assassinate Dr. Martin Luther King is presented in the December 1970 issue of Computers and Automation.
11. Evidence of a cover-up of the conspiracy to assassinate Senator Robert F. Kennedy is presented in the August 1970, October 1970, and September 1972 issues of Computers and Automation.
12. Kaiser, Robert. RFK Must Die. Dutton, 1970.
13 The Los Angeles Times Sunday Supplement (October 23, 1972), Robert Kaiser.
14. Sprague, Richard E. "The Conspiracy to Assassinate Senator Robert F. Kennedy and the Second Conspiracy to Cover It Up." Computers and Automation (October 1970). □

ACROSS THE EDITOR'S DESK
Computing and Data Processing Newsletter

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APPLICATIONS

PRIVATE SHIPYARD USES COMPUTER TO DESIGN, BUILD LARGE VESSELS

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Two Bay State (Massachusetts) companies — ADL Systems, Inc., and General Ship and Engine Works, Inc. — are seeking to combine modern computer technology and time-tested shipbuilding techniques in a venture that may rescue some of the Commonwealth's fading naval capacity. Working with the United States Navy, they're using a computer to design a ship's hull.

ADLS, a Cambridge-based software subsidiary of Arthur D. Little, Inc., has worked for a number of years to develop CASDOS (Computer-Aided Structural Detailing Of Ships), a long-term Navy program to automate the bulk of its ship-building activities by the mid-1980's. Now, under a $3.8 million contract to produce four new landing craft (LCU's) for the U.S. Army, General Ship is using CASDOS in its Mystic River yards in a radical departure from shipbuilding traditions that have existed for centuries.

Traditionally, General Ship would have begun its contract task last December with such ancient practices as: detailed drawings, equivalent to "blueprints"; lofting, the practice of chalking full-scale layouts of every plate, joist, stiffener and bulkhead; and templating, the conversion of these layouts to full-sized wood or paper patterns used to cut steel for every hull part. These procedures — which are to a ship-builder what the designing of a tissue pattern and its subsequent cutting out from fabric are to a dressmaker — have been used to build every large steel-hulled vessel from an iron-clad monitor to the most modern nuclear aircraft carrier. Instead, under this new contract, General Ship will rely on reams of printouts and graphic representations and that specify every angle, joint, bulkhead and deck plate — without the need for a single hand-made drawing. It will convert massive amounts of computer data into four finished LCU hulls in the next 26 months.

The Navy, Arthur D. Little, Inc., and ADL Systems have invested more than 60 man-years, beginning in 1965, in the CASDOS project. The system — which runs on large Navy computers located in Washington, D.C. — consists of more than 240 data modules (design systems), each of which is controlled by a separate computer program under the control of a master program called the Executive System. These design systems use more than 1200 subroutines — smaller programs that perform specification, storage, analysis or testing function on ship design information.

Naval ship designers insert into the system data based on the normal contract design of the ship being detailed. These data are gathered in a single set of data files within the computer. CASDOS then generates a geometric model of the ship's hull inside the computer — determining the location, size and shape of decks, transverse and longitudinal structures, and joints. This information enables the designers to determine automatically the "lofting" details, such as the exact shape and curve of every steel plate, stiffener, and connector, strake, skeg and keel part — even the location of every single spot and continuous weld.

As a byproduct of this process, massive detailed reports are produced, including bills of materials that enable a shipyard to order the exact number of parts (often totalling tens of thousands of items per vessel), computer-generated diagrams and schematics, bending instructions for steel plates, stiffener fabrication details, and reports on weight necessary for checking stability and hydrodynamic properties.

So detailed is the system that it produces tapes of instructions that actually drive automated flame-cutters at the shipyard — a process that elimimates hundreds of man-days of drawing chalk lines on steel plates and manually cutting each along those lines.

For General Ship, the job of being the first shipyard ever to tackle such an assignment is the path to leapfrogging its competitors and assuring its future as a leading ship builder. For ADL Systems, CASDOS is a validation that computer technology — properly applied — can alter even the most enduring traditions and bring into viable competition otherwise dated facilities. For the U.S. Navy, CASDOS represents the first step towards the automated construction of fleets for the 1980's and the 1990's.

MINICOMPUTER-BASED SYSTEM BOOSTS NEWSPAPER PRODUCTION RATE

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During 1972, the Wilmington Star-News, a North Carolina daily newspaper with a circulation of 36,000, increased its total production by an average of 114 pages per month over the previous year. Yet this growth did not require any additions to the Star production staff. Instead, production manager George Hutchinson purchased a Compuscan 170 optical page reader system supervised by a Data General Corp. minicomputer.

According to Hutchinson, the minicomputer-based system can handle the current production rate and also accommodate anticipated future growth. "We would have had to hire at least four more Teletype operators to handle just last year's growth," he says. "With this system we've cut keystrokes on locally generated copy by 50%."

Now news reporters and classified ad takers type original copy on conventional IBM Selectric II typewriters equipped with a standard printing and publishing font. An optical scanner converts this typewritten text to clean computer tape at the rate of over 5,100 characters per minute. The six-level TTS tape is then run into the Star's IBM 1130 which controls the newspaper's Photon and Compugraphic photo-typesetting machines. The Data General Nova 1200 minicomputer which supervises the system is equipped with 8,000 words of core memory and the necessary software to allow a typist or editor to make copy changes quickly and easily. It provides five different editing and correction modes, both on-line and off-line.

In addition to the minicomputer, the basic Compuscan system consists of a desk-sized scanner console and a set of peripheral devices. The optical scanner uses a solid-state electronic read head for recognition. No precision focusing is required. The scanner features an optical display and retractable keyboard for on-line editing, plus a small CRT display.

TEXAS BANK GROWS FAST WITH C.I.F. ON-LINE SYSTEM

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Since November 1968, when it started to use an on-line central information file system (C.I.F.), the Dallas County State Bank has had a 250 percent increase in deposits, from $8 million to $29 million, while increasing its personnel only 25 percent from 28 employees to 37. The bank's president, Kenneth Hughes, says the C.I.F. system has made a "major contribution to our growth."

The C.I,F. service is supplied by Affiliated Computer Systems of Dallas through their data center which has two Honeywell computers, a 1250 and a 2200. The on-line terminal equipment at the bank is supplied by Bunker Ramo Corporation and consists of eight cathode ray tube desk-top units and a multi-station terminal controller connected to the data center by a 2,400 baud leased circuit.

Mr. Hughes said one of the most valuable functions of the service is to "provide our loan officers, on demand, with a display of reliable, up-to-date information of any customer's total relationship with our bank. At a glance, we can review every checking, savings, mortgage and loan account that has a bearing on the loan application of a particular customer. This enables us to make an informed decision on each new loan, with assurance of obtaining desired yield. We can also play back an analysis of the information accumulated by the system to monitor and evaluate the performance of our loan officers.

"Also, our tellers can instantly check the status of any customer account during a window transaction, using one of the CRT terminals located behind the teller windows. Other software features enable the system to flag us well ahead on expiration and maturity dates and other matters where decision lead time helps bank management."

Darwin Deason, Vice President and Manager of Affiliated Computer's Dallas Data Center, said their C.I.F. system is now serving 19 small-to-medium-sized banks in the southwestern region, but is capable of handling large banks also. The system is being offered for franchise in other regions and is already being used by the Framingham Trust Company, a large Massachusetts organization with 15 branches. Framingham also services six other banks in Massachusetts, Rhode Island, and Connecticut with the C.I.F. system.

AMERICAN LEAGUE COMPUTERIZES JOB OF KEEPING STATISTICS

National Cash Register Co.
Dayton,
Ohio 45479

They've taught a computer in Boston, Mass., all about baseball — the statistical side, that is. At the Sports Information Center offices in Boston, an NCR Century 100 system is keeping track of all hitting, fielding and pitching data for the American Baseball League, producing a daily statistical update for each of the 12 teams in the league. No longer do team statisticians have to work into the night manually compiling individual statistics for their teams and players. Now, after a game is completed they fill in a simple report form which is facsimile-transmitted to an untended facsimile receiver at the computer center.

Each morning, shortly after 7 a.m., the computer receives all figures from the games of the day or night before. In less than an hour, it has completed reports on batting, pitching and fielding statistics for transmission to each team by teletypewriter. Thus, before today's game starts, the team statistician has up-to-date figures through yesterday's games for team and news media use. Best of all, according to Tom Monahan who is in charge of the project for the American League, they are gathering, compiling and filing figures that have never been kept before.

At the end of each week two summary reports are prepared for each American League team. The first gives year-to-date figures on hitting, fielding and pitching for all players, along with their rank this week and last week. The second report gives the statistics for the four top performers in such categories as most hits, most runs batted in, highest batting average, lowest earned-run average, most games won, and most innings pitched. At the end of the season will come the final reports. These will exceed 300 pages of data for each team, including complete year-end statistics breaking down batting and fielding proficiencies by player by position by opponent. This is the data from which the teams prepare their club annuals.

At any time during the season any team can request special reports on individual players. For instance, a manager can receive a report on how a particular player bats against right-handed pitchers at home at night, or how another player pitches against a specific team on the road.

Baseball statistics consiitute only a small portion of the Century 100's total workload. The majority of the computer's time is spent processing business data for the parent firm of Sports Information Center, Bay State Milling Company.

RESEARCH FRONTIER

CALCULATOR PREVENTS COLLISIONS AT SEA

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Navy and commercial ships will find greater safety from collisions at sea by the use of a Closest Point of Approach (CPA) calculator developed at the Naval Electronics Laboratory Center (NECL) in San Diego. This ship borne collision avoidance calculator is designed to detect and warn of an impending collision or near collision course between two or more ships.

The technique most commonly used now by ships for collision avoidance is to manually plot the relative motion between ones own ship and the target ship on a plotting board from radar derived data — a time consuming and error-prone method, depending to a large extent on the conditions, and the skill and experience of the operators. A need exists for a simple, low cost method of rapidly and accurately determining the closest point of approach that does not depend on highly skilled personnel.

NELC attacked the problem by developing a Closest Point Approach calculator which can rapidly and accurately compute the five desired parameters — range, time, bearing, target speed, and target course at CPA for up to five target vessels. Recently a weeks demonstration of a breadboard version calculator aboard the USS Ticonderoga proved successful. The mini-computer was designed and developed in the Advanced Modular Concepts Division at NELC. Steps are being taken to protect this invention on behalf of the Navy.

Radar derived data from target ships, range, bearing, and time for two sets of chronologically spaced readings (Mark I and Mark II) are manually inserted into the calculator via keyboard, as well as own ships course and speed. From this data, the calculator automatically computes any or all the five selected CPA parameters. Human errors resulting from incorrect manual data entry can be eliminated by providing the radar display with an array of position sensors such that, by merely placing a probe over the target, its coordinates would automatically be fed to the calculator.

Although not included in the present design, the algorithms for determining corrective change of course to achieve a desired CPA in the case of an impending collision have been worked out, and could be incorporated into the next generation computers, along with the capability of handling many more targets. Todays technology also offers the prospects for automatic data acquisition and CPA determination, and generating an alarm for an impending dangerous situation, all without human attendance.

PROSTHETIC ARM MOVEMENTS CONTROLLED BY COMPUTER

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An artificial arm that allows a handicapped person to comb his hair, feed himself, and scratch his back could be built for around $2000, according to Stanford Research Institute (SRI) researchers John Hill and Antony Sword. In the upcoming summer issue of SRI's quarterly publication, Investments In Tomorrow, the two researchers point out that a system they have already developed can perform the principal motions necessary to accomplish these tasks. The system uses a special arm developed for the National Aeronautics and Space Administration (NASA) for remote-control space operations.

The arm, which has several movable parts including elbow, wrist and pincers, is attached to the user's shoulder and controlled by means of a strap across his back. As his shoulders move and pull on the strap, a single transducer in the strap signals a computer, which has been programmed to interpret the signals and control the movements of the entire 7-jointed arm in a coordinated manner.

To move the hand back and forth from the table to his mouth in a feeding motion, the user pulls his shoulders together, causing the arm to rise toward his mouth. Then he spreads his shoulders apart again, causing the arm to return to the table. The back and forth motions require perhaps an inch of spread in the shoulders. By moving his shoulders rapidly or slowly, he controls the speed of the arm movement. The same shoulder spreading motion can be used to control many different arm movements. The researchers are currently experimenting with specific movements to assist in eating, dressing and personal hygienne.

The control functions now performed by computer could be incorporated into a tiny integrated circuit and inserted into the arm, the article says. An integrated circuit that contains the controls for about 20 different coordinated movements could be ordered custom made today for a price of about $15 in quantity, according to the researchers. Thus it is within the realm of possibility for the handicapped person to have a built-in computer programmed to control the arm movements he needs to perform his particular job and leisure time activities. He might even be able to program his own movements so that he could be fairly self-sufficient.

The SRI researchers are also working with the Naval Prosthetics Research Laboratory in Oakland, California, using the control scheme with a hand that has independently moving fingers.

MISCELLANEOUS

852 OUT OF 2,722 APPLICANTS PASS '73 CDP EXAM

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A total of 852 candidates have passed the 1973 examination for the Certificate in Data Processing (CDP), it was announced by the Certification Council. The 852 who passed all five sections of the exam represented approximately 31% of the 2,722 who sat for the exam last February.

The new CDP holders become part of the select group of nearly 14,000 who have passed the examination since it was first given in 1962. The exams are held annually in colleges and universities in the U.S. and Canada. The successful candidates have achieved a designation which is becoming the recognized method of identifying individuals who have the knowledge to function as data processing managers.

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Univac Div., Sperry Rand Corp., Blue Bell, Pa.	General Services Admn., U.S. Army, Washington, D.C.	15 large-scale UNIVAC 1108 computers split into 8 systems (7 multiprocessors and 1 unit processor); will consolidate Army's world-wide personnel accounting functions at Army Military Personnel Center, Alexandria, Va.	$30 million
Burroughs Corp., Federal and Special Systems Group, Paoli,	Air Force Systems Command, Electronic Systems Div.	A three-processor Burroughs B 6700 data processing system to support Advanced Personnel Data System (APDS) to be installed at A.F. Military Personnel Center, Randolph A.F.B., Texas; replaces two Burroughs B 5500 multiprocessor systems and a Honeywell 1250 system	$16 million
Control Data Corp., Minneapolis, Minn.	Defense Supply Agency, General Services Admn., Alexandria, Va.	Replacement of automatic data processing equipment (ADPE) for Defense Automatic Addressing System (DAAS) at Gentile AFB, Dayton, Ohio and Defense Depot, Tracy, Calif.; installation of 3 interconnected CDC 3500 systems at Dayton and 2 interconnected CDC 3500 systems at Tracy	$9.5 million (approximate)
System Development Corp., Santa Monica, Calif.	Army Advanced Ballistic Missile Defense Agency (ABMDA), Huntsville, Ala.	Production of Parallel Element Processing Ensemble (PEPE), an advanced ballistic missile defense computer system; PEPE system will be installed and tested at the ABMDA Research Center, Huntsville, Ala.	$9.5 million
Informatics Inc., Canoga Park, Calif.	Dun & Bradstreet, Inc., New York, N.Y.	Two Xerox Sigma 9 computers, plus 75 disc storage units and Informatics software for D&E's Advanced Office System (AOS)	$3.7+ million
Litton Industries, New York, N.Y.	Morse Shoe, Inc., Canton, Mass.	500 Sweda point-of-sale electronic cash registers and associated system equipment	$2 million
Univac Div., Sperry Rand Corp., Blue Bell, Pa.	Technischer Uberwachungsverein Rheinland (TUV), West Germany	A UNIVAC 1106 computer for all types of inquiries on the organization's work, activity and performance reports, accounting and payroll	$1.5 million (approximate)
General Electric, Communications Systems Div., Lynchburg, Va.	Hewlett Packard, Palo Alto, Calif.	TermiNet© 300 teleprinters specifically designed for HP (over next 18 months); will be used as medium speed computer terminals for direct or remote communications	$ 1+ million
Interdata, Inc., Oceanport, N.J.	Nuovo Pignone, Florence, Italy	A 3-year OEM Agreement for 25-30 Series Model 70 systems, with 48K bytes of core in each system	$1 million
Computer Sciences Corp. (CSC) Los Angeles, Calif.	U.S. Army Safeguard System Command, Huntsville, Ala.	Upgrading Instrumentation Acquisition System at Kwajalein Missile Range; also design and develop real-time software for CDC 7600 that will replace smaller 3300	$516,000
Advanced Memory Systems Inc., (AMS), Sunnyvale, Calif.	Cogar Corp., Utica, N.Y.	AMS' 1024-bit MOS RAM, the AMS 6002, for production requirements over the next year	$500,000
Systems Control, Inc., Palo Alto, Calif.	Department of the Army, Advanced Ballistic Missile Defense Agency	Computer analysis of defensive systems	$392,000
Univac Div., Sperry Rand Corp., Blue Bell, Pa.	U.S. Department of Transportation	Three data acquisition systems built around UNIVAC 1616 to support urban rail technology program of Dept.'s Urban Mass Transportation Administration (UMTA)	$250,000
Keane Associates, Inc., Wellesley Hills, Mass.	Industrial Ceramic, division of Norton Co., Worcester, Mass.	Design, development and testing of inventory control system using teleprocessing computer equipment and software	$170,000+
Purdue University, West Lafayette, Ind.	National Science Foundation	Research and development of a total computer control system for large industrial steel plants	$115,900
Federal Systems Div., Applied Data Research, Inc.	U.S. Army Electronics Command	Updating documentation of Automatic Message Processing System (AMPS)	——
Atlantic Research Corp., Alexandria, Va.	Baltimore Regional Planning Council, Baltimore, Maryland	Developing an improved Emergency Medical Service communications system to serve six jurisdictions in Maryland	——
Combinatorics, Inc., Lafayette, Ind.	U.S. Navy Material Command	The use of Systems Optimization and Design Algorithm (SODA) computer program for selecting hardware needed to implement a Navy financial management system	——
Daconics Corp., Sunnyvale, Calif.	National Aeronautics and Space Admin.	Airborne Data Management System; will be part of airborne astronomical observatory used for study of celestial objects in the infrared spectral region	——
Data Dimensions, Inc., Greenwich, Conn.	United Press International	Development and implementation of a Regional Information Storage and Retrieval System (IS&R)	——
National Cash Register Co., Dayton, Ohio	State of Michigan, Lansing, Mich.	Installation of 101 NCR 260 data terminals in various personnel offices of state, forming state-wide communications network to provide current employee status information	——
SCM Corp., Kleinschmidt Div., Deerfield, Ill.	M&M Computer Industries, Inc.,	720 line printers, to be delivered over three years	——

NEW INSTALLATIONS

OF	AT	FOR
Control Data 3500 system	South Africa Iron and Steel Corp., Vanderbijlpark, South Africa (dual system)	Handling a variety of on-line data processing requirements; new system upgrades a CDC 3300 system (system valued at $1.8 million)
Control Data 6600 system	Armament Development and Test Center (ADTC), Air Force System Command, Eglin Air Force Base, Fla.	Primary use as backup to CDC 6600 installed in 1968; will also handle time-sharing applications via network of remote visual display and teletype terminals at Eglin and at Tyndall A.F.B., Panama City, Fla.
Digital Equipment PDP-11/40 system	Bentley College, Waltham, Mass.	Instructional and research purposes; the system, designated RSTS/E, is specifically designed to handle multiple, large jobs in an extended timesharing mode
IBM System/3 Model 10	YMCA, Dallas, Texas	Tracing income, expenses and participation in approximately 6,000 programs offered at 17 local YMCA branches; maintain personnel information program on up to 1,300 exployees, and process staff payroll
IBM System/370 Model 125	Wells Fargo Bank, Sonoma Mortgage Division, Santa Rosa, Calif.	Handling a full line of mortgage banking applications from maintaining payment records of borrowers to paying bills on mortgaged property, including property taxes and insurance
NCR Century 50 system	Guy Gannett Publishing Co., Portland, Maine	Processing payrolls for its five newspapers and to do general ledger accounting; later plans include monitoring circulation and advertising
	L & A United Grocers, Inc., Lewiston, Maine	Order-entry processing
	Lamb Plumbing and Heating Co., Minneapolis, Minn.	Payroll, accounts receivable and accounts payable
	Arthur Whitcomb, Inc. Keene, N.H.	Monitoring base-materials sales and equipment-rental accounts
NCR Century 100 system	Danzas, S.A., France	General accounting, analytical accounting, financial and operating statistics for 12 major branches or subsidiaries
	RCA, Paris, France	Invoicing, stock management, clients' accounts and commercial statistics
	Royal Bank of Canada, London, England	General accounting work
	Societe des Ardoisieres, d'Angers, France	Stock management, invoicing, clients' accounts, order management, transportation management, management statistics and payroll
NCR Century 200 system	Cedar Holdings, Limited, London, England	Doubling data processing capacity to handle current loan and deposit accounting for Pall Mall office, other London branches and its Glasgow, Scotland, office; this is a second system
	Inchcape Berhad Group, Singapore	Over 17 applications for all 56 member companies; 10 additional applications will be added including new warehouse control system for 150,000 stock items carried by all members of the group
	Revillon, France	Banking applications which include portfolio handling, accounting records, commodity stocks, interest scales, statistics, stock exchange and foreign exchange work and payroll; Commerical applications include stock control, invoicing, general and analytical accounting, miscellaneous statistics and wages
	Shortland County Council, Newcastle, New South Wales, Australia	Billing, inventory control of parts, payroll and cost accounting; engineers will also use system
NCR Century 251 system	City of Baton Rouge, Baton Rouge, La.	Instant information on drivers' licenses and vehicle registrations, plus police and sheriff's arrest records; also used for general accounting purposes, including payroll processing
Univac 1106 system	NASA, Lewis Research Center, Cleveland, Ohio	Handling expanding workload of business applications such as administrative, personnel accounting and a remote inquiry for purchasing via visual display and printer terminals; some scientific applications will also be included
Univac 1108 system	Scientific Control Systems Ltd. (SCICON), Milton Keynes, England	Real-time, demand, batch and remote batch applications; this is SCICON's third 1108 system
Univac 1110 system	Nomura Securities Co. Ltd., Tokyo, Japan	Serving as center of an integrated information complex reaching all levels of company's management (system valued at $18 million)
Univac 9400 system	Tarrant Savings Association, Fort Worth, Texas	Keeping pace with rapid growth of the financial institution's business; joins 9300 system
Univac 9480 system	Toledo Savings Bank, Toledo, Ohio	Deposit account transactions and teleprocessing; replaces UNIVAC 9300 II system
Univac 9700 system	BASE, Inc., Atlanta, Georgia	Inventory control, accounting, payroll, and computerized storage planning; system replaces a UNIVAC 9400
	Computer Center of Skofja Loka, Yugoslavia	Production control using UNIS (UNIVAC Industrial System) package; other applications include scheduling, customer and sales accounting and payroll processing
Xerox Sigma 6 system	Rochester Products Div., General Motors, Rochester, N.Y.	Multi-use business system; controls many aspects of plant's operation, from payroll and inventory to design and manufacturing

MONTHLY COMPUTER CENSUS

Neil Macdonald
Survey Editor
COMPUTERS AND AUTOMATION

The following is a summary made by COMPUTERS AND AUTOMATION of reports and estimates of the number of general purpose digital computers manufactured and installed, or to be manufactured and on order. These figures are mailed to individual computer manufacturers quarterly for their information and review, and for any updating or comments they may care to provide. Please note the variation in dates and reliability of the information. A few manufacturers refuse to give out, confirm, or comment on any figures.

Part 1 of the Monthly Computer Census contains reports for United States manufacturers, A to H, and is published in January, April, July, and October. Part 2 contains reports for United States manufacturers, I to Z, and is published in February, May, August, and November. Part 3 contains reports for manufacturers outside of the United States and is published in March, June, September, and December.

Our census seeks to include all digital computers manufactured anywhere. We invite all manufacturers located anywhere to submit inforthat would help make these figures as accurate and complete as possible.

The following abbreviations apply:

(A) -- authoritative figures, derived essentially from information sent by the manufacturer directly to COMPUTERS AND AUTOMATION
C -- figure is combined in a total
(D) -- acknowledgment is given to DP Focus, Marlboro, Mass., for their help in estimating many of these figures
E -- figure estimated by COMPUTERS AND AUTOMATION
(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
(R) -- figures derived all or in part from information released indirectly by the manufacturer, or from reports by other sources likely to be informed
(S) -- sale only, and sale (not rental) price is stated
X -- no longer in production
\- -- information not obtained at press time and/or not released by manufacturer

SUMMARY AS OF JULY 15, 1973

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Part 2. United States Manufacturers							
IBM	305	12/57	3.6	40	15	55	-
White Plains, N.Y.	650	10/67	4.8	50	18	68	-
(N) (D) (June 1973)	1130	2/66	1.5	2580	1227	3807	-
	1401	9/60	5.4	2210	1836	4046	-
	1401-G	5/64	2.3	420	450	870	-
	1401-H	6/67	1.3	180	140	320	-
	1410	11/61	17.0	156	116	272	-
	1440	4/63	4.1	1690	1174	2864	-
	1460	10/63	10.0	194	63	257	-
	1620 I, II	9/60	4.1	285	186	471	-
	1800	1/66	5.1	416	148	564	-
	7010	10/63	26.0	67	17	84	-
	7030	5/61	160.0	4	1	5	-
	704	12/55	32.0	12	1	13	-
	7040	6/63	25.0	35	27	62	-
	7044	6/63	36.5	28	13	41	-
	705	11/55	38.0	18	3	21	-
	7020, 2	3/60	27.0	10	3	13	-
	7074	3/60	35.0	44	26	70	-
	7080	8/61	60.0	13	2	15	-
	7090	11/59	63.5	4	2	6	-
	7094-I	9/62	75.0	10	4	14	-
	7094-II	4/64	83.0	6	4	10	-
	System/3 Model 6	3/71	1.0	8	-	-	-
	System/3 Model 10	1/70	1.1	4	-	-	-
	System/7	11/71	0.35 and up	12	-	-	-
	360/20	12/65	2.7	7161	6075	13236	1780
	360/25	1/68	5.1	1112	759	1871	1287
	360/30	5/65	10.3	5487	2535	8022	-
	360/40	4/65	19.3	2454	1524	3978	1363
	360/44	7/66	11.8	109	57	166	39
	360/50	8/65	29.1	1135	445	1580	662
	360/65	11/65	57.2	604	144	748	562
	360/67	10/65	133.8	57	6	63	99
	360/75	2/66	66.9	50	17	67	12
	360/85	12/69	150.3	11	1	12	55
	360/90	11/67	-	5	-	-	-
	360/190	-	-	13	2	15	-
	360/195	4/71	232.0	-	-	9	48
	370/115	-	-	-	-	-	-
	370/125	4/73	8.2-13.8	1	-	-	-
	370/135	5/72	14.4	12	-	-	-
	370/145	9/71	23.3	1	-	-	-
	370/155	2/71	48.0	1	-	-	-
	370/158	-/73	49.5-85.0	1	-	-	-
	370/165	5/71	98.7	3	-	-	-
	370/168	-/73	93.0-170.0	-	-	-	-
	370/195	6/73	190.0-270.0	-	-	-	-
Interdata	Model 1	12/70	3.7	244	75	319	-
Oceanport, N.J.	Model 3	5/67	13.1	-	-	200	X
(A) (Jan. 1973)	Model 4	8/68	8.5	274	115	389	32
	Model 5	11/70	X	70	20	90	X
	Model 15	1/69	20.0	40	24	64	X
	Model 16	5/71	X	1	6	7	X
	Model 18	6/71	X	2	7	9	X
	Model 50/55	5/72	6.8	22	3	25	3
	Model 70	10/71	6.8	268	55	323	75
	Model 74	2/73	15	2	0	2	50
	Model 80	10/72	14.9	6	0	6	15
Microdata Corp.	Micro 400/10	12/70	0.1-0.5	132	0	132	-
Irvine, Calif.	Micro 800	12/68	0.2-3.0	1993	810	2803	-
(A) (Mar. 1973)	Micro 1600	12/71	0.2-3.0	364	95	459	-
NCR	304	1/60	X	5	2	7	X
Dayton, Ohio	310	5/61	X	8	0	8	X
(A) (Dec. 1972)	315	5/62	7.0	255	200	455	-

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
NCR (cont'd)	315 RMC	9/65	9.0	55	35	90	-
	390	5/61	0.7	160	325	485	-
	500	10/65	1.0	1100	1750	2850	-
	Century 50	2/71	1.6	580	0	580	-
	Century 100	9/68	2.6	1175	780	1955	-
	Century 101	12/72	3.7	50	-	-	-
	Century 200	6/69	7.0	575	330	905	-
	Century 300	2/72	21.0	5	5	10	-
Philco	1000	6/63	X	16	-	-	X
Willow Grove, Pa.	200-210,211	10/58	X	16	-	-	X
(N) (Jan. 1969)	2000-212	1/63	X	12	-	-	X
Raytheon Data Systems Co.	250	12/60	X	115	20	135	X
Norwood, Mass.	440	3/64	X	20	-	-	X
(A) (Jan. 1973)	520	10/65	X	26	1	27	X
	703	10/67	12.5	(S) 177	33	210	2
	704	3/70	7.2	(S) 260	70	330	40
	706	5/69	19.0	(S) 75	17	92	0
Standard Computer Corp.	IC 4000	12/68	9.0	9	0	9	2
Los Angeles, Calif.	IC 6000-6000/E	5/67	16.0	3	0	3	-
(A) (June 1972)	IC 7000	8/70	17.0	4	0	4	1
	IC-9000	5/71	400.0	(S) 1	0	1	-
Systems Engineering Laboratories	SYSTEMS 810A/810B	6-66/9-68	1.8/2.6	380	30	410	-
Ft. Lauderdale, Fla.	SYSTEMS 71/72	8-72/9-71	0.9/1.0	17	5	22	-
(A) (June 1973)	SYSTEMS 85/86	7-72/6-70	6.0/10.0	35	2	37	-
Texas Instruments Inc.	960	6/70	X	-	-	-	X
Houston, Tex.	960A	11/71	0.2-2.7	-	-	-	-
(A) (June 1973)	980	5/68	X	-	-	-	X
	980A	8/72	0.3-2.7	-	-	-	-
UNIVAC Div. of Sperry Rand	I & II	3/51 & 11/57	X	23	-	-	X
Philadelphia, Pa.	III	8/62	X	25	6	31	X
(A) (June 1973)	File Computers	8/56	X	13	-	-	X
	Solid-State 80 I,II, 90, I, II, & Step	8/58	X	210	-	-	X
	418	6/63	11.0	80	39	119	23 E
	490 Series	12/61	30.0	76	15	91	15
	1004	2/63	1.9	1522	610	2132	-
	1005	4/66	2.4	617	248	865	72
	1050	9/63	8.5	136	59	195	-
	1100 Series (except 1107, 1108)	12/50	X	10	9	10	X
	1107	10/62	X	8	3	11	X
	1108	9/65	68.0	103	129	232	58 E
	9200	6/67	1.5	1106	835	1941	725
	9300	9/67	3.4	412	62	474	510 E
	9400	5/69	7.0	83	41	124	83 E
	9700	-	-	2	-	-	-
	LARC	5/60	135.0	2	0	2	-
UNIVAC - Series 70	301	2/61	7.0	143	-	-	-
Blue Bell, Pa.	501	6/59	14.0-18.0	17	-	-	-
(A) (Feb. 1973)	601	11/62	14.0-35.0	0	-	-	-
	3301	7/64	17.0-35.0	74	-	-	-
	Spectra 70/15, 25	9/65	4.3	18	-	-	-
	Spectra 70/35	1/67	9.2	95	-	-	-
	Spectra 70/45	11/65	22.5	265	-	-	-
	Spectra 70/46	11/68	33.5	30	-	-	-
	Spectra 70/55	11/66	34.0	10	-	-	-
	Spectra 70/60	11/70	32.0	18	-	-	-
	Spectra 70/61	4/70	42.0	7	-	-	-
	70/2	5/71	16.0	63	-	-	-
	70/3	9/71	25.0	7	-	-	-
	70/6	9/71	25.0	24	-	-	-
	70/7	12/71	35.0	7	-	-	-
Varian Data Machines	620	11/65	X	-	-	75	X
Newport Beach, Calif.	620i	6/67	X	-	-	1300	X
(A) (Mar. 1973)	R-620i	4/69	-	-	-	80	-
	520/DC, 520i	12/69;10/68	-	-	-	500	150
	620/f	11/70	X	-	-	207	X
	620/L, 620/L-00C	4/71;9/72	-	-	-	740	101
	620/f-100	6/72	-	-	-	100	43
	620/L-100	5/72	-	-	-	200	235
	Varian 73	11/72	-	-	-	40	39
Xerox Data Systems	XDS-92	4/65	1.5	43	4	47	-
El Segundo, Calif.	XDS-910	8/62	2.0	170	10	180	-
(N) (R) (June 1973)	XDS-920	9/62	2.9	120	12	132	-
	XDS-930	6/64	3.4	159	14	173	-
	XDS-940	4/66	14.0	32	3	35	-
	XDS-9300	11/64	8.5	25-30	4	29-34	-
	Sigma 2	12/66	1.8	163	36	199	-
	Sigma 3	12/69	2.0	21	1	22	-
	Sigma 5	8/67	6.0	30	14	44	-
	Sigma 6	6/70	12.0	3	-	-	-
	Sigma 7	12/66	12.0	31	7	38	-
	Sigma 8	2/72	-	5	-	-	-
	Sigma 9	-	35.0	5	-	-	-

CALENDAR OF COMING EVENTS

Aug. 13-17, 1973: SHARE Meeting, Miami Beach, Fla. / contact: D. M. Smith, SHARE, Inc., Suite 750, 25 Broadway, New York, NY 10004

Aug. 20-24, 1973: 3rd International Joint Conference on Artificial Intelligence, Stanford University, Stanford, Calif. / contact: Dr. Max B. Clowes, Laboratory of Experimental Psychology, University of Sussex, Brighton, Sussex BN1 9QY, England

Aug. 27-29, 1973: ACM '73, Atlanta, Ga. / contact: Dr. Irwin E. Perlin, Georgia Institute of Technology, 225 North Ave., N.W., Atlanta, GA 30332

Aug. 27-Sept. 1, 1973: Computer Arts Society, 1973 Edinburgh International Festival, Edinburgh, Scotland / contact: R. John Lansdown, Secretary, Computer Arts Society, 50-51 Russell Square, London WC1B 4JX, England

Aug. 30-Sept. 1, 1973: International Conference on Systems and Control, PSG College of Technology, Coimbatore, India / contact: Dr. R. Subbayyan, PSG College of Technology, Coimbatore 641004, Tamil Nadu, India

Sept. 4-7, 1973: International Computing Symposium 1973, Davos, Switzerland / contact: Dr. H. Lipps, International Computing Symposium 1973, c/o CERN, CH-1211 Geneva 23, Switzerland

Sept. 10-12, 1973: 5th Congress on Instrumentation in Aerospace Simulation Facilities, California Institute of Technology, Pasadena, Calif. / contact: H. F. Swift, Materials Physics Research, University of Dayton Research Institute, Dayton, OH 45469

Sept. 17-19, 1973: 7th Annual Intergovernmental Council for ADP Conference, Ottawa, Canada / contact: ICA Secretariat, 18 Keren Hayessod St., Jerusalem, Israel

Sept. 25-27, 1973: Conference on 'Hybrid Microelectronics,' University of Kent at Canterbury, England / contact: Registrar, Institution of Electronic and Radio Engineers, 8-9 Bedford Sq., London WC1B 3RG, England

Sept. 25-28, 1973: Engineering in the Ocean Environment Conference, Washington Plaza Hotel, Seattle, Wash. / contact: Ted Hueter, Honeywell Inc., Marine Sys. Ctr., 5303 Shilshole Ave., N.W., Seattle, WA 98107

Sept. 25-28, 1973: IFAC Symposium, Purdue Univ., W. Lafayette, Ind. / contact: Carl Jenks, Div. of Confs., Rm. 116, Stewart Ctr., Purdue Univ., W. Lafayette, IN 47907

Oct. 2-3, 1973: Elettronica 2 — 2nd International Conference of Industrial Applications of Electronics, Turin, Italy / contact: Secretariat, 2nd Covegno Internazionale di Elettronica Industriale, Corso Massimo d'Azeglio 15, 10126 Torino, Italy

Oct. 2-4, 1973: 2nd International Computer-Aided Design and Computer-Aided Manufacturing Conf., Detroit Hilton Hotel, Detroit, Mich. / contact: Public Relations Dept., Society of Manufacturing Engineers, 20501 Ford Rd., Dearborn, MI 48128

Oct. 3-4, 1973: 7th Annual Instrumentation & Computer Fair, Sheraton Inn/Washington-Northeast, Washington, D.C. / contact: Richard Bullock, Instrumentation Fair, Inc., 10774 Tucker St., Beltsville, MD 20201

Oct. 8-12, 1973: Business Equipment Show, Coliseum, New York, N.Y. / contact: Rudy Lang, Prestige Expositions, Inc., 60 E. 42nd St., New York, NY 10017

Oct. 12-14, 1973: 12th Annual UAIDE Conference, Chase-Park Plaza Hotel, St. Louis, Mo. / contact: Bobby R. Peoples, HEW, Rm. 1070 North Bldg., 330 Independence Ave., S.W., Washington, DC 20201

Oct. 15-17, 1973: 14th Annual Switching and Automata Theory Symposium, University of Iowa, Iowa City, Ia. / contact: Prof. Gerard Weeg, Computer Science Dept., University of Iowa, Iowa City, IA 52240

Oct. 15-18, 1973: 28th Instrument Society of America International Conference and Exhibit, Astrohall, Houston, Tex. / contact: Philip N. Meade, Exhibit Director, ISA, 400 Stanwix St., Pittsburgh, PA 15222

Oct. 16-18, 1973: Canadian Computer Show and Conference, East Annex, Coliseum, Exhibition Park, Toronto, Canada / contact: Industrial Trade Shows of Canada, 481 University Ave., Toronto, Ontario M5W 1A7, Canada

Oct. 16-18, 1973: Input/Output Systems Seminar '73, O'Hare International Tower, O'Hare Airport, Chicago, Ill. / contact: Dan Hrisak, DPSA, 1116 Summer St., Stamford, CT 06905

Oct. 18-19, 1973: Computer Science and Statistics: 7th Annual Symposium on the Interface, Memorial Union, Iowa State Univ., Ames, Iowa / contact: William J. Kennedy, Statistical Lab., Iowa State University, Ames, IA 50010

Oct. 21-25, 1973: 36th Annual Meeting, American Society for Information Science, Los Angeles Hilton Hotel, Los Angeles, Calif. / contact: H. W. Jones, Northrop Corp., Aircraft Div., Hawthorne, CA 90250

Oct. 28-30, 1973: 8th Annual Digitronics Users Association Conference, Atlanta, Ga. / contact: Mr. Glenn Lutat, IOMEC, Inc., 345 Mathew St., Santa Clara, CA 95050

Nov. 5-7, 1973: Systems, Man & Cybernetics Conf., Sheraton Boston Hotel, Boston, Mass. / contact: S. A. Meer, Signatron Inc., 27 Hartwell Ave., Lexington, MA 02173

Nov. 8-10, 1973: 3rd National Conference of the Society for Computer Medicine, Denver, Colo. / contact: Dr. Joseph M. Edelman, Society for Computer Medicine, 200 Professional Ctr., 244 Peachtree Blvd., Baton Rouge, LA 70806

Nov. 13-15, 1973: Data Networks, Analysis and Design, Tampa, Fla. / contact: Raymond Pickholtz, Sch. of Engrg., George Washington University, Washington, DC 20006

Dec. 4-5, 1973: 1973 Vehicular Technology Conference, Sheraton-Cleveland, Cleveland, Ohio / contact: Robert Wylie, Motorola Communications, Inc., 12955 Snow Rd., Cleveland, OH 44130

ADVERTISING INDEX

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

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Science and the Advanced Society, by C. P. Snow, Ministry of Technology, London, England (April 1966)
The Information Revolution and the Bill of Rights, by Dr. Jerome B. Wiesner, M.I.T. (May 1971)
Employment, Education, and the Industrial System, by Prof. John Kenneth Galbraith, Harvard Univ. (Aug. 1965)
Computers and the Consumer, by Ralph Nader, Washington, D.C. (Oct. 1970)

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