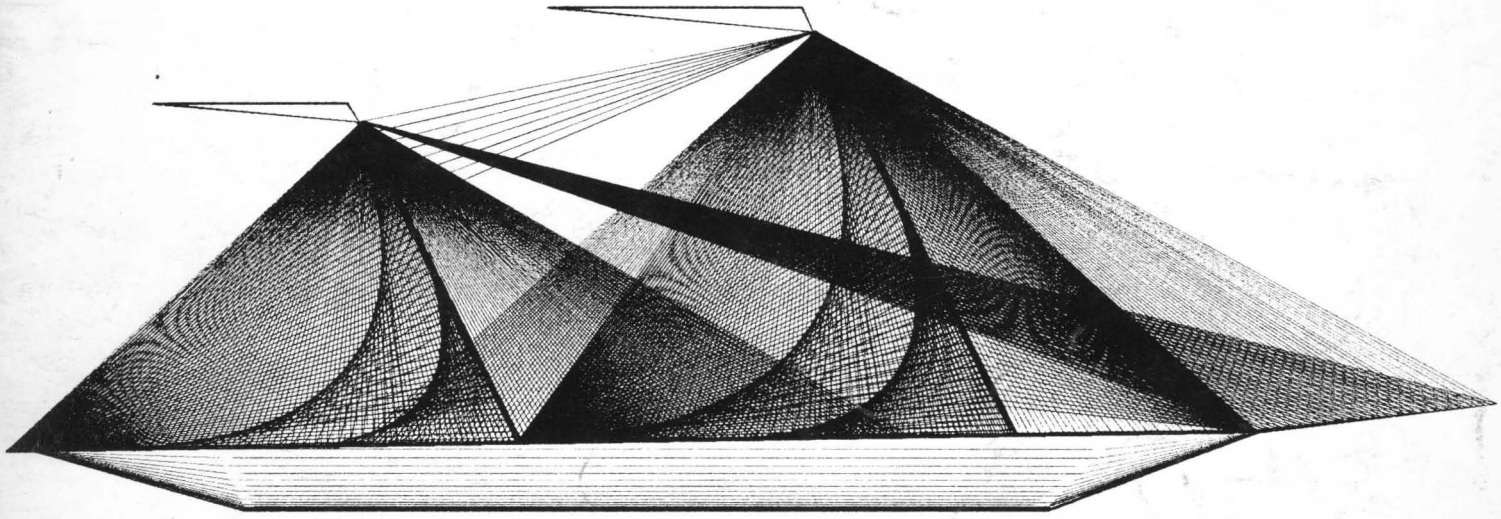
SCIENCE & TECHNOLOGY

May, 1972

Vol. 21, No. 5

computers and automation



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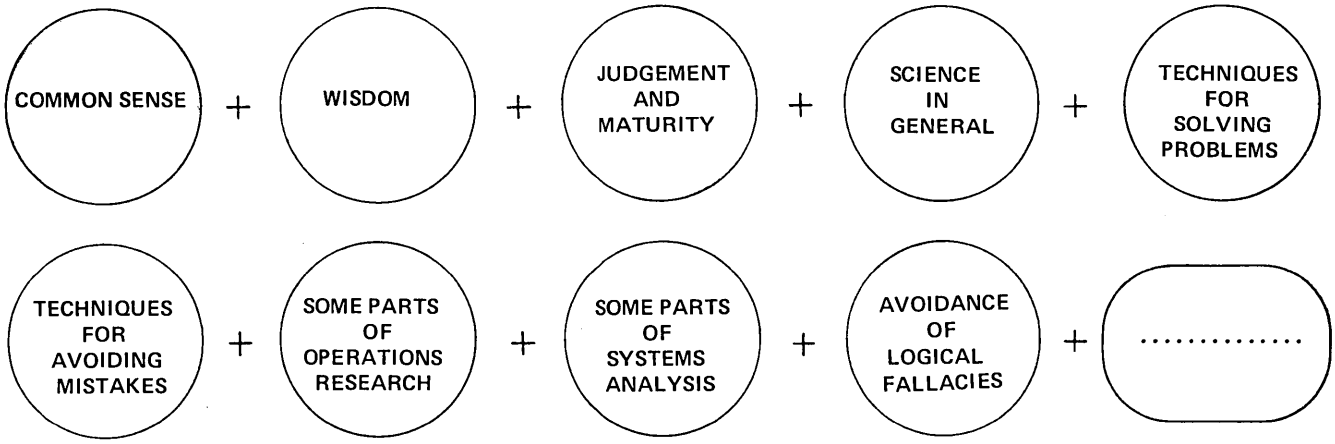

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Editor: Edmund C. Berkeley, author, businessman, actuary, scientist, computer professional, first secretary of the Association for Computing Machinery 1947-53, editor of *Computers and Automation.*

For an idea of what the issues are like, see the titles and summaries of the first 30 issues . . . . on the next page.

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3. The Golden Trumpets of Yap Yap
4. Strategy in Chess
5. The Barrels and the Elephant
   A discussion of truth vs. believability
6. The Argument of the Beard
   The accumulation of many small differences may make a huge difference.
7. The Elephant and the Grassy Hillside
   The concepts of the ordinary everyday world vs. the pointer readings of exact science.
8. Ground Rules for Arguments
9. False Premises, Valid Reasoning, and True Conclusions
   The fallacy of asserting that the premises must first be correct in order that correct conclusions be derived.
10. The Investigation of Common Sense
11. Principles of General Science and Proverbs
    8 principles and 42 proverbs
12. Common Sense — Questions for Consideration
13. Falling 1800 Feet Down a Mountain
    The story of a skimobiler who fell 1/3 of a mile down Mt. Washington, N.H., and was rescued the next day; and how he used his common sense and survived.
14. The Cult of the Expert
    Rules for testing expert advice.
15. Preventing Mistakes from Failure to Understand
    Even though you do not understand the cause of some trouble, you may still be able to deal with it. The famous example of a cure for malaria.
16. The Stage of Maturity and Judgement
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    How 30,000 people refusing to apply their common sense died from a volcanic eruption.
18. The History of the Doasyoulikes
    A parable in which the stern old fairy Necessity plays a part.
19. Individuality in Human Beings
    Their chemical natures are as widely varied as their external features.
20. How to be Silly
    71 recipes for being silly. Example: "Use twenty words to say something when two will do."
21. The Three Earthworms
    A parable about curiosity; and the importance of making observations for oneself.
22. The Cochrans vs. Catastrophe
    The history of Samuel Cochran, Jr., who ate some vichyssoise soup.
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    The commonest cause for mistakes probably is forgetting. Some remedies.
24. What is Common Sense? — An Operational Definition
    A proposed definition of common sense not using synonyms but using behavior that is observable.
25. The Subject of What is Generally True and Important — Common Sense, Elementary and Advanced
26. Natural History, Patterns, and Common Sense
    Some important techniques for observing.
27. Rationalizing and Common Sense
    Coming to believe what you want to believe; and some antidotes for this common mistake.
28. Opposition to New Ideas
    Some of the common but foolish reasons for opposing new ideas.
29. A Classification and Review of the Issues of Vol. 1
30. Index to Volume 1

Some Comments from Subscribers

Harold J. Coate, EDP Manager, St. Joseph, Mo.:
I believe these to be the best, if not the most important, reading that I have had this year.

William Taylor, Vice President, Calgary, Alberta:
Very good articles; something all managers should read.

Edward K. Nellis, Director of Systems Development, Pittsford, N.Y.:
As I am involved with systems work, I can always use one of the issues to prove a point or teach a lesson.

David Lichard, Data Processing Manager, Chicago:
Thoroughly enjoy each issue.

Richard Marsh, Washington, D.C.:
Keep it up. All are good and thought-provoking — which in itself is worthwhile.

Ralph C. Taylor, Manager of Research and Development, West Chester, Ohio:
Especially liked "Right Answers".

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Your tendency to deal with practical applications is very rewarding.

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Vol. 21, No. 5
May, 1972

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computers and automation

The Computer Industry

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

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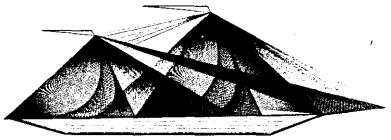
Common Sense, Wisdom, Science in General, and Computers

The Golden Trumpet

Computers, Games, and Puzzles



Front Cover Picture

"Sailboat" was produced by B.C. Munday, III, of Plantation, Florida, and was one of the entries in the Ninth Annual Computer Art Contest of "Computers and Automation" (see the August 1971 issue). Five basic algorithms were used to generate the points that produce the sails; the hull and masts are formed by standard point to point plotting. "Sailboat" was programmed in FORTRAN IV on a SEL 840 MP computer and plotted by a Calcomp 565.

"Computers and Automation" cordially invites entries in the Tenth Annual Computer Art Contest (see page 40).

Departments

Key

[A] — Article
[C] — Monthly Column
[E] — Editorial
[F] — Forum
[G] — The Golden Trumpet
[NT] — Not Technical
[R] — Reference Information
[T] — Technical

C·a

EDITORIAL

The Death of the Democratic Party Candidate for the Presidency, 1972

As most of our readers know, "Computers and Automation" has published from May 1970 on, a series of articles and reports on the assassinations and deaths of important leaders in the United States who are opposed to the de facto alliance of the military-industrial complex, the Central Intelligence Agency, the Pentagon, and the office of the Presidency, which has been carrying on the war in South East Asia.

Among those who have died from assassination or from alleged accidents in the 1960's are:

- President John F. Kennedy (shot by at least one assassin, 1963)
- Senator Robert F. Kennedy (shot by at least one assassin, 1968)
- Reverend Martin Luther King (shot by one assassin, 1968)
- Adlai Stevenson (died suddenly on a street in London, 1964)
- Walter Reuther (auto workers union leader, killed with 5 other persons in a chartered airplane accident in Michigan, 1970)
- Joseph A. Yablonski (shot with 2 other members of his family in his sleep, 1969 – a miners union leader who opposed Tony Boyle for president)

Also, Senator Edward Kennedy had an extraordinary and still largely unexplained accident at Chappaquiddick Island, in which he narrowly escaped death; and he has chosen so far not to run for president this year.

It is reasonable to conclude that the United States contains a remarkably unhealthy climate for liberal American leaders.

On the basis of the evidence that "Computers and Automation" has published in the two years since May 1970 (see the list starting on page 7 of this issue), and more evidence besides, I make the following prediction:

1. If the Democratic candidate for president is not acceptable to the de facto alliance of the military-industrial complex, the Pentagon, the Central Intelligence Agency, and the present occupant of the Presidency, he will be eliminated before coming into the power of the Presidency.
2. Senator Edward Kennedy and Senator George McGovern are not acceptable.

What is the force opposing the fruition of the choice in 1972 of the American people for a different president?

Probably, about 10% of industry, business, and labor in the United States, and 90% of the military have a profound stake in military solutions to problems of the United States. They are diverting to themselves upwards of $50 billion a year out of the United States budget beyond the needs of reasonable defense. This is large-scale theft, decorated with the phrase "national security". They have convinced themselves that the United States ought to spend billions of dollars a year defending the interests of certain businesses, such as oil, all over the world, including South East Asia. They are deeply opposed to communism (where communism is defined as any system that does not permit private ownership of the means of production). They are killing Asians through air war at a rate of over 500 persons a day. They have killed more than 50,000 Americans in the war in South East Asia. Why not kill a few more Americans at home who oppose them?

I am certain that most of the conspiracy is a "silent conspiracy", groups acting together because of common interests. But some of it is conscious conspiracy and organizes the deaths. That is very simple for any organizations that may have the efficacy of the Central Intelligence Agency, which has not hesitated to use assassination and death as instruments to attain power outside of the United States. Examples: Ngo Dinh Diem in Vietnam; Patrice Lumumba in the Congo; Che Guevara in South America. The list goes on and on.

The point where serious danger to the Democratic candidate becomes almost certain is when the nominee for president of the Democratic Party becomes almost certain. Take the example of Senator Robert Kennedy, assassinated a little after midnight after his victory celebration in the California primary in 1968. The assassination of Senator Robert Kennedy made Richard Nixon's victory in the election a very much safer bet. There were 10 bullets found at the scene; Sirhan's gun contained only 8. (See "Computers and Automation", August, 1970, p. 48.) The sooner the liquidation takes place after it becomes "clearly necessary", the better for the de facto alliance. And all public-spirited citizens can go to his funeral and mourn publicly – but the office of commander-in-chief, the Presidency, will still be safely in the hands of the de facto alliance.

I deeply hope my prediction is wrong. But I am very much afraid it is right. The stakes are too great for the de facto alliance to ever again risk having another president like John F. Kennedy.

As for the credibility, honesty, honor, and any other possible virtues of the de facto alliance, the Pentagon Papers released by Daniel Ellsberg, the Anderson Papers on the Tonkin Gulf incident and on the deal between ITT and the Department of Justice in which an antitrust suit was called off for $100,000 (or $400,000) to be given to the Republican Party, etc., provide a little of the evidence of what these people really amount to: thieves, liars, scoundrels, and killers, wrapped in a cloak of words, illusions, and "holy war" against communism.

Edmund C. Berkeley

Edmund C. Berkeley, Editor

Political Assassination in the United States

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May 1970

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by Richard E. Sprague
A reexamination of some of the evidence relating to the assassination of John F. Kennedy — with emphasis on the possibilities and problems of computerized analysis of the photographic evidence.

July 1970

29 THE MAY ARTICLE, "THE ASSASSINATION OF PRESIDENT JOHN F. KENNEDY: THE APPLICATION OF COMPUTERS TO THE PHOTOGRAPHIC EVIDENCE" — REPORT NO. 2:
32 More About Jim Hicks
32 Confirmation of FBI Knowledge 12 Days Before Dallas of a Plot to Kill President Kennedy, by Edmund C. Berkeley
35 The Second Conspiracy About the Assassination of President Kennedy, by Richard E. Sprague

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52 Bullet Hole in the Frame of a Door
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39 PATTERNS OF POLITICAL ASSASSINATION: How Many Coincidences Make a Plot?
by Edmund C. Berkeley, Editor, "Computers and Automation"
How the science of probability and statistics can be used as an instrument of decision to determine if a rare event is: (1) within a reasonable range; (2) unusual or strange or suspicious; or (3) the result of correlation or cause or conspiracy.

48 COMPUTER-ASSISTED ANALYSIS OF EVIDENCE REGARDING THE ASSASSINATION OF PRESIDENT JOHN F. KENNEDY — PROGRESS REPORT
by Richard E. Sprague

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52 THE CONSPIRACY TO ASSASSINATE SENATOR ROBERT F. KENNEDY AND THE SECOND CONSPIRACY TO COVER IT UP
by Richard E. Sprague
A summary of what researchers are uncovering in their investigation of what appears to be not one but two conspiracies relating to the assassination of Senator Robert F. Kennedy.

56 INDEX TO "SPECIAL UNIT SENATOR: The Investigation of the Assassination of Senator Robert F. Kennedy"
An index is supplied for the Random House book written by Robert A. Houghton, of the Los Angeles Police Department, about the investigation of the assassination of Senator Robert F. Kennedy.

November 1970

44 CONFIDENTIAL AND SECRET DOCUMENTS OF THE WARREN COMMISSION DEPOSITED IN THE U.S. ARCHIVES
by Neil Macdonald, Assistant Editor
A list of the subjects of over 200 documents of the Warren Commission which were classified confidential, secret, and top secret.

December 1970

39 THE ASSASSINATION OF REVEREND MARTIN LUTHER KING, JR., THE ROLE OF JAMES EARL RAY, AND THE QUESTION OF CONSPIRACY
by Richard E. Sprague
James Earl Ray says he was coerced into entering a plea of guilty to killing Martin Luther King ... and contrary evidence (plus other evidence) have led to filing of legal petitions for "post-conviction relief".

January 1971

45 THE DEATH OF WALTER REUTHER: ACCIDENTAL OR PLANNED?
by Edmund C. Berkeley and Leonard Walden
Some significant questions about the plane crash in May 1970 in which Walter Reuther was killed.

February 1971

48 THE REPORT OF THE NATIONAL COMMITTEE TO INVESTIGATE ASSASSINATIONS
by Bernard Fensterwald, James Lesar, and Robert Smith
What the National Committee in Washington, D.C. is doing about computerizing files of evidence, initiating lawsuits to obtain information, etc., and comments on two new books by District Attorney Jim Garrison and Robert Blair Kaiser.

March 1971

35 "THE ASSASSINATION OF PRESIDENT KENNEDY: THE APPLICATION OF COMPUTERS TO THE PHOTOGRAPHIC EVIDENCE" — COMMENT
35 I. ANOTHER VIEW
by Benjamin L. Schwartz, Ph.D.
A polemical attack on "The Assassination of President Kennedy: the Application of Computers to the Photographic Evidence" by Richard E. Sprague published May 1970.
40 II. RESPONSE
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45 DISTRICT ATTORNEY JIM GARRISON ON THE ASSASSINATION OF PRESIDENT KENNEDY: A Review of Heritage of Stone
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(please turn to page 50)

Effective Management of an Instrument Pool

D.H. Townsend, Supervisor
Standard Tool and Instrument Operations
Lockheed Missile and Space Co.
P.O. Box 504
Sunnyvale, Calif. 94088

"Utilization of the instruments included in the Instrument Pool Data System has increased from 56% to 87%, and the number of instruments has decreased from 20,000 to 12,000 with no loss of effectiveness."

The Basic Pool Function

In the early years of a rapidly expanding new company, management decisions must be made to establish tool cribs, instrument pools, office supply facilities, etc. At the Lockheed Missile and Space Company (LMSC) this problem became rather significant in late 1961 in relation to the test instrument inventory. During this period LMSC was growing by leaps and bounds as was this expensive inventory. From essentially no inventory in 1957, the number of calibrated test instruments had grown to over 45,000, with a value of approximately $30,000,000, by 1963. These instruments were custodially assigned to organizations throughout the plant.

Interest in a pool concept was emphasized through the results of both customer and corporate audits conducted during this period. An Instrument Pool would provide the disciplines considered lacking at the time, namely:

a. Centralized management
b. Increased inventory flexibility
c. Common control systems
d. Improved utilization
e. Lower calibration costs.

Implementation

The implementation of the Instrument Pool at IMSC could only be accomplished through the complete awareness of top management that the need existed and positive benefits would be realized. Management was aware, by early 1962, that action must be taken to effectively control the dramatic instrument inventory growth and realize the five benefits identified above. Company policies and procedures were established in 1962 that basically created the Instrument Pool functions and responsibilities that exist today. These policies and procedures stipulated that all calibratable, general purpose, portable test instruments were to be controlled by a centralized Instrument Pool Organization. Based upon these established functions and responsibilities an Instrument Pool organization was created and manned in mid-1962. Crib facilities were planned and initial control systems established.

The major difficulty at this point was to effectively motivate test organizations to comply with the intent of established company policy. This was primarily accomplished through a company wide publicity campaign entitled "Operation Roundup". The campaign was carried out through a company letter signed by the general manager instructing all managers and supervisors to transfer property to the pool as outlined in the "Operation Roundup" instruction packet issued to them. The campaign was also widely publicized through the company newspaper. The overall effect was awareness of management's intent at all levels of the company structure. Most importantly, each division was given a goal they were to attain in order to effectively accomplish the objectives of the campaign. Weekly tracking information was circulated to top management reporting the ability of each division to attain targeted goals. "Operation Roundup" was completed in December, 1963 with the transfer of approximately 5,000 items to the Instrument Pool.

At this point, a significant effect was achieved that would pay considerable dividends in years to come; namely, the awareness of all test instrument users of the purpose of the Instrument Pool and the interest of top management in its success.

The Instrument Pool Organization Today

As mentioned earlier, the test instrument inventory had grown very rapidly in the first six to seven years after the company was founded. The pool was created to control this growth and ensure centralized management of general-purpose equipment. This function of the pool was achieved rather quickly through a reduced total inventory growth rate and the concurrent increased control the pool exercised over the inventory. The Instrument Pool inventory grew from approximately 2,000 in 1962 to over 20,000 in January, 1967. The inventory currently consists of government funded facilities and special test equipment in addition to Lockheed funded equipment.

During the initial coordination and planning with the test labs in establishing an Instrument Pool, it became apparent that Instrument Pool control stations should be located in each of the major buildings rather than having one centralized station servicing the entire facility. This philosophy is practiced today with five control stations located at strategic points throughout the plant. Each of the stations also act as a depot for the pickup and delivery of all instrumentation requiring calibration. Specially designed instrument carrying trailers are pulled by tugs for the movement of instruments between stations and the centralized calibration laboratories. One station exists which, to a large extent, exemplifies

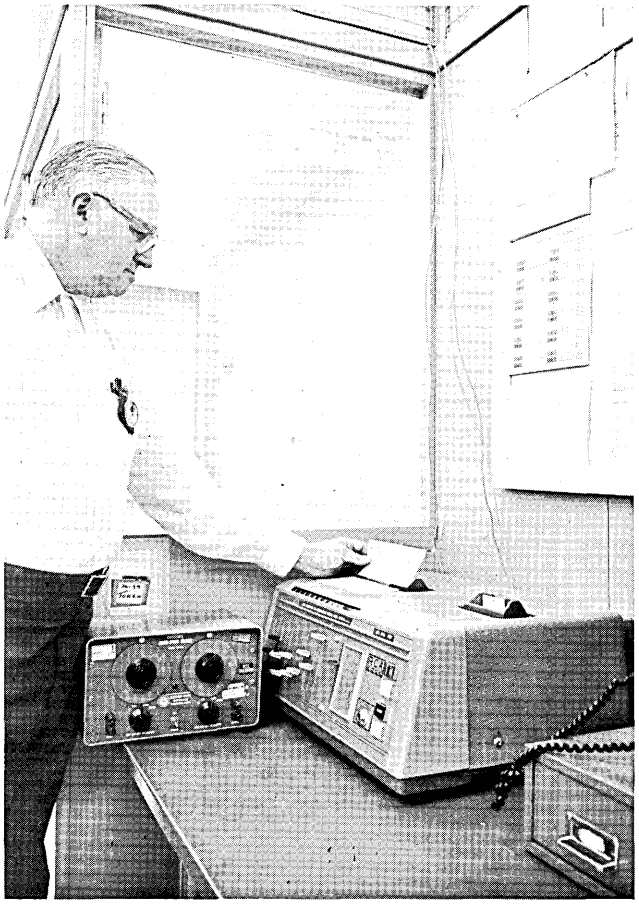
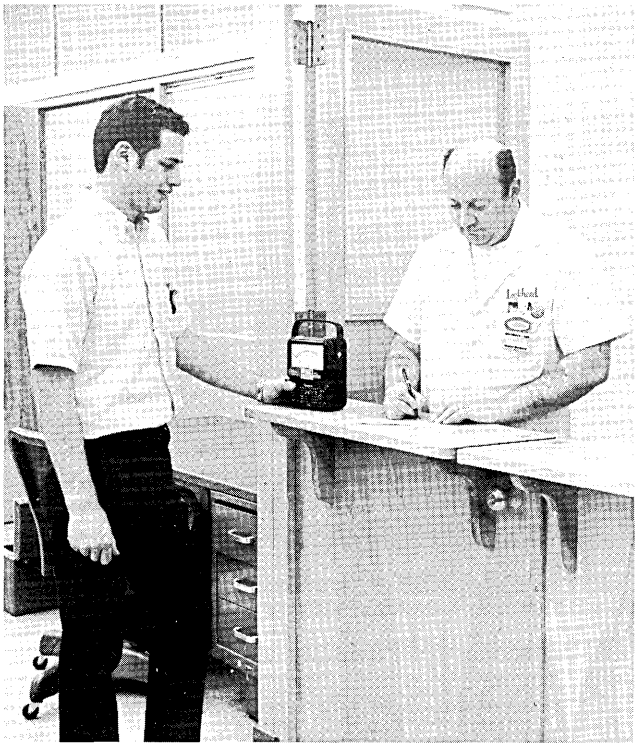


Photo No. 1

Photo No. 2



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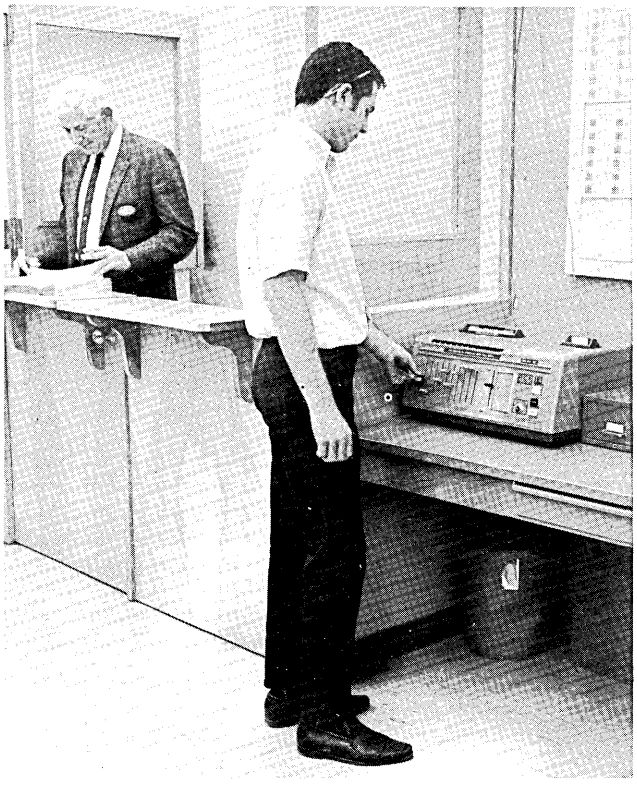

Photo No. 4

a primary benefit of a strong Instrument Pool. The Storage/Retirement Station typically has an inventory that ranges from 800 to approximately 1900 and has been the clearing house for over 25,000 excess instruments in the past five years. Each of the major stations is manned by an industrial engineer with electronics and test lab experience in addition to a sufficient staff of station attendents to satisfactorily control the inventory. There are three engineers and nine attendants performing this function at the present time.

The single most important element in the control of any inventory of this size, diversity, and value is a system that will adequately and accurately report the conditions of the inventory within reasonable cost.

Instrument Pool Data System

The present Instrument Pool Data System (IPDS) consists of RCA Remote Data Input (RDI) terminals in each station which process inventory status data to a central computer system as each transaction occurs. The data consists of the instrument property tag number, description, borrowing employee number, loan date and promised return date.

The current system is the outgrowth of a first phase charge-a-plate, five part loan form that required considerable manual filing and keypunch support in addition to efforts to decipher the handwritten data entered by the attendants. This handwritten data included loan dates, instrument description, borrowing employee data, etc.

The second phase was the conversion of the station records to prepunched tab cards containing the identity and description of each item and requiring only the entry of each specific transaction on the loan cards. This second phase required periodic collection of all loan cards and considerable keypunch support prior to batch processing to the computer for the generation of utilization reports. This involved the collection of approximately 15,000 loan cards, keypunch processing, verification and return of the original cards to the submitting station. This whole process had to be completed in 7 working days on a quarterly basis. The result of this effort was a test instrument utilization report which was never seriously used as a management tool due to the high data collection and processing error rate.

The current system requires little keypunch effort. The status of the inventory is automatically maintained by the station attendants as the transactions take place through the use of remote terminals. (Photo #1). Based on this information the IPDS generates three reports — a weekly, bi-weekly, and a monthly.

These reports are:

1. Weekly Inventory Status Report
2. Bi-Weekly Loan Recall Report by Organization
3. Monthly Utilization Report

The implementation of the OPDS in November 1967 has accounted for the highest instrument retirement levels achieved at LMSC: 6000 in 1968, over 5800 in 1969 and 4088 in 1970. The utilization rates, based upon days available for loan vs. days on loan, have increased from 56% to a high of 87%. The inventory has been decreased from a high of over 20,000 in January 1967 to approximately 12,000 today with no loss in the effectiveness of Instrument Pool functions.

During initial installation of the Instrument Pool Data System (IPDS), it was particularly important to obtain the cooperation of the station attendants in the use and benefits of the Remote Data Input (RDI) terminals. Job instructions were written and modified as needed based upon suggestions from the attendants and engineers. Concurrently, training sessions were held explaining the use and benefits of the RDI terminals and the workings of the computer system. The uses of the computer reports were explained and most importantly, what information these reports would provide.

Monthly Utilization Report — Exhibit A

The first reliable utilization report generated by the system indicated that 56% of the inventory was on loan with 44% on the shelf — idle. The first reaction was to consider the report inaccurate and of no use. Inventory audit samples, however, proved the report to have considerable validity. The monthly utilization report is currently the basic source of data for determining inventory excesses, developing retirement decisions and justifying procurement needs. Current figures average around 80% on loan with a high of over 87%.

The report detail identifies for each unit within a manufacturer/model the percentage utilization for the past six months. The six month figure is used to stabilize decision making as related to the possible variances that may be experienced in monthly data.

Currently the utilization report is analyzed on a bi-monthly basis to determine those specific instruments having less than acceptable utilization. This information is then keypunched and listings prepared for each specific Instrument Control Station. The cards are routed to the responsible engineer for retirement disposition or retention justification.

Weekly Inventory Status Report — Exhibit B

The weekly report identifies the status of each instrument within the Instrument Pool as of the previous Friday. Each Monday this report is routed to each control station and also the central procurement screening desk for status reference. This report is sequenced by instrument manufacturer and model and identifies if the instrument is on loan, in calibration, storage or pending retirement. If the item is on loan it identifies the borrowing employee by name and number, his department, the day the item is to be returned, and if overdue from loan, the number of days overdue from loan and the calibration due date.

The information provided allows each Control Station to have access to the information as to the availability of all the test instruments assigned to the Pool. There is no need to call other stations in the plant on a hit or miss basis. The calls are limited to those stations that have equipment available. If none are available and an item is in calibration, a request for expedited calibration is negotiated and the request satisfied in this manner.

Bi-Weekly Instrument Pool Loan Recall

The bi-weekly report identifies all the Instrument Pool inventory overdue from loan. The report is sequenced by department number and then by employee name listing each instrument overdue from loan charged to that employee. The sequence of the report was deliberately established by employee name

Monthly Utilization Report — Exhibit A

TDR Q64-71 DETAIL LMSC INSTRUMENT POOL EQUIPMENT UTILIZATION FOR THE SIX MONTHS ENDED 10-30-71, MFG DAY 863 PAGE 20

MANUFACTURER	MODEL	NCUN	OWNG CRIB	O T W Y N P	PROPERTY TAG NO.	DYS AVL	---LAST SIX MONTHS--- PERCENTAGE UTILIZATION---- LOAN	CALIB	TOTAL	LAST MONTH LOAN	CALIB	N A TRN C XNS	NO. LOAN TO	ON MFG DAY DUE	CUR STR	CALIB DUE DATE DYS MO DA YR	YR MF
BARBER COLMAN	6024-2600	RECORDER	TOTAL			127	96.1	5.5	101.6	100.0	.0	2	STRD	0	ACTIV		1
BARBER COLMAN	7403-1	CONTRCLLER	7099	L 1	M 78496 00	127	47.2	3.1	50.4	.0	16.0	1				- -	63
BARBER COLMAN	7403-1	CONTRCLLER	TOTAL			127	47.2	3.1	50.4	.0	16.0	1	STRD	0	ACTIV		1
BARBER COLMAN	7403-11108	CONTRCLLER	7099	L 1	M 78497 00	127	100.0	.0	100.0	100.0	.0	0	6230 899			12-31-71	63
BARBER COLMAN	7403-11108	CONTRCLLER	TOTAL			127	100.0	.0	100.0	100.0	.0	0	STRD	0	ACTIV		1
BARNES ENGINEER	RS8B	SOURCE I-R	7099	L 1	M 59466 00	127	100.0	.0	100.0	100.0	.0	0	6230 815			- -	60
BARNES ENGINEER	RS8B	SOURCE I-R	TOTAL			127	100.0	.0	100.0	100.0	.0	0	STRD	0	ACTIV		1
BARNES ENGINEER	TC8B	CONTRCLLER	7099	L 1	M 59467 00	127	100.0	.0	100.0	100.0	.0	0	6230 815			12-31-71	60
BARNES ENGINEER	TC8B	CONTRCLLER	TOTAL			127	100.0	.0	100.0	100.0	.0	0	STRD	0	ACTIV		1
BARTON INST CO	N-AC1	INDICATOR	7092	L 4	MSL 10096 00	127	100.0	.0	100.0	100.0	.0	0	8646 882			6-16-72	00
BARTON INST CO	N-AC1	INDICATOR	TOTAL			127	100.0	.0	100.0	100.0	.0	0	STRD	0	ACTIV		1
BARTON INST CO	10PSI	GAGE PRESS	7092	L 4	MSL 52825 00	127	100.8	.0	100.8	100.0	.0	1	8434 895			4-21-72	63
BARTON INST CO	10PSI	GAGE PRESS	TOTAL			127	100.8	.0	100.8	100.0	.0	1	STRD	0	ACTIV		1
BARTON INST CO	100PSI	GAGE PRESS	7092	N 4	S 13371 00	127	100.8	.0	100.8	100.0	.0	1	8434 906			1-19-73	62
BARTON INST CO	100PSI	GAGE PRESS	TOTAL			127	100.8	.0	100.8	100.0	.0	1	STRD	0	ACTIV		1
BARTON INST CO	15PSI	GAGE PRESS	7092	N 4	F 436 00	127	100.0	.0	100.0	100.0	.0	0	8421 786			3- 3-72	00
BARTON INST CO	15PSI	GAGE PRESS	TOTAL			127	100.0	.0	100.0	100.0	.0	0	STRD	0	ACTIV		1
BARTON INST CO	30PSI	GAGE PRESS	7092	L 4	MSL 22110 00	127	100.0	.0	100.0	100.0	.0	0	8434 627			- -	60
BARTON INST CO	30PSI	GAGE PRESS	TOTAL			127	100.0	.0	100.0	100.0	.0	0	STRD	0	ACTIV		1
BARTON INST CO	50PSI	GAGE PRESS	7092	N 2	91285 951572 00	127	100.8	.0	100.8	100.0	.0	1	8434 915			2- 4-72	62
	50PSI		7092	L 4	MSL 60108 00	127	100.8	.0	100.8	100.0	.0	1	8434 791			- -	64
	50PSI		7092	SUBTOTAL		254	100.8	.0	100.8	100.0	.0	2	STRD	0	ACTIV		2
BARTON INST CO	50PSI	GAGE PRESS	TOTAL			254	100.8	.0	100.8	100.0	.0	2	STRD	0	ACTIV		2
BECKER CHRIS CO	AB-4	BALANCE	7099	L 4	MSL 75982 00	94	101.1	.0	101.1	.0	.0 *	0	4850			- -	69
BECKER CHRIS CO	AB-4	BALANCE	TOTAL			94	101.1	.0	101.1	.0	.0	0	STRD	0	ACTIV		0
BECKER CHRIS CO	SG2	BALANCE	7099	L 4	MSL 66735 00	94	101.1	.0	101.1	.0	.0 *	0	4850			- -	66

Weekly Inventory Status Report — Exhibit B

TDR Q52-42 LMSC INSTRUMENT POOL INVENTORY BY OWNING CRIB WITHIN MFG-MODEL WEEK ENDING 11-20-71 MFG DAY 878 PAGE 14

O T W Y N P	PROPERTY TAG NO.	NCUN	MANUFACTURER	MODEL	OWN CRIB	MFG	CALIB DUE DATE MO DA YR	USAGE SINCE CALIB	DAYS USED	CURRENT LOAN STATUS DAYS LEFT	RTN DTE	BORROWERS NAME	CRGN	S	WKS NO MATCH
F 4	F 501542 00	CONVERTER	BECKMAN INSTR	7571	7080	62								9	
F 4	F 501543 00	CONVERTER	BECKMAN INSTR	7572	7080	62								9	
N 3	977027 00	OSCILLATOR	BECKMAN INSTR	7560	7092	61	11 19 71	138	64		878	RL RICHARDS	8434		
N 2	91285 957183 00	OSCILLATOR	BECKMAN INSTR	7560	7092	65	2 11 72	1	1	21	899	RL RICHARDS	8434		
F 2	787 1800 00	OSCILLATOR	BECKMAN INSTR	7560	7099	62	2 11 72								
N 2	91285 6654 00	OSCILLATOR	BECKMAN INSTR	7560R	7092	61	2 4 72	14	14	42	920	JE BURNS	8434		
F 2	C 17015 00	OSCILLATOR	BECKMAN INSTR	7560R	7095	66	11 26 71	14	8	4	882	DJ POCHE	7570		
F 3	542680 00	OSCILLATOR	BECKMAN INSTR	7560R	7095	61									
F 2	47 4200 00	OSCILLATOR	BECKMAN INSTR	7560R	7099	59	11 26 71	56	56	4	882	JC WINSLOW	7072		
N 3	977686 00	COUNTER	BECKMAN INSTR	8360	7092	62	2 4 72	2							
L 1	M 72667 00	COUNTER	BECKMAN INSTR	8360R	7095	62	2 25 72	56	56	25	903	SJ RACIC	7570		
F 3	453715 00	COUNTER	BECKMAN INSTR	8371N	7099	62	2 25 72	33	33	42	920	JC WINSLOW	7072		
L 4	MSL 50821 00	METER PH	BECKMAN INSTR	96	7080	63									
L 1	M 81723 00	HYGROMETER	BECKMAN INSTR	9700	7094	66	1 7 72								
L 1	M 76887 00	HYGROMETER	BECKMAN INSTR	9700	7095	62	1 26 72	17	17	32	910	EB DOWLING	6544		
L 1	M 76886 00	HYGROMETER	BECKMAN INSTR	9700	7095	62	1 26 72	12	12	32	910	WE HOWSEMAN	7314		
L 1	M 91646 00	TESTER IC	BECKMAN INSTR	997	7094	69									
L 1	M 91647 00	TESTER IC	BECKMAN INSTR	999	7094	69									
N 4	S 9054 00	OSCILLATOR	BEHLMAN ENGR CO	N-A1B	7099	62	1 28 72	58	58	22	900	AJ BAUMAN	4864		
F 4	S 565273 00	OSCILLATOR	BEHLMAN ENGR CO	N-A1B	7099	63	12 31 71	174							
F 4	S 577686 00	OSCILLATOR	BEHLMAN ENGR CO	OSC1-400	7099	64	2 4 72	177	92	13-	865	VY LEE	7544		
N 2	963386 00	OSCILLATOR	BEHLMAN ENGR CO	OSC1-800	7082	69									
N 4	S 8989 00	OSCILLATOR	BEHLMAN ENGR CO	OSC1-800	7092	66	5 5 72	109							
N 4	S 7554 00	OSCILLATOR	BEHLMAN ENGR CO	OSC1-800	7092	66		3	8	7-	871			MSL	
N 4	S 9053 00	OSCILLATOR	BEHLMAN ENGR CO	OSC1-800	7092	66		4	4	21	899	DB WOODARD		8434	
N 4	S 8872 00	OSCILLATOR	BEHLMAN ENGR CO	OSC1-800	7099	66	6 2 72								
L 4	MSL 62752 00	OSCILLATOR	BEHLMAN ENGR CO	OSC3-45	7099	65	2 25 72	23	23	39	917	SV DAVIS	4864		
L 1	M 77631 00	POWER SUPPLY	BEHLMAN ENGR CO	R101A	7094	63	6 2 72								
F 2	C 1389 00	POWER SUPPLY	BEHLMAN ENGR CO	R503A	7099	63		174	9	8-	870			MSL	
N 4	S 9152 00	OSCILLATOR	BEHLMAN ENGR CO	1-1800	7091	66	6 16 72								
N 4	S 9151 00	OSCILLATOR	BEHLMAN ENGR CO	1-1800	7092	66	3 3 72								

(please turn to page 30)

EDP AXIOMS — A Critical Analysis

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"Data processing is so young a field that none of its self-evident truths" can be accepted as true without questioning and validating.

This article is not intended to convey the idea that computer programmers and systems analysts are either unintelligent or naive — in fact my experience has indicated that they are generally above average in intelligence, highly motivated to perform their job, well qualified (technically), logical in their approach to problem solving and generally work 20% more hours per week (without pay since most are salaried) than their counterparts in business. However, this article is written from the businessmen's point of view and from this angle the author recognizes several habits that bear closer scrutiny.

In this article, the author takes to task several "rules of thumb" currently being applied on a day-to-day basis by computer programmers and systems analysts. These "rules of thumb" were logical when developed during an earlier era of computers, but for various reasons are no longer valid. One of the reasons that these items have not been subjected to more scrutiny is that today's "third generation" EDP manager was a programmer or systems analyst when these axioms were developed and they were logical at that time. Unless these "rules of thumb" are quickly subjected to an objective review, today's manager will find that he is attempting to enforce a set of outdated standards.

Third-generation "novice" programmers and systems analysts, those never exposed to first and second generation computers, will probably be the key to the detection of, and hopefully correction of, illogical procedures being employed in the day-to-day operation of the average EDP shop. Today's EDP managers would do well to listen intently when questions are raised and suggestions are put forth by neophyte systems analysts and programmers. It can be tough, even for the most astute manager, to listen objectively as a fledgling programmer or analyst questions the validity of (pseudo) standards in daily use by an EDP shop, but the manager must listen if the EDP function is ever going to attain real stature in the typical company.

What Are EDP Axioms?

Upon close inspection it becomes readily apparent that data processing just like any other field of endeavor has developed a "folk lore" that is being passed from (computer) generation to generation of computer specialists. This means that new generations are springing up every five years. I have chosen to refer to the components of this "folk lore" as axioms since they represent:

- Maxims that are widely accepted on their intrinsic merit (one of the characteristics of an axiom according to Webster's dictionary)
- Propositions that are regarded as self-evident truths (ibid.)

In the author's opinion there is a great danger involved in the application of seemingly "self-evident" truths that have not withstood the test of time — data processing is so young relative to other fields that none of its "self-evident" truths have been exposed to the jaundiced eye of the non-believer over an extensive period of time. Though it is undoubtedly true that a number of the axioms currently employed by data processing personnel will withstand the test of time, the author firmly believes that several of these EDP "golden rules" are of doubtful value and others are totally worthless. This article is devoted to a discussion of selected EDP axioms that, in the author's opinion, are producing negative and undesirable results.

"Axiomatic" Phrases

The following phrases are indicative of EDP axioms being employed:

1. "Reject all transactions as early as possible in a system ------".
In other words: Incomplete or erroneous transactions should be detected and rejected as soon as possible in a computerized system.

2. "Programmer A's programs, eat up core as though it were going out of style".
In other words: Emphasis should be placed on reducing each program to a minimum core size to promote operational efficiency.

3. "That program is no good (it is process bound), it cannot be used in a multiprogramming environment".

4. "We are going to be a multiprogramming shop — we must develop programs which will function in a multiprogramming type environment .
In other words: Multiprogramming is the key to the future and new systems should be designed to function in a multiprogramming environment.

5. "Wish we could get rid of those tables in our programs, it seems as though we are constantly recompiling programs to add or change items in these tables".
In other words: Having to recompile programs to change data in tables is a necessary evil which must be endured because the use of tables is such a powerful feature of the computer.

6. "An Operations Supervisor is giving instructions to the night shift operators" "Don't forget this is the last day of the sales month for XYZ system; today is Friday and program 1204 must be notified to purge the weekly production data ----".

In other words: Having computer operators respond to automated systems to indicate such things as last day of sales month, today is Wednesday, etc. is undesirable, but to do anything else is too time consuming and/or complicated.

Each of These Axioms Is Being Overemphasized By Many EDP Shops

In the author's opinion the preceding axioms are being overemphasized by many EDP shops and this overemphasis is detrimental to the EDP profession in particular and to organizations in general because:

- The reason for employing some of these axioms no longer exists and has not existed since the advent of 3rd generation computers.
- Better alternates exist and should be employed just as fervently as the axioms are being applied today.
- Undue emphasis is being placed on techniques that are destined to be obsolescent in the near future.
- The axioms are being applied as absolutes, when in fact they should be applied based upon the characteristics of each individual situation.

Invalid Transaction

(Axiom #1): Invalid or incomplete transactions generally should not be rejected.

The axiom that invalid or incomplete transactions should be detected and rejected by a computerized system as quickly as possible is absurd today — good computer programs always test each transaction for all errors before rejecting them which is logical, but the early rejection of transactions containing errors should be avoided. A well designed system should handle errors in this way:

- Test each transaction for all error conditions and notify the user of each error detected.
- Hold the error transaction in limbo (generally by logging the transaction onto a disk) until the user has supplied the missing information — the error listing generally can be designed such that it is a turn-around document for the re-entry of incorrect information.
- Continue to highlight erroneous, incorrect or missing data elements. Having the automated system "remember" the status of rejects eliminates the need for elaborate control systems to assure that rejected items are resubmitted, since the system will automatically highlight all errors during the next reporting cycle.
- Hold errors in abeyance to facilitate the generation of error statistics (by type of error encountered) and the number of corrective attempts made.

NOTE: This philosophy is just as valid with on-line data entry applications as off-line applications. Consider the situation in which the terminal operator is keying data as it appears on her source document, but the automated system is telling her that a field is in error because of a logic test:

It is generally best, in the interest of efficiency, to accept the partial transaction and log it on a disk error file if the reason for the rejection cannot easily (and quickly) be determined. The system should always highlight such incomplete transactions during successive reporting cycles until the missing data has been supplied and the transaction can be handled as any other valid transaction.

Saving Core

(Axiom #2): Programmers should not be given blanket instructions to save core.

Core storage is the most economically priced component of today's computer, relative to its capability to perform. In the author's opinion core storage was moderately priced in the second generation; its cost was halved with the third generation and it is currently being slashed again with the 3½ generation computer models being announced.

To dramatize, let's take a look at typical ways in which programmers conserve core storage:

- First, he shortens all of the long descriptive error messages so that they become meaningless.
- Second, he resorts to the elimination of all descriptive error messages and provides an error code instead.
- As his next to last resort, he will combine several different error messages under one code. This particular aspect of core conservation has caused untold hours of wasted effort on the part of users who must analyze each error in an attempt to decipher the real reason a transaction was rejected.
- The last resort is to reduce the blocking factor of one or more files; programmers hate to do this because this step makes their programs operate less efficiently. Some programmers never determine how much longer the program will run (30 seconds or 14 hours) in order to evaluate this degrading of their system against the overall benefits to be gained.

Process-Bound Programs

(Axiom #3): Process-bound programs are often effective.

In the average (business oriented) computer shop it is common for process bound programs to be criticized by operations personnel because they cannot be efficiently run in a multiprogramming environment. To determine whether such a program is good or bad it is first necessary to ascertain why the program is process bound. Common reasons are:

1) Poor systems design.
2) Sloppy or illogical programming.
3) Extensive logic checking between input/output instructions.
4) Extensive arithmetic manipulations between input/output instructions.

Naturally, if a program is process bound because of poor systems design or illogical programming techniques, it should properly be criticized and the errors corrected as quickly as possible if practical. If, on the other hand, the program is process bound because it performs extensive logic checks or does massive arithmetic calculations and is thus "properly" process bound, it will seriously degrade the performance of any input/output programs that are being run at the same time, and thus it will be a poor candidate for use in a multiprogramming environment.

The percentage of properly designed programs that logically are process bound has been steadily increasing for several reasons:

- The experience level of systems analysts and programmers has increased significantly; experienced personnel tend to design and implement more complex systems (which generally means numerous logic tests) which are more likely to be process bound.
- The mere fact that recent generations of computers have large core storage capacity has tended to encourage the creation of larger, more sophisticated programs. It is a well known fact that you quickly reach a point of diminishing returns by increasing record blocking factors as a means of utilizing increased core storage — operating efficiencies quickly diminish after block length exceeds a few thousand characters plus the fact that manufacturer supplied sorts have relatively small maximum block sizes. Once these optimum block maximums have been reached, it is only natural for programmers and analysts to expand programs in an effort to utilize as much of available core storage as possible.
- The systems being implemented today are orders of magnitude more complex than their predecessors — this additional complexity usually translates itself into additional logic and/or arithmetic instructions and an increased likelihood that a program will be process bound.

Multiprogramming

(Axiom #4): Multiprogramming may not exist in the fourth generation.

To put this axiom into its proper perspective we must realize that multiprogramming today exists for one basic reason — The Fact That The Central Processing Unit Is Much Faster Than The Average Input/Output Device and thus the cpu is often idle while waiting for input/output operations to be completed.

Multiprogramming is the interim solution created to improve the productivity of the cpu by allowing it to control the I/O units of two or more programs at the same time. Consequently, the need for multiprogramming will eventually disappear (in the author's opinion it may well occur with the 4th generation of computers):

- Let us assume that the major input/output device of the future will be a mass-storage device (s).
- Let us further assume that present increases in efficiency continue to the point that such mass storage devices are so fast that no cpu is fast enough to handle two input/output operations while executing other instructions.

An initial tendency might be to criticize a cpu that is not fast enough that it can handle such high speed I/O devices, but in fact we will have improved the situation greatly by establishing a proper balance between the speeds of the two components of the computer. In fact a situation in which the speeds of the two components were the same would be a major improvement over today's multiprogramming environment — such a situation would have removed the imbalance that initially gave rise to multiprogramming (a mismatch between the speed of the cpu and I/O devices).

It Is Not Outside The Realm Of Possibility That The 4th Generation Of Computers May Create a Need For "Multi-I/O-ing", the opposite of multiprogramming — where I/O devices are faster than cpu's such that two or more cpu's must function in tandem to keep pace with an I/O unit.

Table Look-Up

(Axiom #5): Data for table look up operations should not be part of source programs

The practice of including the elements of a table lookup operation as part of a computer program necessitates recompiling the program each time an element must be added or changed. More logically, the data for all table lookup operations would be stored on disk and read into core each time the program is run. Changes to tables would be handled just like the updating of any master file — the user does it as a clerical function. In this environment an update program is written to handle changes and/or additions to all tables on disc. A single, generalized routine is inserted in each program to retrieve the tables required for that particular program.

Operator Responses

(Axiom #6): Operators should never have to respond to a system: Today is the last day of month; Today is Monday; today is a holiday; today is the 5th of the month; etc.

Operators have traditionally had to make this type response to computer programs to permit the program to determine if files are to be purged; if payroll is being run at mid-month or at the end of the month; if today is sales closing, etc. A system can be designed whereby data concerning day of month, week, etc. is placed on a disk and each individual program makes its own determination (with nothing more than current date) as to what special things are to happen each processing cycle. This type of system gives the operator an option to override any automatic decision made by the computer. In one instance a system has been operational for a number of years, when the computer programs are able to determine the proper course of action to take each processing cycle with 90% accuracy — the operator overrides the programs 10% of the time.

Business Benefits Should Be Emphasized

Finally there is a general criticism of the EDP function, which is not specifically related to the axioms in this article, that must be mentioned. This is the continuing need for the EDP technician to become much more cognizant of the business benefits he and his automated systems must provide. He must be willing to acknowledge that technical perfaction does not always result in satisfied users, nor does it necessarily provide profitable results.

In a large company a computer program is constantly criticized by EDP technicians because it cannot be used effectively in a multiprogramming environment. From a technical point of view these computer professionals are to be congratulated (their timing tests proved that the program was process bound 97% of the time) upon the conclusion reached. However, if the business benefits had been considered by those individuals it would have been readily apparent that whether or not the program was "process bound" was irrelevant — a program which produces a quarter of a million dollars in benefits (as is projected for this one) throughout its useful life could have a number of undesirable aspects from a technical point of view and still be perfectly sound from the businessman's vantage point.

Had the businessman's perspective been utilized in the foregoing example, not one minute would have been wasted to determine if the program was input/output bound (and thus a good candidate for multiprogramming) — the benefits are so staggering that this program must be used regardless of whether or not it is practical for another program to be run at the same time. Other examples of "technical excellence but business folly" that the author has encountered are listed below.

- A programmer once boasted to me about his inventory reporting system that produced 66 boxes of output (at maximum printer speed) each month. The problem here is that a whole army of human beings could not possibly assimilate this much data.

- A system manager once convinced a user that he did not need a particular systems improvement because it would increase computer run time by 10%. The program in question required 20 minutes per day and would have an additional 2 minutes with the modification. This particular computer center has a minimum of 5 hours per day available on each of its 4 computers.

- Some programmers like to keep refining programs to obtain the maximum rated speed of one or more input/output devices and/or reduce the number of micro-seconds for a complex arithmetic operation. Generally speaking, these minor improvements are worthless unless the EDP shop is nearing its computer capacity (on a 24-hour basis).

Standards for Measuring Performance

The time has come for computers to be measured by the same standards as any other tool. The same should apply to data processing people. Management criteria such as objectives, results, benefits and budgets are just as applicable to data processing as any other segment of the business. The following elements (though not an all-inclusive list) should be utilized in managing any business-oriented EDP function:

1. Potential projects to be automated are identified and given priorities for development based on the cost to develop versus the benefits to be realized from implementation of the system.
2. Emphasis will be placed on implementing projects in the sequence which produces the best net cash flow.
3. Sophisticated project control techniques will be utilized to plan and control projects. Such a technique will include:
   a. A definition of the major tasks to be performed to install each project.
   b. Identification of the various types and quantity of technical skills required to perform each task.
   c. The assignment of overall project responsibility as well as responsibility assignment for each major task.
   d. A periodic reporting mechanism that accurately records the status of partially completed tasks in addition to the status of fully completed tasks.
   e. A definition of the sequence in which tasks must be implemented and an identification of the "critical" items that will determine the final implementation date.
4. A "creeping-commitment" approach will be utilized whereby each project passes through several "go" or "no go" stages and any decision to continue is based upon the latest information available regarding benefits to be gained and further implementation costs to be encountered.
5. Documentation should be produced as a normal by-product of the systems management process, thus making it possible to interrupt any project (because another project logically should be given a higher priority) and continue the process at a later date without losing the benefit of efforts expended prior to the interruption of the project.
6. Equipment planning is done based upon the composite requirement of the various projects to be installed on the equipment throughout its estimated useful life.
7. The number of, and capabilities of, personnel in the systems development and programming area are based upon the requirements of the projects to be developed and installed together with the implementation time frame desired by management.
8. Each potential development project is evaluated to assure that it is in fact an independent project (not a modification to another system) and that its development will be compatible with management's overall objectives.

In essence such an approach tends to remove the awe or mystique commonly associated with the management of the EDP facility.

Conclusion

As was stated earlier, many of these axioms were valid with second and earlier generation computers, but generally are not valid today because of the increased capabilities of the various components of modern computers. What is really needed today is for EDP technicians to continually test the logic behind the guidelines (axioms) being used when automation is applied, much as they test a user's logic as part of the problem definition of any new system. In essence EDP technicians must make an extra effort to assure that the tools of their trade are consistently applied in an objective manner.

Actually, many of these axioms can still be applicable to particular situations today and when it is logical they should be applied. I am not advocating that they all be abolished and the negative form of each blindly followed — this would be just as foolhardy as what is happening now. I do strongly recommend that all EDP axioms, not just the few listed here, be recognized for what they are and then be tested for reasonableness before being applied.

One of the best ways I can think of for EDP technicians to test the validity of their axioms is to attempt to explain to a "hard nosed" businessman why each is logical and its application is consistent with the solution of the immediate problem and with the overall objectives of the company. Many illogical axioms can be detected in this manner, but more importantly, this can be a step toward breaking the communications gap that exists between technicians and management.

Sound management practices dictate that the expertise of the EDP technician and the business manager must be optimized if today's computers are to be used effectively. For this to happen these two elements of an organization must communicate with each other. Hopefully, a conscientious effort on the part of both parties plus a "schooling" of each in the rudiments of the discipline of the other, will eventually permit these two diverse elements to function as a cohesive unit. □

Academic Computer Practices, and Their Deficiencies

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"Teachers are behind in computer know-how and use: it is time to catch up."

The Report to the President and the Congress of the United States by the Commission on Instructional Technology, March, 1970, entitled "To Improve Learning", among other things, dealt with the causes of technology's lack of impact on American education.

The causes listed are:

1) Indifference or antipathy toward using technology in education;
2) Poor programs;
3) Inadequate equipment;
4) Inaccessibility;
5) Teachers not trained in Instructional Technology;
6) Media specialists excluded from central planning;
7) Limited staff.

The use of computers in education, when measured against these seven reasons for lack of impact, fails in all seven areas.

School Computer

The computer presents a different problem from other educational media primarily for two reasons: 1) The school computer is already functioning well in areas other than educational, such as financial accounting and student records, and therefore has a group of users with a vested interest; 2) There is already a vested interest in computer education by a group of professional and technical computer people and teachers of the computer. The combination of these two interest groups presents a very formidable wall for teachers. They must break through that wall in order to improve learning through computerization of methodology and learner assessment. The techniques that these two interest groups use to prevent the introduction of the teacher to the computer field are subtle, and they seem very reasonable, although the end result is restricted use or no use by the faculty.

I will attempt in this article to identify and describe some of the techniques used by these interest groups and show how they demotivate potential users of the computer and prevent its wide-spread use in instruction. What I have to say will be objected to vehemently by professional and technical computer men because it will strike directly at the basis of their operation, which is based on exclusive control and independent decision-making on their part.

Division of Authority

One of the biggest arguments that goes on within educational institutions today concerns the question: Where should the authority and responsibility for computer management lie? Shall data processing services be attached directly to the president, the vice president for academic affairs, or the vice president for business affairs? Or, should they be controlled by an independent administrative board? This question would not be so difficult of resolution if administrators knew as much about computers as they do about adding machines and bookkeepers. It is the mystery and the mysticism of the computer that makes the non-computer mind assume that it is different from older forms of data processing. In reality it is not. The computer is essentially nothing more nor less than an adding machine, or an abacus, or marks on the wall of a cave. The computer deserves no more honor or respect than an adding machine, plus a typewriter plus a tape recorder.

This mysticism has placed educators in a position of having to rely almost entirely on the professional and technical computerman to establish his own objectives, set up his own department, including equipment and procedures, and determine his own services.

The greatest problems in educational institutions with computers seem to come from the services offered and for this reason various organizational forms have been tried to control computer services. At the present stage of development, the committee seems to be the most effective. This is probably because the committee can spend more time collectively studying computer problems. Also it has more possibility of having some educators on the committee who are fairly knowledgeable about computers, as compared to having the computer services under a single boss. The single boss is apt to be preoccupied with the traditional expectations of his office. When the responsibility for the computer function is overlaid on his office, he will slough it off onto the professional and technical computerman, rather than seek to make himself informed so that he can intelligently direct the development of all computer use in the educational institution, including instruction.

Advisory Committee: A Dead End

It seems to me that the establishment of an advisory committee to control computer operations virtu-

ally makes the data processing services in educational institutions an independent agency. Because data processing personnel have been educated and trained in business divisions of colleges, services to business activities of an educational institution are usually good and evoke little criticism. However, if these personnel try to function in an instructional setting, they immediately encounter problems which they do not understand because of their business experience and training background. Since it is an independent agency, academic administrators and instructors are very apt to yield, because not only do they run into a lack of understanding of their problems but also they find themselves powerless to bring any power to bear on the computer operation. As a result:

- educators look in other directions than the computer to improve learning; they are indifferent or antipathetic toward the computer;
- the available programs remain mediocre or poor;
- the equipment remains inadequate for learning, however adequate it may be for business functions;
- the equipment and programmers remain inaccessible behind the curtain of an independent agency; teachers remain untrained in the uses of the computer in learning and teaching; they remain excluded from central planning processes because they are not computer users.

Nothing militates against educational uses of the computer as much as independently established computer agencies. We could not design a system that would more effectively "kill off" the use of computers by teachers if we sat down intellectually and carefully and tried to design a plan to do it.

Mystical Computer

Various practices of professional and technical computer personnel are designed to keep the computer mystical. One of the most effective of these practices is: to use no headings on computer printouts; or, if headings are used, they include non-standard abbreviations and code numbers and letters which make it virtually impossible for any of the uninitiated to understand what is on that printout. Only a continuous user can remember the meanings of the abbreviations and words. This practice prevents teachers from becoming familiar with what kinds of uses the computer is providing because they cannot understand the printouts that they may see in meetings or see on other colleagues' desks. This practice also perpetuates the ignorance of administrators because they cannot understand the printouts that their subordinates use on a daily basis. So the computer remains a mystery.

Rejection of Responsibility for Educating

Another practice of professional and technical computermen is to tell the teacher that they will make programs for him if he will just describe what he wants the program to do. This is understandable as most computermen are oriented in a business tradition, not an educational tradition, and to some degree they do not know what to provide for a teacher. However, this practice has become a fetish, to the extent that it represents a solid brick wall between data processing services and a teacher who is ignorant of what the computer can do for him. People working in computer services traditionally accept no responsibility whatsoever for familiarizing themselves with what is going on in educational institutions nationwide that would provide a basis for them to help teachers to get started with computer uses in their own institutions. We would not tolerate this from other divisions within our educational institutions but because of the mysticism of the computer we allow this to exist in data processing services. The professional educator must stand up and demand that these practices on the part of administration and computer services stop. All other professional fields are proceeding to develop technical and equipment support both in quality and quantity beyond that which is available to the teachers. Hospitals are the most easily understood illustration of this point. As much as we detest the high cost of illnesses, no one questions the medical competence of the practitioners.

Proposed Changes

I propose that the following changes in educational institutions are necessary in order to promote rapid and high quality uses of the computer at the learner-teacher level:

1. The computer, computer time, and computer personnel must be fractionated so that those persons being served have both responsibility and authority over the equipment and personnel which will be doing their work. This is becoming easier as various kinds of computer terminals become more wide-spread. This development will stop all arguments about priorities, projects, division of expenditures, competence of programmers and systems analysts, development of programs and systems, and many of the other arguments now plaguing educational institutions in regard to the computer users and uses and will relegate these problems directly to the responsible user. They will then be resolvable on an operational basis among the people and projects concerned. This is no different from what has always been in school work, where secretaries, office machine operators, store keepers, librarians, and media producers, have been attached directly to academic groups.

Bosses

2. Computer people should have bosses, not operating committees. This is a natural result of the development mentioned above. When I make this statement, I do not imply departure from the normal committee structure of any educational institution which will bring its educational thinking to bear on what is going on. Faculty meetings, department meetings, divisional meetings, administrative meetings, and all committees that are assigned some form of control will offer direction to computer people. But, the computer operation does not deserve or require an operating committee, any more than do the girls who run the adding machines or prepare reports for the administrators. Administrative councils and committees should exercise control over computer people as part of their overall responsibility structure, and thereby make this function a part of an integrated whole rather than an isolated phenomenon.

Titling of Reports

3. A uniform rule in educational institutions in regard to computer printouts should be followed. This rule is: Every report and every column in a report shall be titled. The titles should not include abbreviations or codes. One only has to think of various financial reports he has read over his lifetime to realize that almost all of these are well titled; the exceptions have been those with poorly selected titles or titles too abbreviated or titles containing

terminology unfamiliar to the viewer. This requirement is really just a matter of good English usage that any writer would expect to follow; we would not consider publishing articles or books without proper chosen titles and headings on the graphic and illustrative material, any more than we would publish a newspaper without headlines.

4. Institutions should provide funds for travel and conference attendance so that computer people can find out what is going on with computers in other educational institutions.

We have seen fit to supply computers and appropriate peripheral equipment for business uses in educational institutions. These uses have come first probably because it is very easy to see savings in terms of personnel and the instantaneous availability of coordinated information somewhere down the road. These uses are primarily substituting computer production for what we formerly did by hand and by fewer machines. If we can do these jobs faster, the obvious result should be eventual reduction in cost.

Institutional Computer Uses

Instructional computer uses are different. The projected uses computers have in instruction add instructional elements that are new, currently lacking in education:

- they speed up student learning by doing large scale calculating rapidly;
- they group and regroup students on the basis of selected criteria, which will lead to personalized and individualized learning (and to eventual discard of the semester and class system);
- they provide for student record-keeping, and faculty information services upon which instruction can be based, on a vast scale that has never been available before.

The dream of dramatically increased quality and quantity of learning is just now beginning to materialize because of the computer and other forms of automation. Academic uses of the computer actually increase costs; so if we hope to improve learning significantly, additional funding for computers, peripheral equipment, and personnel that will make this improvement possible must be provided. Categorical aid must become a reality — general aid to the state and to schools and institutions of higher education is not good enough. Past experience with non-categorical aid has proved that most of this aid goes into salaries. To achieve the optimum in computer use and its resultant improvement in learning, we must ask for funds to be spent for this purpose as well as for other automation facilities for learning and teaching.

Remedy

Let's review here the six causes of technology's lack of impact on education, and consider how the suggested reforms would help to eliminate these causes.

1. Indifference or antipathy toward technology in education — This cause evaporates as responsibility and authority move to the level of use. Having control of computer time and personnel, faculty groups will do as they have always done — they will use the new force to improve learning.

2. Poor Programs — As the suggested reforms are put into practice over a period of time, the quantity of programs available and the continued use by learners and teachers will refine the programs and develop quality computer software.

3. Inadequate equipment — Money supplied specifically for this purpose will add to existing computers used for other purposes and provide an equipment basis for use in instruction.

4. Inaccessibility — If specific time is assigned for computer use and specific personnel are assigned for programming and systems work, then the problem of inaccessibility is reduced to a manageable level. Communication between business-oriented computer personnel and instruction-oriented teachers will become the major problem and a "pressure" will build up to solve it.

5. Teachers not trained in instructional technology — When responsibility and authority of computer uses are placed at the academic level, the necessity to become knowledgeable or trained in this field will become apparent, and will motivate teachers to become able to function with the computer and with computer programmers.

6. Media specialists excluded from central planning — When authority and responsibility resides with teachers who are competent in the computer field, the problem of making oneself felt at the planning level is largely resolved.

7. Limited staff — The staff necessary as a result of solving the six above problems will clearly delineate what kinds of staff are needed and how many.

Computer practices have militated against instructional uses long enough. It is time that we alter the practices which prevent instructional computer uses. Teachers are behind in computer know-how and use. It is time to catch up. □

Deciphering an Unknown Computer Program, as Compared With Deciphering of Ancient Writing

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"In working on the problem of deciphering a computer program, we can be helped by comparing the deciphering of other systems of symbols, and noticing the principles used."

Outline

Edmund C. Berkeley concentrated in mathematics while attending Harvard College and graduated in 1930 with an A.B. summa cum laude. He did actuarial work in the life insurance business 1930 to 1948 except for 3½ years on active duty in the U.S. Navy 1941-45. He is a Fellow of the Society of Actuaries; a founder of the Association for Computing Machinery; its first secretary, 1947-53; the author of 13 books on computers and related subjects; an invited lecturer on computers in the United States, Canada, England, Japan, the Soviet Union, and Australia. He implemented the programming language LISP for the DEC PDP-9 computer. He has been editor of "Computers and Automation" since 1951, and president of Berkeley Enterprises, Inc. since 1954.

The subject of this article is the interesting parallel between two problems:

- the documentation of an unknown computer program; and
- the decipherment of a system of unknown ancient writing.

Both these problems consist of finding and reporting the meaning of a recipe, a procedure. A computer program is a recipe or procedure for making a calculation, for computing some desired information. A piece of writing is a recipe or procedure for conveying a message.

When a computer program is adequately documented, the programmer who reads the documentation knows just what part of the program does what job. He knows just how to change or modify or replace any part of the program so that he can do something else that he may wish to do.

When a system of ancient writing is adequately documented, a human being who reads a script knows what is being said; and he knows just how to use the signs in some other sequence so that something else can be said instead.

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The Problem of Unknown Computer Programs

In almost all computer installations, it is very easy to be confronted with the problem of unknown computer programs. Among other reasons are the following:

1. No Programmer. The programmer who wrote the computer program has left to work elsewhere and is not available to answer questions.
2. No Recollection. The programmer who wrote the program does not remember what he did, because much time has gone by.
3. No Glossary. If mnemonic symbols are used in the symbolic program which assembled gives the working binary program, the meanings of the mnemonic symbols have to be guessed, for there exists no glossary of the mnemonics with their explanations. For example, on one occasion it took me several weeks to guess that the mnemonic PDL stood for "push-down list"; and I still do not know what the mnemonic ZORCH means.
4. No Recording of What is "Obvious". The programmer who produced the computer program did not write down "what everybody of course knows because it's obvious" — so that when, for example, peripheral equipment changes, many undefined symbols are left as relics in the program.
5. Accidental Incompleteness. The programmer "forgot" to record some of the essential information. For example, on one occasion it took me several hours of effort and two long distance phone calls to discover that a carriage return had been omitted from the operating instructions at a certain point in the operation of an interactive program.

Etc., etc., etc., as the King of Siam said.

Documentation, an Old Problem

Documentation is an old, old problem. Whenever a person A has written something without deliberate intention to conceal, and later on other persons have read it and tried to understand what A meant when A wrote it, the problem of deciphering what A meant has arisen. For example, in Shakespeare's play (published 1603) Hamlet says:

> Who would fardels bear
> To grunt and sweat under a weary life,
> But that the dread of something after death,
> The undiscover'd country from whose bourn
> No traveler returns, puzzles the will
> And makes us rather bear the ills we have
> Than fly to others that we know not of?

But we who live more than 300 years later, need to be told by the documenter that "fardels" means "burdens", and "bourn" means "boundary" (though in another of Shakespeare's plays it means "brook").

Analogies With Other Deciphering Problems

In working on the problem of deciphering a computer program, we can be helped by comparing the deciphering of other systems of symbols, and noticing the principles used.

There are basically two cases. Case 1 is where the writer has attempted to conceal his message, as in all systems of ordinary cryptographic writing. Case 2 is where the writer has made no attempt to conceal his message, as in a system of ancient writing to which the key has been lost. Our situation resembles Case 2.

For example, the understanding of the hieroglyphic writing of ancient Egypt was lost for at least a thousand years. Its successful deciphering began with the finding of what is called the "Rosetta Stone". This was found near the port of Rosetta in Egypt by a French army engineering officer in 1799. This stone is a basalt stele inscribed in three languages and systems of writing: ancient Greek; Egyptian hieroglyphic; and Egyptian demotic, a simplified form of cursive Egyptian writing used for books, deeds, etc. The Rosetta Stone expressed in three parallel texts a decree by priests at Memphis in regard to Ptolemy V, Epiphanes, around 190 B.C. The demotic and Greek parts of the stone were quite complete; the hieroglyphic part was rather incomplete. But the Rosetta Stone gave enough clues so that with other information, the French scholar, J. F. Champollion, effectively began the deciphering of Egyptian hieroglyphic writing. He worked at this problem from 1802 (when he was aged 11) until his death in 1832. In 1822, he had essentially "broken the back" of the problem, and had established the meaning and significance of about 14 of the hieroglyphic characters denoting sounds.

A much harder problem was the deciphering of what is called "Linear B", a system of ancient writing used in the Island of Crete about 1450 B.C. by the Minoan and Mycenaean civilizations. Here there existed no "Rosetta Stone", no translation of the same text into two or more scripts, one of which was known.

Deciphering the System of Ancient Writing: Linear B

It is useful and instructive to study the account of deciphering Linear B. We can examine the principles that were applied, and compare them with those useful in deciphering and documenting an unknown working binary program for a computer.

A book that is interesting and important, and that sheds much light on this decipherment is "The Decipherment of Linear B", by John Chadwick, a scholar of the University of Cambridge, England, second edition, published by Oxford University Press, 1967, softbound, 164 pages.

In this article, we shall select from that book a number of passages that shed light on problems and principles. For frequently when a group of scientists work on a difficult and complicated problem, and afterwards describe what they did and how they achieved success, they succeed in noticing and expressing principles that are much more widely applicable than in just the field of the problem they are working on. A good investigator generalizes from his experience in solving a problem; and many of his generalizations are useful to those who come after him.

In the case of Linear B, there existed somewhat over 3000 clay tablets that had been found in archeological excavations at the ruins of a palace at Knossos in Crete (and from a few other locations). This palace had been built of timber and bricks, stood for many years, and burned about 1400 B.C., thus firing the sun-dried clay tablets which otherwise would not have survived even one thorough wetting.

The language was unknown. The script was unknown. The message was unknown.

The problem of decipherment was worked on by several dozen investigators from about 1890 to about 1960. The person who contributed the most to the

decipherment was an Englishman named Michael Ventris, an architect and brilliant scholar who was unfortunately killed outright in an automobile accident in Sept. 1956 at the age of 34. John Chadwick was his friend and collaborator, and the author of the book above mentioned.

Arthur Evans

The first English investigator of the tablets from Crete was Arthur Evans, who was the first archeologist who excavated at Knossos in Crete. He wrote in 1901 (Beginning of quotation):

From the frequency of ciphers on these tablets it is evident that a great number of them refer to accounts relating to the royal stores and arsenal. The general purport of the tablet, moreover, is in many cases supplied by the introduction of one or more pictorial figures. Thus on a series of tablets, from the room called after them the Room of the Chariot Tablets, occur designs of a typical Mycenaean chariot, a horse's head, and what seems to be a cuirass ... Among other subjects thus represented were human figures, perhaps slaves, houses or barns, swine, ears of corn, various kinds of trees, saffron flowers, and vessels of clay of various shapes ... Besides these were other vases of metallic forms — implements such as spades, single-edged axes, and many indeterminate objects ...

In the present incomplete state of the material it is undesirable to go beyond a very general statement of the comparison attainable. Among the linear characters or letters in common use — about 70 in number — 10 are practically identical with signs belonging to the Cypriote syllabary and about the same number show affinities to later Greek letter-forms ... The words on the tablets are at times divided by upright lines, and from the average number of letters included between, it is probable that the signs have a syllabic value. The inscriptions are invariably written from left to right. ... (End of quotation)

Linear B eventually turned out to be the result of adapting the Minoan script to the writing of an early form of Greek — though this was not guessed prior to the discovery and proof. In fact, the hypothesis that the script expressed an early form of the Greek language was among the experts extremely unfashionable, "ridiculous", and heretical, for half a century.

The Urge to Discover Secrets, and the Flair for Learning Languages

(Quoted, p.1)

The urge to discover secrets is deeply ingrained in human nature; even the least curious mind is roused by the promise of sharing knowledge withheld from others. Some are fortunate enough to find a job which consists in the solution of mysteries, whether it is the physicist who tracks down a hitherto unknown nuclear particle or the policeman who detects a criminal. But most of us are driven to sublimate this urge by the solving of artificial puzzles devised for our entertainment. Detective stories or crossword puzzles cater for the majority; the solution of secret codes may be the hobby of a few. This [book] is the story of the solving of a genuine mystery which had baffled experts for half a century.

In 1936 a fourteen-year-old schoolboy was among a party who visited Burlington House in London to see an exhibition organized to mark the fiftieth anniversary of the British School of Archaeology at Athens. They heard a lecture by the grand old man of Greek archaeology, Sir Arthur Evans; he told them of his discovery of a long forgotten civilization in the Greek island of Crete, and of the mysterious writing used by this fabulous people of pre-history. In that hour a seed was planted that was dramatically to bear fruit sixteen years later; for this boy was already keenly interested in ancient scripts and languages. At the age of seven he had bought and studied a German book on the Egyptian hieroglyphs. He vowed then and there to take up the challenge of the undeciphered Cretan writing; he began to read the books on it; he even started a correspondence with the experts. And in the fullness of time he succeeded where they had failed. His name was Michael Ventris. ...

As this book is largely the story of his achievement, it will not be out of place to begin with a short account of his life. He was born on 12 July 1922 ... His schooling ... was unconventional; he went to school at Gstaad in Switzerland, where he was taught in French and German. Not content with this, he quickly mastered the local Swiss-German dialect — an accomplishment that later on endeared him at once to the Swiss scholars whom he met — and even taught himself Polish when he was six. He never outgrew this love of languages; a few weeks in Sweden after the war were enough for him to become proficient in Swedish and get a temporary job on the strength of it. Later he corresponded with Swedish scholars in their own language. He had not only a remarkable visual memory, but, what is rarely combined with it, the ability to learn a language by ear. ...

Astonishingly Rapid Thought, and the Power of Seeing Order in Apparent Confusion

(Quoted, p. 4)

If we ask what were the special qualities that made possible his achievement, we can point to his capacity for infinite pains, his powers of concentration, his meticulous accuracy, his beautiful draughtsmanship. All these were necessary; but there was much more that is hard to define. His brain worked with astonishing rapidity, so that he could think out all the implications of a suggestion almost before it was out of your mouth. He had a keen appreciation of the realities of a situation; the Mycenaeans were to him no vague abstractions, but living people whose thoughts he could penetrate. He himself laid stress on the visual approach to the problem; he made himself so familiar with the visual aspect of the texts that large sections were imprinted on his mind simply as visual patterns, long before the decipherment gave them meaning. But a merely photographic memory was not enough, and it was here that his architectural training came to his aid. The architect's eye sees in a building not a mere facade, a jumble of ornamental and structural features; it looks beneath the appearance and distinguishes the significant parts of the pattern, the structural elements and framework of the building. So too Ventris was able to discern among the bewildering variety of the mysterious signs, patterns and regularities which betrayed the underlying structure. It is this quality, the power of seeing order in apparent confusion, that has marked the work of all great men.

The Existence and the Availability of Adequate Material

(Quoted, p. 26)

The success of any decipherment depends upon the existence and availability of adequate material.

How much is needed depends upon the nature of the problem to be solved, the character of the material, and so forth. Thus a short 'bilingual' inscription, giving the same text in two languages, may be used as a crib, and may supply enough clues to enable the rest of the material to be interpreted. Where, as in this case, no bilingual text exists, a far larger amount of text is required. Moreover, restrictions may be imposed by the type of test available; for instance, the thousands of Etruscan funerary inscriptions known have permitted us to gain only a very limited knowledge of the language, since the same phrases are repeated over and over again.

There are two methods by which one can proceed. One is by a methodical analysis, and this approach will form the subject of the next chapter; the other is by more or less pure guesswork. Intelligent guessing must of course play some part in the first case; but there is a world of difference between a decipherment founded upon a careful internal analysis and one obtained by trial and error. Even this may produce the correct result; but it needs to be confirmed by application to virgin material, since it can gain no probability from its origin. A cool judgement is also needed to discriminate between what a text is likely or unlikely to contain. This faculty was notably lacking among those who risked their reputations on the conjectural method.

The Conjectural Method, i.e. Guesswork
(Quoted, p. 26)

Evans and the more cautious of his followers had observed that with few apparent exceptions all the documents were lists or accounts. The reasons for this will be discussed later on. But this did not prevent some amateurs from venturing upon interpretations of their own. In most cases these would-be decipherers began by guessing the language of the inscriptions — most of them treated [Linear] A and [Linear] B and even the Phaistos Disk as all specimens of the same language. Some chose Greek, though the Greek which they obtained would not stand philological examination. Others chose a language with obscure affinities or one imperfectly known: Basque and Etruscan were proposed as candidates. Others again invented languages of their own for the purpose, a method which had the advantage that no one could prove them wrong. One attempt, by the Bulgarian Professor V. Georgiev, presented an ingenious mélange of linguistic elements, which resembled Greek when it suited his purpose and any other language when it did not. Almost all decipherers made resemblances with the Cypriot script their starting-point.

(Quoted, p. 31):

The Bulgarian V. Georgiev summed up a series of earlier publications in a book entitled (in Russian) Problems of the Minoan Language published in Sofia in 1953. He dealt somewhat scornfully with his critics, but recognized that his theory would take a long time to perfect and could not convince everyone at once. The Minoan language was, he believed, a dialect of a wide-spread pre-Hellenic language spoken in Greece before the coming of the Greeks and possibly related to Hittite and other early Anatolian languages. This theory, which in one form or another has enjoyed considerable popularity, undoubtedly contains an element of truth, though we are still unable to say how much. One thing that is certain is that most Greek place-names are not composed of Greek words: There are a few that are, like Thermopulai "Hot-gates"; but a good number, like Athēnai (Athens), Mukēnai (Mycenae), Korinthos, Zakunthos, Halikarnassos, Lukabēttos, are not only devoid of meaning, but belong to groups with a restricted range of endings; just as English names can be recognized by endings like -bridge, -ton, -ford. The preservation of place-names belonging to an older language is a common phenomenon: in England many Celtic names survive, such as the various rivers called Avon (Welsh afon 'river'), though Celtic has not been spoken in their neighbourhood for more than a thousand years. The attempt has therefore been made to establish the pre-Hellenic language of Greece through the medium of these place-names; but although the fact of its existence is clear, its nature is still very much disputed.

The Nature of the Language as Seen through the Barrier of the Script
(Quoted, p. 35)

The most valuable contribution came a little later (1943-50), from the American Dr. Alice E. Kober. She died at the early age of forty-three in 1950, just too soon to witness and take part in the decipherment for which she had done so much to prepare the way.

She was the first to set out methodically to discover the nature of the language through the barrier of the script. The questions she asked were simple ones. Was it an inflected language, using different endings to express grammatical forms? Was there a consistent means of denoting a plural? Did it distinguish genders?

Her solutions were partial, but none the less a real step forward. She was able to demonstrate, for instance, that the totalling formula, clearly shown by summations on a number of tablets, had two forms: one was used for men and for one class of animals; the other for women, another class of animals, and also for swords and the like. This was not only clear evidence of a distinction of gender; it also led to the identification of the means by which the sex of animals is represented (that is, by adding marks to the appropriate ideograms).

Even more remarkable was her demonstration that certain words had two variant forms, which were longer than the simple form by one sign. These are now commonly, and irreverently, known as "Kober's triplets". She interpreted them as further evidence of inflexion; but they were destined to play an even more important role in the final decipherment.

I do not think there can be any doubt that Miss Kober would have taken a leading part in events of later years, had she been spared; she alone of the earlier investigators was pursuing the track which led Ventris ultimately to the solution of the problem.

The Recognition of Variant Forms and the Distinction of Separate Signs
(Quoted, p. 38)

E. L. Bennett, Jr., working on new material, proceeded with sound sense and caution. ... His outstanding contribution is the establishment of the signary: the recognition of variant forms and the distinction of separate signs. How difficult the task is only those who have tried can tell. It is easy enough for us to recognize the same letter in our alphabet as written by half a dozen different people, despite the use of variant forms. But if you do not know what is the possible range of letters, nor the sound of the words they spell, it is

impossible to be sure if some of the rare ones are separate letters or mere variants. This is still the position with regard to Linear B. The characters no. 18 and 19 (see the table at the end of this book) occur only a few times; are they variants of no. 17 or not? It is to Bennett's credit that few such problems remain; diligent comparison enabled him to set up a table of variants which made it clear in the case of all but the rarest signs what was its possible range of variation. By contrast, it is one of the weaknesses of Scripta Minoa II that different signs are sometimes confused, and variants of the same are treated as distinct.

Orderly Analysis
(Quoted, p. 39)

With the publication of The Pylos Tablets in 1951 the scene was set for the decipherment. Orderly analysis, begun by Miss Kober and Bennett, could now take the place of speculation and guesswork; but it required clear judgment to perceive the right methods, concentration to plod through the laborious analysis, perseverance to carry on despite meagre gains, and finally the spark of genius to grasp the right solution when at last it emerged from the painstaking manipulation of meaningless signs. ...

(Quoted, p. 40):

There is an obvious resemblance between an unreadable script and a secret code; similar methods can be employed to break both. But the differences must not be overlooked. The code is deliberately designed to baffle the investigator; the script is only puzzling by accident. The language underlying the coded text is ordinarily known; in the case of a script there are three separate possibilities. The language may be known or partially known, but written in an unknown script; this, for instance, was the case with the decipherment of the Old Persian inscriptions by the German scholar Grotefend in 1802; the cuneiform signs were then quite unknown, but the language, as revealed by recognition of proper names, turned out to be largely intelligible through the medium of the Avestan texts. Secondly, the script may be known, the language unknown. This is the case of Etruscan, which is written in a modified form of the Greek alphabet that presents little difficulty to the understanding of its sounds; but no language has yet been found sufficiently closely related to throw any light on the meaning of the words. Thus in spite of a large collection of inscriptions our knowledge of Etruscan is still very elementary and uncertain. Lastly, we have the situation which confronted the decipherers of the Minoan script [Linear B], an unknown script and an unknown language. The fact that the language subsequently proved to be known in irrelevant; that fact could not be used in the first stages of the decipherment.

(Quoted, p. 41):

In the last case decipherments have usually been judged to be possible only when they could start from a bilingual text. The Egyptian hieroglyphs began to yield their secret only when the discovery of the Rosetta stone, with the Egyptian text repeated in Greek, made it possible to equate the royal names in the two versions. No such document exists for Minoan; but it was useless to sit back and wait for one to appear.

Any Code can in Theory be Broken
(Quoted p. 41)

Cryptography [cryptanalysis] has contributed a new weapon to the student of unknown scripts. It is now generally known that any code can in theory be broken, provided sufficient examples of coded texts are available; the only method by which to achieve complete security is to ensure continuous change in the coding system, or to make the code so complicated that the amount of material necessary to break it can never be obtained. The detailed procedures are irrelevant, but the basic principle is the analysis and indexing of coded texts so that underlying patterns and regularities can be discovered. If a number of instances can be collected, it may appear that a certain group of signs in the coded text has a particular function; it may, for example, serve as a conjunction. A knowledge of the circumstances in which a message was sent may lead to other identifications, and from these tenuous gains further progress becomes possible, until the meaning of most of the coded words is known.

The application of this method to unknown languages is obvious; such methods enable the decipherer to determine the meaning of sign-groups without knowing how to pronounce the signs. Indeed it is possible to imagine a case where texts in an unknown language might be understood without finding the phonetic value of a single sign.

The first step is of course to determine the type of system employed and, in the case of Linear B, this is not so difficult as it seems at first sight. There are only three basic ways of committing language to writing, and all known graphic systems use one or a combination of these.

The simplest method is to draw a picture to represent a word; these pictograms are then often simplified until they become unrecognizable, but the principle remains that one sign represents one word. This is called "ideographic" writing, and it has been carried to the highest stage of development by the Chinese, who still write in this way, although the Communist government is now trying to introduce reforms. For instance: ... is "man"; ... is "woman"; non-pictorial concepts have of course to be expressed by oblique means: thus ... is "big" — it is a picture of the fisherman telling you how big the one was that got away!; or ... "eye" (much modified) is equipped with a pair of legs ... to mean "see".

The significant fact about ideographic systems is that they require an enormous number of signs to cope with even a simple vocabulary. Every literate Chinese has to be able to read and write several thousand different signs, and the large dictionaries list as many as 50,000. Even in English we still use ideograms on a restricted scale. The numerals are the most conspicuous example: 5 is not a sign for the word "five", but for the concept of five; and one can often see abbreviations like Charing X for "Charing Cross".

Linear B Basically a Syllabic System
(Quoted, p. 43)

Equipped with this knowledge we can turn to our Linear B texts. These consist of groups of signs separated by small vertical bars; the length of the groups varies from two to eight signs. Accompanying these in many cases are other signs which stand alone followed by a numeral; many of these are recognizable pictograms. It is easy to guess that single signs standing alone are probably ideographic, that is, representing a whole word; those used in groups are likely to be either syllabic or alphabetic. A count of these signs shows that they number about eighty-nine — the exact total is still disputed, because some are very rare, and it is not

yet clear whether certain forms are separate signs or variants of others.

But the number is significant; it is far too small for a wholly ideographic system, and it is too large for an alphabet. It must therefore be syllabic, and a fairly simple form of syllabary like Cypriot or Japanese, not the more complicated systems of the cuneiform script. This elementary deduction was neglected by many of the would-be decipherers.

(Quoted, p. 46):

Thus in many cases it was possible to deduce the general subject-matter of the tablets before a single syllable could be read; almost without exception it was clear that they were lists, inventories, or catalogues. For instance, a list of single sign-groups ("words"), each followed by the ideogram MAN and the numeral I, was clearly a list of men's names, a muster roll or the like. If the names were followed by WOMAN I, then they sometimes had added small numbers of children, the word for which had been pointed out by Cowley. On the other hand, where a word was followed by MAN and a number larger than one, and this collocation was repeated on a number of different tablets, the word was likely to be a descriptive title or occupational term, like "cow-herds", "tailors" or "men of Phaistos". A similar series of words could be deduced for women. If a word is regularly associated with a particular ideogram, it is likely to be the name of the object denoted by that ideogram; but if there are several varying words associated with the same ideogram, then they may be epithets denoting the various types.

(Quoted, p. 46):

This method of deduction, since it depends chiefly on studying the same words in different combinations, is often called "combinatory". Its usefulness is not exhausted at this stage, but it does even at the outset lead to some valuable conclusions about the meaning or sort of meaning possessed by certain words. At a later stage these can also act as a check on the correctness of a decipherment, because they are completely independent of the syllabic values. If a word so identified as an occupational term turns out, when transcribed phonetically, to mean "cow-herds", this confirms the interpretation. On the other hand, interpretations which do not agree with this preliminary classification are at once suspect, due allowance being made for errors.

The Science of Cryptanalysis
(Quoted, p. 67)

Cryptography [= cryptanalysis] is a science of deduction and controlled experiment; hypotheses are formed, tested, and often discarded. But the residue which passes the test grows and grows until finally there comes a point when the experimenter feels solid ground beneath his feet: his hypotheses cohere, and fragments of sense emerge from their camouflage. The code "breaks". Perhaps this is best defined as the point when the likely leads appear faster than they can be followed up. It is like the initiation of a chain-reaction in atomic physics; once the critical threshold is passed, the reaction propagates itself.

Only in the simplest experiments or codes does it complete itself with explosive violence. In the more difficult cases there is much work still to be done, and the small areas of sense, though sure proof of the break, remain for a while isolated; only gradually does the picture become filled out.

In June 1952 Ventris felt that the Linear B script had broken. Admittedly the tentative Greek words suggested in Work Note 20 were too few to carry conviction; in particular they implied an unlikely set of spelling conventions. But as he transcribed more and more texts, so the Greek words began to emerge in greater numbers; new signs could now be identified by recognizing a word in which one sign only was a blank, and this value could then be tested elsewhere. The spelling rules received confirmation, and the pattern of the decipherment became clear.

(Quoted, p. 71):

Secondly, the mere fact of being able to translate the tablet ["At Pylos: slaves of the priestess on account of sacred gold: 14 women"] does not automatically answer all the questions. Why were these women slaves of the priestess? Which priestess? What was the sacred gold? What was the state of affairs or the transaction that this tablet was meant to record?

All these are questions which we cannot answer; the facts were known to the writer of the tablet, and he did not expect it to be read by anyone who did not have the same knowledge; just as many of us make jottings in our diaries which convey a clear message to us, but would be meaningless to a stranger ignorant of the circumstances in which they were written.

This problem is still with us, and will always remain; we cannot know all the facts and events of which the tablets are an only partial record. We have to examine them as minutely as we can, to compare them with similar documents elsewhere, to check them against the archaeological evidence. Imagination may help to fill in the gaps, and in Chapter 7 I shall attempt to look beyond the texts at life in the Mycenaean world; but it is no good pretending we know more than we do.

A Definitive Interpretation
(Quoted, p. 84)

[Professor M. S. Ruiperez wrote:] Although it may be susceptible of further refinements and corrections the interpretation ... (which comes to crown many years of tenacious effort by the young English architect Mr. Michael Ventris) unites — let us say it at once — all the guarantees which can be demanded (reading of whole phrases with meaning suited to that expected from the ideograms, reading of known place and personal names, perfect coherence in orthography and grammar) and must in consequence be regarded as definitive.

(Quoted, p. 85):

For this [changing Dr. Platon's mind] I can claim a small share of credit. In the spring of 1955 I was able to spend a week in Crete working on the Knossos tablets. In the course of conversation, Dr. N. Platon [the director of the Iraklion Museum] told me that since Bennett left the year before, he had found in the museum storerooms some trays containing fragments of tablets; they had been exposed to the weather when the museum was damaged during the war, and he thought they would be useless. They were certainly in a poor way; some had crumbled to dust or disintegrated at a touch. But I was able to salvage a large number of pieces that were rea-

sonably hard. Time prevented me from making a proper job of it, and it was left for Ventris to finish later in the year.

But I had one great stroke of luck. I found a largish piece which was the left-hand end of a two-line tablet; the break showed plainly half of a horse's head — the ideographic sign for "horse". Now horses appear in the Knossos tablets only in the records of the chariot force, which have a quite different form, and in an isolated tablet showing horses and foals — a famous tablet on which Evans had identified, and discarded, the word for "foal". The left-hand edge of this was missing; was this the piece? I cleaned it hurriedly and carried it downstairs to the glass case where the tablet was on exhibition. I laid it on the glass; it looked a good fit. Platon came and opened the case, and the join was sure. A happy discovery; but there was something on this fragment which shook Platon's scepticism, for we now had the introductory words for each line, and they read: i-go "horses" and o-no "asses". Again Blegen's question could be asked: is coincidence excluded? What are the chances that two series of equine heads will be introduced by words exactly corresponding to the Greek for horses and asses? Such probabilities are beyond mathematical analysis; we can only have recourse to the guidance of common sense. Again difficulties have been raised by our critics: why are the asses not more markedly distinguished from the horses in the drawings? Perhaps the simple answer is that the scribe having written the appropriate words did not feel it worth the effort. It is also probable that there was a standard ideographic sign for "horse", but none for "ass"; what could be more natural then to employ the same sign but with the phonetic indication to show the difference? (End of Quotations)

These many quotations from "The Decipherment of Linear B" are however not a good substitute for the book. The book is very interesting, a fascinating detective story from real life, excellently written, inspiring in its reporting on Michael Ventris, and is highly recommended. PLEASE GET IT AND READ IT!

Principles in Decipherment of Computer Programs, Contrasted with Principles in Decipherment of Ancient Writing

A number of factors have been described or mentioned in the foregoing account of the decipherment of Linear B. In Table 1 we present a list of many of these factors, and briefly contrast their importance in the decipherment of ancient writing and of computer programs.

One of the interesting questions is "What are the kinds of characters that a computer program contains? Are they ideographic, syllabic, or alphabetic?"

They are not alphabetic (even though the symbolic form of machine language is written with letters, digits, and other symbols) because these letters and symbols (or meaningful sound units) do not express the phonemes of a spoken language that expresses computer programs.

They are not syllabic, because the characters of a computer program do not express the syllables of a spoken language that expresses computer programs.

The characters of a computer program are ideographic. They are ideograms under conditions where the ideograms have to be combinations of letters and other symbols on the typewriter. The ideographic signs of a computer program (spelled in letters,

Table 1

COMPARISON OF THE IMPORTANCE OF FACTORS

(1) Factor	(2) Decipherment of: Ancient Writing	(3) Decipherment of: Computer Programs
1. The urge to discover secrets	Needed	Needed
2. The flair for learning languages	Needed	Probably not needed
3. Astonishingly rapid thinking processes	Needed	Can largely be delegated to the computer
4. The power to see order in apparent confusion, to see structural regularities underneath a facade	Greatly needed	Greatly needed
5. The existence of adequate material	Needed	More material can be manufactured
6. The availability of adequate material	Needed	More material can be produced
7. Intelligent guesswork (the "probable words")	Some is needed	Some is needed
8. The power to recognize the nature of the language as seen through the barrier of the script	Much is needed	Much is needed
9. The recognition of variant forms of the same sign	Result of hard work	No problem at all
10. The distinguishing of separate signs	Result of hard work	Usually no problem at all
11. Orderly, methodical analysis	Much is needed	Much is needed, and the computer can take on the heavy load
12. Ideographic characters	Possibility: many thousands of different characters	Entirely ideographic
13. Syllabic characters	Possibility: about 70 to 150 different characters	None
14. Alphabetic characters	Possibility: about 15 to 45 different characters	None
15. The power to discriminate between what a text is likely or unlikely to contain	Much is needed	Only a small problem because of the operating instructions

digits, etc.) are an outgrowth of the ideographic signs of mathematics. They are spelled in common symbols and mixtures of them, in the same way as ideograms in, say, trigonometry are spelled, such as SIN, COS, TAN, COT, SEC, and CSC. The reason was that mathematicians could not think up satisfactory arbitrary signs like $\sqrt{}$ (for "square root" or "root") and ∞ (for "infinity"), to designate all that they wanted to talk about.

Unfortunately, in present years, the ideographic signs of a computer program are limited in usage to one or a few persons, the programmers of that particular program. Consequently, the evolutionary processes of language cannot work on them well; and consequently, there are very many different systems of ideograms, usually differing from each program to the next; and so it is very difficult to keep them all in mind.

However, because of the power of the computer, once a good ideographic system for expressing the underlying language of working binary computer programs is developed, the computer should be usable to produce the translation of each binary program into the good ideographic system.

In the determination of "what a text is likely to contain", a computer program is again a much more favorable case than ancient writing. The operating instructions imply what the program does. For example, if you can operate a program so that it will read tape, then the program must contain some instructions that will read tape. Etc.

In applying "orderly methodical analysis" and "intelligent guesswork", the power of the computer is available to implement guesses, test them rapidly, and examine and analyze the results rapidly.

Probably the most important difference between the decipherment of ancient scripts and the decipherment of working computer programs is "the existence and availability of adequate material", to work with in decipherment. In deciphering ancient writing, we are at the mercy of luck. Nothing we can do easily and certainly can increase the amount of material. Digging in likely archeological sites may increase the material, but that is far from certain.

In deciphering a working computer program, however, we can operate it, on example after example, on exercise after exercise, and thus increase the amount of material available for decipherment as much as we wish.

This is such an enormous advantage that we can confidently assert that the deciphering and the documentation of a working computer program should in all cases be possible. So the problem reduces to deciphering it as efficiently as possible.

References

1. Chadiwick, John / The Decipherment of Linear B: Second Edition / Cambridge University Press, 32 East 57 St., New York, N.Y. 10022 / second edition, 1967, softbound, 164 pp
2. Berkeley, Edmund C. / Computer-Assisted Documentation of Computer Programs, Vol. 1 / Information International Inc., Boston, Mass. (available from Berkeley Enterprises Inc., 815 Washington St., Newtonville, Mass. 02160) / 1969, softbound, 128 pp.
3. Berkeley, Edmund C. / Computer-Assisted Documentation of Computer Programs, Vol. 2 / Berkeley Enterprises Inc., 815 Washington St., Newtonville, Mass. 02160 / 1971, softbound, 112 pp

C.a PROBLEM CORNER

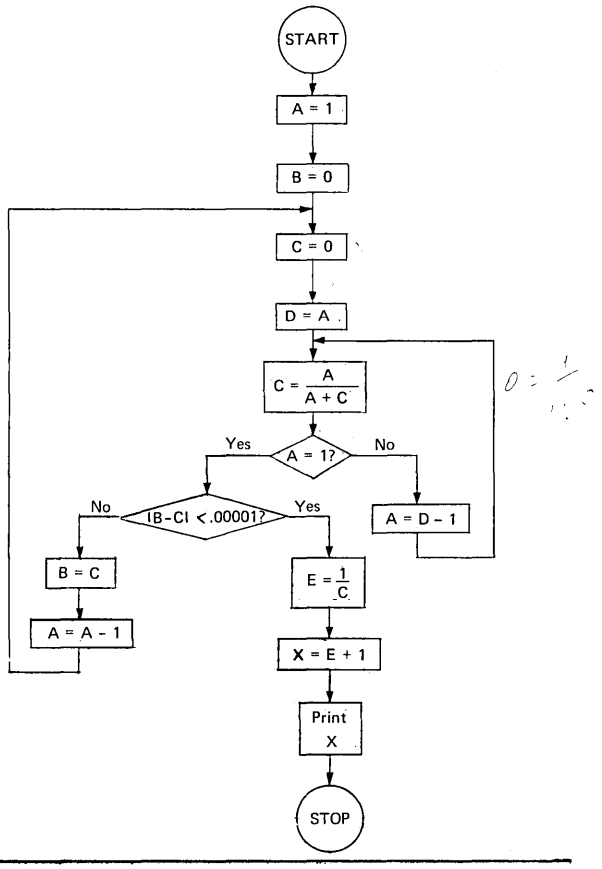
Walter Penney, CDP
Problem Editor
Computers and Automation

PROBLEM 725: STUCK-UP STICK-ONS

"Someone gummed things up this time," said Joe in a tone of exasperation, "and I mean that literally."

"How come?" asked Pete.

"Someone made up the instructions for this flowchart by typing them on those stick-ons. I think some of the instructions got stuck on the wrong boxes." Joe pointed to the chart on his desk.



"What makes you think some of the instructions got stuck on the wrong boxes?"

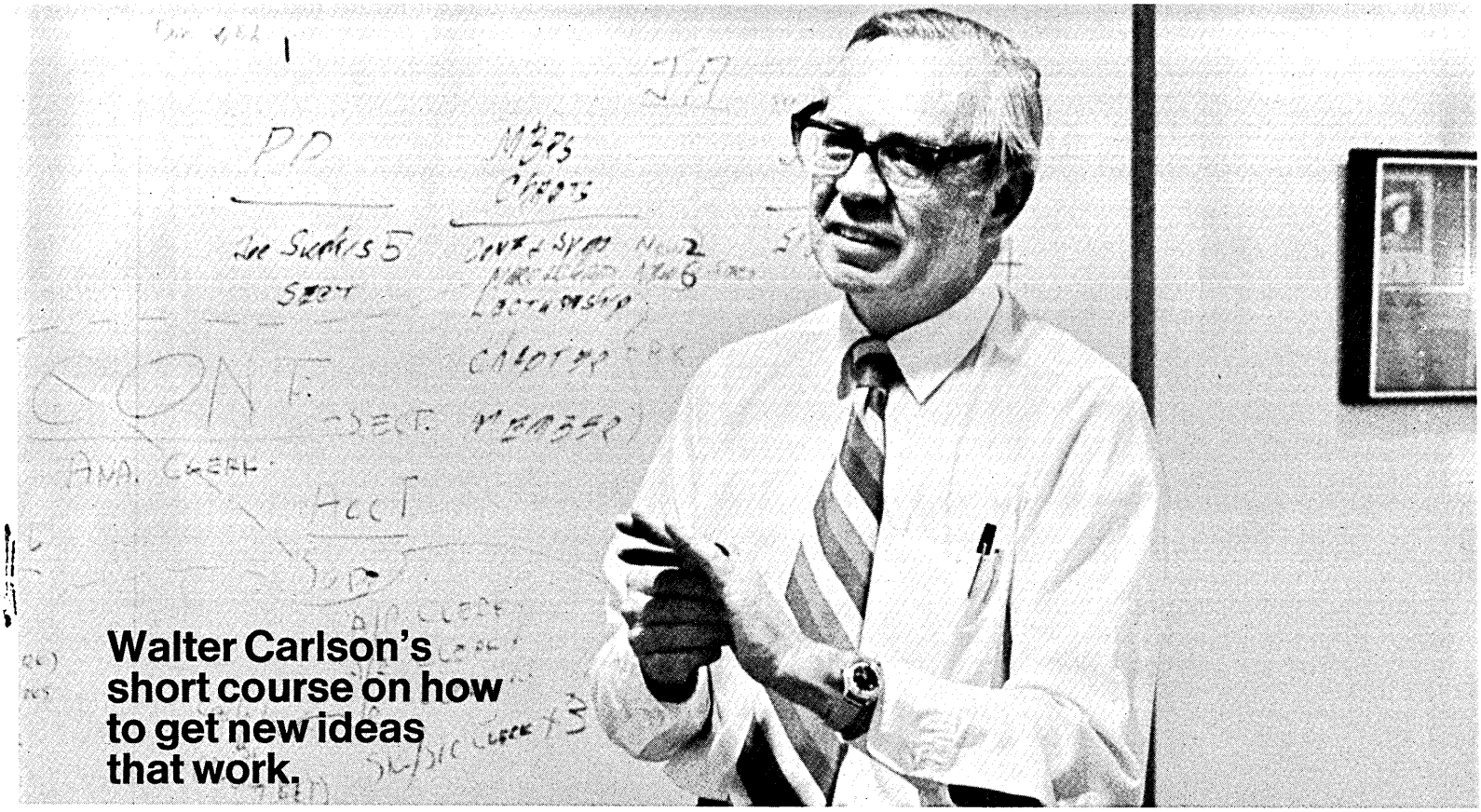
"Well, this is supposed to be a flowchart to compute e. I've tried to go through the steps, but all I get is zero divided by zero."

What is wrong?

Solution to Problem 724: Chafing at the Bit

The equivalents selected for 0 to 7 could be respectively: 0 0, 1 0, 0 1 0, 0 1 1, 1 1 1, 1 1 0 0, 1 1 0 1 0, and 1 1 0 1 1. This will lead to an average of 2.6 bits per experiment yet will allow a stream to be separated into individual values without ambiguity.

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



Walter Carlson's short course on how to get new ideas that work.

Start with ACM 72.

Walter Carlson is President of ACM through this May. In a long career in the information business he's formed some pretty savvy conclusions on what it takes to bring fresh thinking into organizations.

"We're going through a tough period," says Walter. "Every company I know is running lean and hard—looking for ideas to build on and expecting more from its computer people. The best way I can think of to get new ideas and sharpen skills is to attend—or send people to— an ACM technical conference, where people exchange ideas face-to-face.

"ACM 72 will be held August 14-16 in Boston. John Donovan has built a superb technical program. We'll have tutorial sessions to bring anyone up-to-speed who doesn't feel comfortable with a specialized topic. Plus debates, mini-tutorials, workshops, joint sessions and a number of other innovations that bring people together on the nitty-gritty of this business.

"This will be the Silver Anniversary Conference for ACM. In addition to our program on current technologies, we'll have the people who formed ACM 25 years ago talking about the ideas that created our industry. Some of the original concepts discarded long ago are coming back now. Microprogramming, for example. It should be a great conference."

If you're an ACM member, plan to be at ACM 72. If you're not a member, join us there and convert part of your admission fee to annual dues. If you're a data processing executive who's looking for new ideas, send some of your people and encourage them to join ACM.

Send in the coupon for more information today!

Association for Computing Machinery
1133 Avenue of the Americas
New York, New York 10036

I would like to consider ACM and ACM 72. Please send more information.

Name _____

Position _____

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City _____ State _____ Zip _____

acm

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FORUM

MISSING ISSUES OF "COMPUTERS AND AUTOMATION"

1. From Stanley Jaffin
211 North Piedmont St.
Arlington, Va. 22203

Thank you for sending me one more copy of the February 1972 issue to replace the one that I as a subscriber never received.

During the last five weeks, a copy of the February issue of C&A, in a special envelope, was delivered. The other copy mentioned in your letter will be returned as per your request. The regular copy, sent under your normal mailing label, normally delivered before the end of the second week of its respective month, has never surfaced.

Perhaps a note of explanation is in order.

The past year has seen the customer-directed service of many of the well-known publications in the fields of management, information technology, etc., drop off into oblivion. Included in this definition are those who do not acknowledge renewals, do not make an attempt to resend missing issues, and those that bill for phantom subscriptions. Their names would read like a Who's Who of the professional literature field. Oddly enough, the pages of their publications are full of exhortations to the readership to act like "professionals" in the management of their computer systems, and to be ever mindful of what possible bugs are doing to the customers. Apparently, their staffs cannot comprehend their own articles. I can see C&A isn't one of them. I regret any inconvenience this matter has caused. Unfortunately, missing issues, subscriptions, etc., are a very sore issue for me.

In the past four years C&A has taken many steps for the better. It is refreshing to find a publication not beating the same horses to death every month.

Of course, no one can match C&A's breadth of coverage of events outside the normally accepted areas of information technology. Other publications feel safe attacking only IBM, bureaucracy, and other conventional ogres.

There is a certain amount of courage in taking a stand that loses subscribers. Few magazines have that courage.

2. From the Editor

Starting in October and November we found a steady stream of complaints from our subscribers in our incoming mail: two and three letters written with no response; failure on our part to understand some detail of payment; rebilling on subscriptions renewed a month before and earlier still; etc.

We promptly discontinued with that computerized fulfilment service and changed to another one, which had a much larger staff of personnel to deal with subscribers' requests and needs. The change became effective with January and February. We hope very much that grounds for complaints will be far less.

The second fulfilment service and we agreed that irrespective of any information in the files, if there seemed to be a reasonable chance that the subscriber was right, we would immediately send any missing issues, and immediately reply, and we would unravel the records later.

We appreciate your nice remarks about the courage of C&A.

We happen to believe that professionals in the field of information engineering should be professional — and acknowledge their responsibility for the pursuit of truth — truth in input, truth in output, and truth in processing information.

We also believe that the issue of reliable information is becoming so important for humanity that it affects the survival of humanity on our spaceship Earth.

Unsettling, Disturbing, Critical . . .

Computers and Automation, established 1951 and therefore the oldest magazine in the field of computers and data processing, believes that the profession of information engineer includes not only competence in handling information using computers and other means, but also a broad responsibility, in a professional and engineering sense, for:

— The reliability and social significance of pertinent input data;
— The social value and truth of the output results.

In the same way, a bridge engineer takes a professional responsibility for the reliability and significance of the data he uses, and the safety and efficiency of the bridge he builds, for human beings to risk their lives on.

Accordingly, Computers and Automation publishes from time to time articles and other information related to socially useful input and output of data systems in a broad sense. To this end we seek to publish what is unsettling, disturbing, critical — but productive of thought and an improved and safer "house" for all humanity, an earth in which our children and later generations may have a future, instead of facing extinction.

The professional information engineer needs to relate his engineering to the most important and most serious problems in the world today: war, nuclear weapons, pollution, the population explosion, and many more.

ODE IN CELEBRATION OF RFPs

Michael Lipp
Bogota, N.J.

To the Editor:

There I was with the 500th "request for proposal" in front of me, having to prepare my 500th response. But poetry emerged ahead of proposal:

We Are Pleased

At such time as several vendors
have been selected —
Per our conversation —
we are looking forward
to looking forward
to looking forward.

We are using the supported monitor.
We envision making changes.
Our application is acquisition,
and we are looking forward.

Attached is our attachment.
It is specifically preliminary —
The specifications are also preliminary,
specifically preliminary,
and general, too.
So we are looking forward.

If it did crash, recovery may not be tolerable,
so we are looking forward.
Our evaluation will include
specifications in general and, specifically,
redundancy.
Our primary reason for this venture
is collection — to any great degree.

Consequently we require
response,
extremely short and fast response.
This phase is considered minor.
In the interim we generally develop
a preliminary feel for scope.
In the interim please respond.
In the interim the magnitude
of our application is acquisition.
And we are looking forward.

We are pleased and thank you,
Thank you for this opportunity,
Thank you for your response,
And we'll be looking forward
to hearing from you,
to your response,
from our response.
And in the future.
And we are pleased
to thank you
for looking forward
to our response.

On The Legal Side: COMPANY NAME SELECTION

Milton R. Wessel, Attorney
New York, N.Y.

I recall sitting with a client in an underwriter's office four years ago, and being told that the underwriter could market 100,000 shares at $5 a share of any company — no matter how speculative and whatever the earnings, net worth or what-have-you — provided the company's name at least remotely suggested the computer business. No wonder the directories of EDP organizations are so filled with companies whose trade names contain the prefix "Compu-" and the word "Data".

But times have changed. The financial world no longer responds automatically and enthusiastically to an EDP name, finally acknowledging that true economic value must be predicated on the fundamentals of product, earnings, sales, growth, market, liquidity and the like. Selection of EDP company names and product trademarks — if ever justified on any other basis — should now certainly be predicated solely upon marketing essentials, of which the most important will always be distinctiveness.

An organization which selects at its inception a name which is purely descriptive runs the risk of not having a protectible name. So does the company which picks a name which is exciting and locally useful, but which will not stand the test of distinctiveness in expanded future geographic or product markets. Yet but a glance at any listing of EDP organizations, such as are included in the several stock exchange and over-the-counter lists published in The Wall Street Journal, The New York Times and elsewhere (particularly the regional lists), reveals that many industry names continue to be employed without apparent regard to distinctiveness. One service center directory lists fifteen company names beginning with the prefix "Com" (eleven of which are the word "Computer"). Tne National Quotation Bureau in fact lists so many similar names that over-the-counter traders even make mistakes.

Already there have been litigated controversies based on alleged likelihood of confusion (Advanced Techniques Corporation v. Advance Computer Techniques, Inc., United Data Processing Services v. United Computer Systems, Inc., and Comsat v. Comcet) and administrative determinations denying registration to names as merely descriptive ("Scientific Data Systems"). The burden of going through such lengthy and expensive proceedings alone should be more than enough to justify name selection on a different basis.

It's time to get back to fundamentals. A corporate name or trademark should be selected — or changed — so as to distinguish and identify a product or service, without confusion now or in the event of future expansion, geographically or to new products.

Purely descriptive names should be avoided like the plague, and trademark and corporate name searches in Washington and all the applicable state and local jurisdictions should be a routine part of the selection and use of any name.

ADVERTISING INDEX

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

Who's Who in Computers and Data Processing

A CONTINUING PUBLICATION:
FIFTH EDITION AND SUPPLEMENTS ——→ SIXTH EDITION

Who's Who in Computers and Data Processing is published jointly by Quadrangle Books (a New York Times Company) and Computers and Automation.

In view of the financial depression in the computer field, the Who's Who will until further notice be published as the FIFTH EDITION plus a number of SUPPLEMENTS.

The annual subscription rate is $49.50; it includes at least two updating supplements per year, AND the Fifth Cumulative Edition, 1970-71, hardbound, 3 volumes, over 1000 pages, over 15,000 capsule biographies. Persons who already have the Fifth Edition may subscribe at $22 per year until the Sixth Cumulative Edition is scheduled.

If you wish to be considered for inclusion in the Who's Who (or if information for you has been previously published and requires updating), please complete the following entry form (or a copy of it), and send it to us.

WHO'S WHO ENTRY FORM
(may be copied on any piece of paper)

1. Name? (Please print)_____
2. Home Address (with Zip)?_____
3. Organization?_____
4. Its Address (with Zip)?_____
5. Your Title?_____
6. Your Main Interests?_____

Applications	( )	Logic	( )	Sales	( )
Business	( )	Management	( )	Systems	( )
Construction	( )	Mathematics	( )	Other	( )
Design	( )	Programming	( )	(Please specify)	

_____

7. Year of Birth?_____
8. Education and Degrees?_____
9. Year Entered Computer Field?_____
10. Your Present Occupation?_____
11. Publications, Honors, Memberships, and other Distinctions?_____
_____(attach paper if needed)
12. Do you have access to a computer? ( ) Yes ( ) No
a. If yes, what kind of computer?
Manufacturer?_____
Model?_____
b. Where is it installed:
Organization?_____
Address?_____
c. Is your access: Batch? ( ) Time-shared? ( )
Other? ( ) Please explain:
d. Any remarks?_____
_____
13. In which volume or volumes of the Who's Who —
(a) Have you been included? {see below}
(b) Do you think you should be included? {see below}

	(a)	(b)
Vol. 1: Systems Analysts and Programmers	( )	( )
Vol. 2: Data Processing Managers and Directors	( )	( )
Vol. 3: Other Computer Professionals	( )	( )

14. Do you subscribe to Computers and Automation?
( ) Yes ( ) No
15. Associates or colleagues who should be sent Who's Who entry forms? Name and Address?
_____
_____
_____
(attach paper if needed)

When completed, please send promptly to:
Who's Who Editor, Computers and Automation,
815 Washington St., Newtonville, MA 02160

Townsend — *Continued from page 11*

within the organization to better enable the manager to identify any employees that were not complying with the intent of the program. The number of instruments overdue from loan was reduced 65% during the first 19 months the report was distributed.

System Operation

Prepunched card sets are filed by instrument noun in book leaf kardex for each instrument assigned to an Instrument Control Station. For example, a request for a Hewlett Packard, Model 614, signal generator is processed by locating the instrument loan card in the kardex by noun, manufacturer and model number (photo #2). The appropriate prepunched loan card is removed and presented to the requesting employee to sign and enter his employee number, telephone, organization and building (photo #3). The attendant then places the loan card in the Remote Data Input (RDI) terminal. The variable levers are set to reflect the borrowing employee's number and the promised return date. A token is permanently assigned to the terminal which identifies the submitting station and building. The terminal is then activated to process the prepunched tab card data, variable lever information and token information (photo #4). The data is gathered on daily journal tapes which are processed weekly against two master files. 1) The instrument identification data input from the prepunched tab card is matched with the company property master file to assure proper instrument identity. 2) The employee number is matched with the company payroll file to properly establish the borrowing employee's name and organization. From these two master files and the terminal data, the Instrument Pool Data System (IPDS) master file is updated with the week's activity and the weekly and bi-weekly reports are published for distribution and use the following Monday.

Monthly system audits are conducted, using statistical sampling techniques, to verify overall system accuracy and utilization figures. These audit checks are used to maintain system discipline and establish awards for Zero Defects performance. Results of each monthly audit are distributed to all personnel within the Instrument Pool.

Looking Forward

Feasibility studies are currently being conducted in relation to on-line input, inquiry and response. The ability to establish utilization parameters for exception reporting to be used in retirement and procurement analysis is also being considered.

Unfortunately, the need for these capabilities has a relatively high dollar cost in relation to terminals, computer programming and the normal cost constraints of an on-line system.

Conclusion

The implementation of the IPDS has produced the following results for LMSC in the past four years:

1) Increased instrument pool inventory utilization from 56% to an average of 87%.
2) Reduced the inventory from 20,000 to 12,000 with no loss of effectiveness.
3) Resulted in the highest retirement activity in the history of the company.
4) Accounted for calibration savings in excess of 780,000 hours. □

HOW FIENDISH CAN YOU GET?

by Helsingen Sanomat, Helsinki, Finland; Ian Low, "New Scientist", Jan. 20, 1972; Judy Bellin, Women's Strike for Peace, New York, N.Y.; Congresswoman Bella Abzug, House of Representatives, Washington, D.C.

"A more atrocious, more refined, and more cunning form of warfare is being intensified."

Outline

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1. Less Visible War Against Civilians with IBM Computerized Guidance

Helsingen Sanomat
Helsinki, Finland

The war in Indochina is changing — it is becoming a silent war. The battlefields are shaking less because the big bombs have given way to small, harmful splinter bombs, to steel bullet bombs and fragment bombs. It has become a war personified by small mines camouflaged by leaves or sand; they wound rather than kill. And the newspapers are covering it less because there seems to be less happening.

This has been the major goal of Vietnamization: to forestall defeat implicit in a peaceful settlement by making the war less visible, allowing it to be carried on quietly into 1973 so that Mr. Nixon does not have to run for re-election as the only American president to have lost a war. Costs have been cut, troops are being withdrawn and American casualties have been reduced to make the Vietnamization plan look respectable to the American people and to the world. But behind the misleading statistics lies a new and equally destructive Vietnam War controlled from the White Igloo.

The White Igloo sounds as peaceful and innocent as an Eskimo hut on polar ice. But it is a cover name for something far more complicated — automated warfare planned and carried out by electronic machines. One U.S. Senator called it a "seismic and acoustic Christmas tree", another picturesque term which doesn't quite suit this system which is responsible for massive, blind-folded air strikes in Laos and along the Ho Chi Minh Trail.

The White Igloo operates without troops. Acoustic and seismic "sensors" and "reconnoiters" are built inside long poles which are dropped from planes in great quantities. They implant themselves upright in the ground. A radio transmitter and receiver is dropped by parachute; it may settle in a tree or shrub after which the chute self-destructs so that the radio will not be easily found by the enemy. The poles then receive sounds and vibrations from the environment which are relayed via the radio to a reconaissance plane which circles at very high altitude overhead.

The messages are forwarded to a control center in Nakhon Phanom, Thailand, where they are fed into computers. Professional "target-seekers" determine the source of the messages; if they conclude that they originate from hostile troops, an air attack order is issued.

An IBM machine (Type IBM 360-65) analyzes the source of movement, indicating its numerical strength, speed and position. It is not of course misled by camouflage, darkness, fog or cloud cover. The control center orders an attack against the area. The order goes to airbases in Thailand or South Vietnam or to the aircraft carriers which circle the Vietnamese coast. IBM machines in the airplanes receive the attack signal, and they automatically fly directly to the target, unerringly dropping their bombs. General Evans, one of the directors of the White Igloo system, has noted that the splinter-bombs used in this type of procedure have achieved "excellent results".

Hundreds of different weapons have been created to fight the automated war in Indochina. There are laser and TV-guided bombs that find their own targets. There is the Starlight Scope, a powerful light source that destroys the camouflage of night. There are binoculars that can see the trademark of a golf ball at over a thousand yards.

There are devices that react to the secretions and temperature changes of the human body. And automatic rapid-fire guns that fire 5000 shots per minute, mowing down everything like a scythe. There are magnetic devices that register all metallic items and relay their messages to the IBM machines, dozens of miles away. And there are weapons specifically designed to mutilate human beings without causing property losses: they can crush a person's leg but don't damage automobile tires.

There are grapeshot bombs, which bounce up to chest-level before they explode, releasing a round of 500 shots. Their bullets are a little bigger than those of a hunting gun and are obviously designed to kill, as they necessarily hit vital organs — except when a small child is struck by this spray of bullets at a distance, in which case he will likely carry them around for the paralyzed remainder of his life.

Round bullets are considered too humanitarian for certain purposes, and are often replaced by small, sharp-edged splinters (which inflict severe wounds and are more difficult to remove). Plastic and fiber bullets which escape X-ray detection are now being used.

There are cobweb bombs, which are dropped from airplanes. Upon hitting the ground, they send out 10-yard-long feelers called "reconnoiterers" in every direction. When the reconnoiterers hit something, the bomb explodes.

American war theoreticians have calculated that it is better psychological warfare, and better public relations at home, to disable people rather than kill them. A dead person is buried and forgotten; but an invalid has to be taken care of, perhaps for the rest of his life. When disabling weapons are used in large quantities, the Vietnamese must devote their energies to caring for the wounded.

It is not easy to fight these technical monsters. The Vietnamese guerrillas have managed to confuse the computers in several ways: for instance, they have hung bags of human urine on trees to confuse devices that record the location of human secretions.

The automation of the war in Indochina is still in its early stages, but improvements are rapid and continuous. We are facing a revolution in war technology the consequences of which are impossible to estimate. The peoples of Indochina must be saved from the agonies of the new "electronic battlefield".

2. Lethal Technology

Ian Low
"New Scientist", Jan. 20, 1972

While the rest of the world is beginning to hope that the Vietnam war may at last be ended — President Nixon may have found, as Eisenhower did, a winning slogan in "Bring the boys home" — there is evidence of grisly developments in military technology for which no tactical or strategical reason seems valid. It looks uncommonly like brutality for its own sake.

A letter in Le Monde (15 January) from Professor Andre Roussel, deputy director of the French National Institute of Health and Medical Research, refers to some of the things going on in Vietnam and the misgivings they aroused at an international conference on medicine in the Vietnam war, held in Paris at the end of last year. Both American and Vietnamese doctors who attended referred to the daily use of a variety of bombs — napalm, magnesium, and a device containing a mixture of phosphorus and aluminum which, according to Professor Roussel, "leaves monstrous wounds". The anti-personnel bombs have progressed from those which, bursting several feet above the ground, scattered hundreds of steel missiles the size of billiard balls. These penetrated the body and ricocheted, reaching several organs in turn. The most recent model, however, uses plastic missiles which defy detection by radiography so that it is virtually impossible for the surgeon to remove them.

Professor Roussel also refers to the "earthquake" bomb used to clear ground for helicopters to land. It also has the effect, however, of dislocating the bone in the inner ear, producing deafness in adults, and leaving young children deaf and dumb. A form of booby trap bomb parachutes to earth where it sends out, in different directions, eight threads of nylon each about 8 metres long. The threads are almost invisible but the least disturbance of one of them causes the bomb to explode. Roussel is also disturbed by an ethical development among doctors. He claims that psychologists — half doctors, half combatants, called "aid men" — are being sent on missions to carry out psychological warfare.

As Roussel says, it is unimportant that land forces are being withdrawn if a "more atrocious, more refined, and more cunning form of warfare goes on and is even intensified".

3. Total Body Radiation on Human Beings for the Pentagon

Judy Bellin
Women's Strike for Peace
New York, N.Y.

The Pentagon has paid the University of Cincinnati $850,000 to test the effects of total body radiation on troops in a possible atomic war.

Terminal cancer patients were selected as guinea pigs and the sinister experiments have continued for the past 11 years. The Washington Post reported that the patients were not told of the Pentagon funding or the main purpose of the research. Senator Edward Kennedy has demanded a full report from Defense Secretary Laird.

In addition to guaranteeing certain death, the hideous radiation treatments heighten the agony of the victims, causing nausea, vomiting and severe depression.

4. Biological Weapons

Judy Bellin
Women's Strike for Peace
New York, N.Y.

In November 1969 Nixon announced that the US would never use biological weapons in war and would never be the first to use lethal gas. Existing stocks of chemical and biological (CB) weapons and ingredients for their manufacture were to be destroyed; such CB "research" facilities as Fort Detrick would be converted to civilian use. This fall the US and the USSR co-sponsored a UN resolution (as well as a draft treaty at Geneva) banning the production and stockpiling of biological weapons (but not their use!) — reference to chemicals such as the defoliants and nausea agents used in Vietnam were discreetly omitted.

The following facts would suggest that instead of decreasing, US plans for CBW are escalating:

— The 1972 military budget provides for doubling US purchases of CBW weapons (from $25.3 million in 1971 to $50.8 million in 1972).

— Weapons destruction was not very meaningful: at Rocky Mt. Arsenal it involved "some obsolete types, not compatible with today's high-performance aircraft," and at Pine Bluff Arsenal it meant destruction only of obsolete (WWII) nerve gas — the arsenal will continue to study such weapons as the M36E2 cluster, an incendiary anti-personnel weapon.

— The US Army chemical center at Ft. McClellan, where officers (including those from Greece and S. Arabia) are trained, continues to use a manual on how to spread germ warfare. Although the course now claims to train for defensive purposes only, civilian protection is almost ignored — in fact, it is suggested that this may be impossible in any case.

— The Defense Marketing Survey (an industry newsletter) reported April 1971: "Despite public announcements to the contrary, the military agencies are not discontinuing CBW research. Work in these areas is continuing at funding levels equal to or exceeding those prior to the "public relations" announcements of cessation of these efforts. CBW research is merely being conducted in a different environment, and ... with less public attention."

— American Report, 9/17/71, said that new contracts will include the manufacture of nerve gases, incapacitating, riot control and harassing agents, defoliants, herbicides, and biological agents, including anthrax, Rocky Mt. spotted fever and tularemia.

— Last fall the Army started construction on a new $27 million facility on the grounds of the Presidio. 45% of its funding has been authorized for CB "defense" research. The Army insists this research will be solely for treatment purposes, but the Institute's design is based on that of Fort Detrick. Did the Army perhaps turn Ft. Detrick over to civilian (USPHS) use because it was outmoded, and in order to build itself a new facility in safer surroundings?

5. A Lawbreaker, Guilty of Contempt of Congress

Congresswoman Bella Abzug
House of Representatives
Washington, D.C.

"When the President recently signed the $21.4 billion Military Procurement Act, he said that because he didn't agree with one section of that law he would ignore it. ...

"I submit that by his words and his actions President Nixon, who represents himself as a law-and-order advocate, is actually himself a law-breaker, guilty of contempt of Congress."

(Address to the National Youth Caucus at Loyola University, December 4, 1971)

6. Why No Wide Publication?

Edmund C. Berkeley
Editor, Computers and Automation

Why is information about atrocities of these kinds not widely published and distributed throughout the newspapers and media of the United States? So that Americans with a sense of common decency can roar their protests?

There seem to be two answers. One is the cooperation of the American press with the American Establishment. The other is failure of Americans to be as concerned about Asian civilians and American cancer victims as they are concerned about drafted American soldiers. This is a moral failure.

C.a ADVANCED NUMBLES

Neil Macdonald
Assistant Editor
Computers and Automation

We regret that an error occurred in the April Advanced Numble No. 72401. The problem should have read:

ADVANCED NUMBLE NO. 72401

Find one solution to: ONE x TEN = SEVEN

We wish to thank those who wrote to us pointing out that the Numble as published had no solution. You are correct. The solution to the correct Advanced Numble No. 72401 will be published next month for those who wish to try their hand again.

Solution to Advanced Numble 72402

E = 4	R = 0	TWO x TWO = THREE
H = 9	T = 1	
O = 8	W = 3	138 x 138 = 19044

We invite our readers to send us solutions, together with human programs or a computer program which will produce the solution.

DALLAS: WHO, HOW, WHY? — Part III

Mikhail Sagatelyan
Moscow, USSR

"The fact that an enormous quantity of documents having a bearing on the crime [of assassinating President Kennedy] were classified for a period of 75 years by the Warren Commission without a word of explanation ... evoked grave suspicion."

Ten months later, early morning on September 25, 1964, in a long corridor of the Executive Office building which neighbours on the White House, several hundred American and foreign correspondents queued up for the just released Report of the Warren Commission. It was a thick volume consisting of 888 pages. Press reports were embargoed until Sunday evening, September 27, 1964, so reporters had two-and-a-half days to sift through the findings and compose their copy. So much has been written since about the Warren Report and about the official version of the "crime of the century" that there is no need here to recapitulate the whole thing in detail. I will limit myself to a brief resume of the main points made in the Warren Report: Lee Harvey Oswald was acting on his own initiative, so was Jack Ruby, and neither killing in Dallas was the result of a conspiracy — either American or foreign.

Without giving their readers an opportunity to actually familiarise themselves with the contents of the Report, the American mass media of information in its majority unleashed a flood of commentaries and articles frankly designed to persuade the reader to accept the Report as definitive and indisputable. Here are some indicative examples.

Walter Lippmann, writing in The New York Herald Tribune on September 29, 1964, expressed his conviction that future historians would uncover nothing that might cast a shadow on the absolute honesty and integrity of the seven members of the Commission and their findings. No one, at home or abroad, Lippmann stated, should question the validity of their verdict.

In The Washington Post and Times Herald, Marquis Child wrote on the 28th of the same month that the Report was a monument to the painstaking sifting and analysis of facts, rumours, suspicions and wild surmises examined by the Commission. It would not satisfy those who insisted on a conspiracy. For the ultra-leftists, Lee Harvey Oswald was a pawn in the hands of the right. The ultra-right declared it was a plot hatched in Moscow or Havana. But the thorough investigation must convince the honest, Childs maintained, that the killer was a loner.

In an editorial, The New York Times wrote on the same day that the facts presented by the Commission destroyed the ground from under the feet of those who alleged there was a conspiracy.

I was not able to follow everything that the eminent columnists had to say on the subject subsequently, but two years later The New York Times ran an open letter addressed to Earl Warren which asked whether Kennedy was not destroyed as a result of an organised attempt to change the political course of the United States and whether or not it was true that within the national political and military power structure there was a functioning internal opposition which had attempted to gain its ends through the murder of the Chief Executive and that there was a conspiracy not only directed against the person of John Kennedy, but also directed against his attempts to end the cold war.

But to return to the Report. Two characteristic peculiarities catch the eye upon an attentive reading of the main conclusions.

In the first place, the Warren Commission tried to combine a truth — there was no "communist plot" — with an untruth — there was no conspiracy of any kind. These two artificially combined conclusions, one well-founded and the other more than questionable, were served up to America and the rest of the world on one plate, in the hope they would be swallowed together.

The psychological sleight-of-hand worked like this: since it was easy to prove that neither Oswald nor Ruby were "foreign agents", then by a sort of psychological inertia, the strength and force of those proofs could be used to lend credence to the Commission's finding that Oswald and Ruby were both operating alone and that they were "psychologically unbalanced". The Commission also stated that in committing their crimes (and it must be noted that Oswald's guilt was not proved by the Commission) the men were governed by purely personal and emotional motives and reasons. In short, in the Report everything appeared to be clear and simple — there was no conspiracy either on the part of right extremists or on the part of communists.

Secondly, the formulations and presentation of the conclusions reached by the Commission were somewhat odd. In the opening paragraphs where the Commission promises to reveal the "whole truth" and boasts about the thoroughness of its investigation, the language is concise and assured. But in the conclusions, when such questions are touched on, for example, as Oswald's connections with the FBI and the CIA, then the language suddenly loses its crispness and becomes convoluted. This is how the Com-

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(Parts 1 and 2 were published in the March and April 1972 issues respectively, of *Computers and Automation.* Reprinted from *Sputnik,* published by Novosti Press Agency, Moscow, USSR.)

mission dealt with Oswald's connection with the FBI and the CIA: "Judging by the facts available to the Commission ...".[6] And at the end of the paragraph: "All of the contacts of these bodies with Oswald were established in the routine carrying out of their duties."[7] Is this a denial?

With respect to others being involved in the actions of Oswald and Ruby, the Commission reported that if such evidence existed, it was not available to investigating bodies of the United States and the Commission knew nothing of such proofs.

So what remained inaccessible to the Warren Commission and investigating bodies? A check on the files of the FBI and CIA in order to establish whether or not Oswald and Ruby were in fact agents of one or the other of these organisations? It seems to. So then what "independent investigation" could there be?

In fact, out of the 26 supplementary volumes (they were published much later than the Report), it is possible to pick out scores if not hundreds of absolutely convincing facts which refute the Warren Commission's claim of impartiality of investigation. Here is only one glaring example.

In the Report it is stated that as a result of Oswald's request to allow him to return with his wife to the United States, on May 9, 1962, by request of the State Department, the US Immigration and Naturalisation Service agreed to temporarily waive the limitation imposed by law which prevented the issuing of an American visa to a Russian wife until she had left the Soviet Union. The Commission revealed another interesting fact: it seems that the American Embassy in Moscow paid out $435.71 to Oswald to pay for plane tickets to the United States.

Why were such exceptions made for a man who called himself a "communist" and who at one time had renounced his American citizenship (although he prudently took no legal steps to do so)? Why existing immigration laws were waived in order to allow his wife — a Soviet citizen — to enter the States and why government funds were allotted to pay their fares, the Report did not explain.

On the whole, the triumphant fanfare that greeted the Warren Commission Report proved in the final count futile. The only section of the "investigation" which sounded convincing was the part that stated that communists, American or foreign, had nothing to do with the assassination of John Kennedy. Everything else was open to doubt. The fact that the enormous quantity of documents having a bearing on the crime were classified for 75 years by the Commission without a word of explanation also evoked grave suspicion.

Abroad the Report was not accepted. Within a week of its publication, The New York Times was forced to admit that the conclusion that President Kennedy's assassination was the work of one man not belonging to any conspiracy had met with widespread scepticism and frank disbelief in many newspapers in many countries. Rather typical of the reaction abroad to the Warren Commission Report was Guy Mollet's, General Secretary of the French Socialist Party. He suggested that someone in the United States had found an "invaluable" killer — he was a Communist, a Marxist and a Castro-ite all rolled into one. It was simply too good to be true. They were not very original in their fantasies, Mollet went on to say. It had all been done by Hitler before them and the whole business reminded one of the Reichstag fire ...

The American reaction to the Report was more complex. In the beginning quite a few fell for the psychological sleight-of-hand — the "neither left nor right" approach. However their acceptance of it lasted only the length of time it took various American writers, professors and journalists to study the Report themselves, reach their own conclusions and challenge the Commission's findings. When they did, they repudiated only those conclusions that insisted there was no internal conspiracy of the right. I have in mind the works of Mark Lane, Thomas Buchanan, Joachim Yosten and a whole number of other American writers. The vast majority are known to the reader and I shall not repeat their crushing analyses of the report, the accusations of suppressing and falsifying evidence, ignoring vital information, etc., directed at the Commission.

However, mention must be made of William Manchester's book, Death of a President, (now available in Russian) which came out in 1966. Manchester performed a Herculean task of gathering statements from witnesses. Everyone he requested for an interview agreed to meet with him except for two people — Lyndon Johnson and Oswald's widow, Marina, who was jealously guarded by the FBI. Marina Oswald was quick to refuse to see Manchester — it was obvious that the FBI had simply forbidden her to do so. But Johnson was another story. At least twice he promised to see the writer and both times at the last moment avoided an encounter. "He found he could not bear to do so," Manchester explains rather suggestively (just as he could not bear to talk to Rose Kennedy). Finally Johnson agreed to reply in writing to submitted questions. However, he replied by no means to all of the questions raised, Manchester points out in his book. Precisely what questions were ignored by Johnson, Manchester does not say. This, along with the obvious fact that much in Death of a President is only hinted at, left unsaid, and what is said sometimes contradicts the real content of the book (for instance the author's avowal that he agrees with the findings of the Warren Commission) is not hard to understand: Manchester was writing his book at a time when Johnson was still President. Nevertheless, Death of a President had considerable influence on the American evaluation of the Warren Report.

Two years after the Report was published, the Louis Harris Institute of Public Opinion conducted a national poll. The results were reported in the press and must have caused uneasiness in some quarters in Washington and Dallas. Three out of five Americans did not accept the main tenet of the Report that the assassination was the work of one man and were inclined to think the killing was part of a wide conspiracy. The majority believed that the Report of the Warren Commission did not contain the whole story. Figures were given: 46 per cent thought the assassination of Kennedy was part of a wide-spread conspiracy; 34 per cent thought it was the work of one individual; 20 per cent doubted the trustworthiness of the Report but had no firm opinions as to underlying motives. Therefore, 66 per cent of those questioned disbelieved the validity of the conclusions presented by the Commission.

It should be noted that the same poll revealed that in spite of the attempted brainwashing as to a communist conspiracy, few Americans had accepted it. In reply to more detailed questions as to who precisely was behind the Kennedy assassination, only two per cent said "Oswald and the Russians" and only one per cent — "Castro". Two per cent had the temerity

to assert: "Lyndon Johnson."

A little while later the same Harris Institute conducted another poll on the same subject. The results were still more depressing for both Johnson and the Warren Commission. The percentage of those who thought the Report was false had risen to 72. Ten per cent simply doubted it but could not give (or did not wish to give?) any reason. Only 18 per cent stated that the Warren Report had fully illuminated the killing in Dallas.

When I was in Oklahoma once, I saw an old grave in the local cemetery that had survived from cowboy times. On a simple tombstone the words were carved: "Sam Jones. Hanged by mistake. 1896." I was reminded of that stone when I read the results of the polls. In their own way, they are a tombstone in the cemetery of history: "The Warren Commission Report. Composed with evil designs. 1964."

That is why loud and insistent demands were raised in the United States for a new investigation of the circumstances of John Kennedy's assassination. Among others, Life Magazine, The Saturday Evening Post, Look Magazine and several important weeklies called for a new inquiry. Pressure was also exerted on Earl Warren to personally reply to the numerous accusations levelled by the public.

How did the government react to these demands? For one thing, through journalists close to the Administration it spread the following explanation of the demands for a re-examination of the "Kennedy Case": it was all part of Robert Kennedy's political game; he was preparing to fight Johnson in 1968 for the presidential nomination and was not above exploiting his brother's death for his own ends and had therefore raised the fuss around the Warren Report.

Such an explanation had a certain validity. However, it in no way invalidated the just demands for a new inquiry. Notwithstanding personal political ambitions, Robert Kennedy did not erect the symbolic tombstone over the Warren Report. The American people did it themselves.

Subsequently the government replied to the appeals to re-open the case and replied directly. At a regular White House press conference Johnson announced that he had no grounds to question the findings of the Commission. The same thing was said earlier by J. Edgar Hoover, director of the FBI, only a little more crudely. There was no evidence, he said, of Oswald having had an accomplice or accomplices. The head of the FBI did not stop there. He told off the millions of doubting Americans and demanded that they show a little more respect for the available facts.

The Warren Commission Report, the criticism of it by competent American investigators, the reaction to the criticism on the part of the White House and the FBI (other government departments preferred to say nothing) led to a situation where people all over the world were beginning to ask themselves questions of this kind: why does the President ignore the opinions of the American people? What threat to himself does Johnson envisage in the attempt to investigate the "Kennedy Case" more fully, unless he himself is mixed up in it or powerful political forces not subject to his control?

But facts incriminating the President and significant episodes continued to crop up, including thousands of miles from the shores of America.

In Moscow, shortly after the Warren Report came out, the chief editor of one American weekly said to me:

"It doesn't seem to me that the Russians should criticise the Warren Report. It's no good for you or us or for anyone who'd like to see tensions relaxed between Washington and Moscow ..."

In answer to my "how so?" the American at first tried to get away with generalisations about "inevitable worsening of Soviet-US relations in such a case, even if you're not to blame, but still it would entail a deterioration". At last he became irritated with my "denseness" and said: "For some real big shots in our country the whole subject is like waving a red rag at a bull ..."

"But what you're saying is pure blackmail!" I finally exploded.

"It may be, it may very well be so ... But bear in mind that it's not my blackmail, I only raised the whole thing in order to explain the situation. Believe me, personally I'd be very happy if things were otherwise ..."

Another foreign colleague who knew Russian and Russian literature quite well, suddenly recalled Griboyedov when we started discussing the Warren Commission Report:

"How does he put it?" he said with a thin smile. "He says, 'What a commission, oh Lord Creator!' Well, the creator is Lyndon Johnson. He's the one who must answer for it. But no one wants to put the questions: the Americans are a bit afraid — after all, he is the President! And then they're ashamed for their country. We allies — don't dare! But what a wonderful title for an article: 'What a commission, oh Lord Creator!' Only a question mark at the end. Followed by dot, dot, dot. Not bad, eh, Mike?"

The Thorny Path of Jim Garrison

There probably isn't a newspaper reader in the world who doesn't know the name of Jim Garrison, District Attorney of New Orleans. He is better known than all the authors of all the books on the killing in Dallas put together. Why is that? In the first place, because he, like they, wished to raise the curtain on the mystery surrounding the death of John Kennedy. Secondly, and more importantly, the New Orleans District Attorney is the first and so far the only person in a position of authority in the United States who has attempted to carry out a new investigation of the crime. Various writers have only demanded such an investigation. Jim Garrison pursued it.

Who is this Jim Garrison? An American 20th-century Don Quixote, fearlessly challenging official Washington windmills? A smart politician hoping to make capital out of a burning issue? Or perhaps a shrewd, calculating one, acting in the interests of some grouping which wishes to settle accounts with its enemies and the tragedy in Dallas presents an excellent opportunity? And finally, did his investigation and subsequent court case in any way help to uncover the truth? Did it bring us any closer to the sources of the conspiracy?

In October 1966 — in other words, at a time when demands that the Lyndon Johnson administration reopen the inquiry into the circumstances of John Kennedy's assassination were at a height — Russell B.

Long, Democratic Senator from Louisiana, expressed his grave doubts to Garrison about the Warren Commission's conclusions that Lee Harvey Oswald was a lone assassin. The Senator pointed out that before the shooting in Dallas Oswald had lived in New Orleans for several months and his activities there could bear investigation. Senator Long added that Garrison could count on his support ...

The District Attorney certainly wasn't acting on his own. Behind him there was a special committee composed of over 50 prominent New Orleans businessmen led by the millionaire Rolt. This committee raised additional finances over the meagre official budget of the D.A.'s office in order to cover the far-ranging investigation which Garrison launched shortly after his conversation with Senator Long.

Garrison was also supported in his endeavour by Cardinal Cushing of Boston, close friend and father-confessor to the Kennedy family. "I think they should follow it through," the Cardinal said of the New Orleans probe. "I never believed that the assassination was the work of one man."

Garrison maintained that Robert Kennedy approved of his investigation.

And so, in the fall of 1966, without any publicity, the New Orleans District Attorney's office opened an investigation into the circumstances of the assassination of President Kennedy.

On February 17, 1967, the New Orleans States-Item reported the fact. Several dozen reporters from New York, Washington, Chicago and a number of foreign correspondents immediately converged on New Orleans. By February 19 the press was quoting Garrison:

> We have been investigating the role of the city of New Orleans in the assassination of President Kennedy, and we have made some progress — I think substantial progress ... what's more, there will be arrests.

I won't go into details concerning the people arrested by Garrison, the charges levelled against them and the court findings. All that has been thoroughly publicised. I just want to tell briefly the story of the New Orleans case.

Clay Shaw, a New Orleans businessman, was accused of being party (under the name Clay Bertrand) to preparations to assassinate President Kennedy. The plotters included David Ferrie, a former civil aviation pilot, Lee Harvey Oswald and a number of others who met in Ferrie's apartment in the presence of witness Perry Russo. The charge, as Garrison reiterated more than once, was painstakingly documented.

On March 14, 1967, a preliminary hearing was held in New Orleans to determine whether there was enough evidence against Shaw to bring him to trial. On March 17, after a four-day hearing, the three presiding judges ruled there was sufficient evidence to hold Clay Shaw for trial.

All the sessions of the grand jury were held in camera and it heard Garrison's evidence against Clay Shaw and his accomplices (most of whom were dead — Oswald, Ruby and Ferrie). The American press believed that Garrison would lose his case since members of the grand jury were in possession of the Warren Commission Report which stated that both Oswald and Ruby were operating on their own initiative. As far as the press knew, the District Attorney had only one witness — Perry Russo.

And then, on the 22nd of March, after examining the evidence against the accused, the grand jury concluded that there was a conspiracy directed against President Kennedy, that Clay Shaw was a participant, that the evidence was overwhelming on this score, and that the trial must proceed. This decision of the grand jury created a sensation: an American court had in fact repudiated the Report of the Warren Commission both as a document and as an official verdict. The sceptics had miscalculated. Jim Garrison was triumphant ...

After innumerable delays and postponements insisted upon mainly by the defence, the trial took place at last in February 1969. Clay Shaw was acquitted. Obviously, unlike during the closed grand jury hearings, the prosecution witnesses did not sound very convincing. The District Attorney himself seemed to have lost interest in his case and turned up at only two or three sessions.

What had happened? Why was Garrison's case lost? Why, after putting so much effort and energy into investigating the "crime of the century" did the D.A. cool off? And finally, does the fact that the case was lost prove that there was no conspiracy and that the Warren Report was correct? Not at all.

All the investigations and preparations for the trial serve as vivid, if indirect, proof that the charges were based on truth. The justice of this conclusion will be seen if one examines the obstacles that were placed in the way of the District Attorney. The very fact that Garrison had such a difficult time of it is in itself convincing proof that he was on the right track and had arrived at the truth.

As already mentioned, on February 17, 1967, the world learned that an investigation into the Kennedy assassination was underway in New Orleans. The next day the White House made public a document drawn up by a special commission which called on the nation to fight the crime syndicate, Cosa Nostra. The document contained quite a number of breath-taking sensations and exposures. Is it possible that the publication of the document on the day following the news from New Orleans was pure coincidence? Of course. But the practice of killing one undesirable sensation with the help of another or other sensations is so widespread in America that the coincidence puts one on guard, to say the least. Whatever the case, it proved impossible to deflect attention away from New Orleans. After Garrison's investigation became known, events moved swiftly and evoked mounting interest throughout the world.

On February 19 Jim Garrison told reporters that the Warren Commission was wrong and that he would prove it.

Washington made no comment. Not a single highly placed official had a word to say in the two weeks following the New Orleans announcement. However, in the very first days after the press reports appeared, someone's mysterious hand made itself felt. On the evening of February 18, 1967, in one of New Orleans' numerous bars, the District Attorney met a former employee of Batista's secret police, the counter-revolutionary exile, Seraphino Eladio del Valle. Garrison showed del Valle a picture of Oswald together with "an unidentified man". That is how the photograph was called in the Warren Report where it is listed under No. 237. Del Valle recognized the "unidentified man" right away — it was one of the leaders of the Cuban counterrevolutionaries in the

United States, one Manuel Garcia Gonzales. Del Valle agreed to arrange a meeting between Garrison and Gonzales. On the evening of February 20 both Cubans disappeared. Three days later the mutilated body of del Valle was found in an abandoned car in Miami. Gonzales simply disappeared from Louisiana.

On February 22 David Ferrie was found dead in his apartment. Traces of cyanide were discovered on fragments of a broken tumbler. The police hesitantly presumed suicide. In any case, with the death of Ferrie, Jim Garrison lost a vital witness for the prosecution, a connecting link between Clay Shaw and Lee Harvey Oswald.

The day after the body of Ferrie was discovered, Jim Garrison stated that Ferrie had been the key to many mysteries surrounding the killing in Dallas and then incautiously added that he feared for the safety of others involved before the investigation was completed. On February 24, Jack Martin, a New Orleans private detective who had gathered significant information concerning the assassination for the District Attorney, left the city for an unknown destination, leaving word with a friend that he did so for reasons of "personal safety". At the end of February another leader of the Cuban counter-revolutionaries disappeared whom Garrison believed to be directly connected with the conspiracy.

Only then did Washington break its silence. The new Attorney General, Ramsey Clark, and President Johnson himself made statements.

In a brief interview given to the press, Clark stated that he was aware of Garrison's investigation and did not consider it had any foundation. According to evidence possessed by the FBI there was no connection between Clay Shaw and the assassination in Dallas, he said. In reply to persistent questioning on the matter by reporters, Clark again confirmed that Shaw had been checked out in this connection and cleared of suspicion.

The same day at a White House press conference, a reporter asked President Johnson about his attitude to the New Orleans investigation in view of the fact that it set out to demolish the Warren Report and considering that Johnson had recently stated he saw no reason to doubt the conclusions reached by the Commission.

Johnson replied he saw no reason now to repudiate any of his earlier statements.

Thus both the Attorney General and more cautiously, the President, had spoken up for Clay Shaw. Only three months later, on June 3, the Department of Justice was forced to admit that Mr. Ramsey Clark had lied on March 2: the FBI had never questioned or investigated Clay Shaw in connection with the assassination of John Kennedy. Washington's battle with Jim Garrison had taken a scandalous turn: in an effort to preserve some credibility on the part of the public in the Warren Report, the Attorney General had resorted to an outright lie.

On March 2 another attempt was made to thwart Garrison's inquiries. The New York radio reporter of the Hearst World International Service announced that Garrison intended to prove that the assassination of President Kennedy was carried out on Fidel Castro's orders and that the real reason for Oswald's trip to México was not to obtain a Cuban visa, but in order to receive instructions from the Cuban embassy. The American press picked up the statement and began to comment on it.

At the back of the whole provocative manoeuvre, lay the desire to undermine faith in the "Clay Shaw case". Well aware that by 1967 almost no one in America or abroad accepted the "Communist conspiracy" version, the enemies of the New Orleans District Attorney counted on the fact that if people thought that that red herring was the purpose of Garrison's investigation, they would lose interest.

However, it didn't work. Jim Garrison denied the Hearst allegations as to the trend of his investigations and flatly announced that no foreign state was involved in the assassination of John Kennedy. When the whole truth became known, he went on, a lot of people, including the President of the United States, were going to lose some sleep.

On top of everything, Garrison was seeking another witness who could shed light on the conspiracy. His name was Gordon Novel and he was the owner of one of the biggest bars in New Orleans. However, having been warned, he sold his business and disappeared on the eve of his impending arrest. After a considerable search, Garrison's men located Novel in Columbus, Ohio. In response to a request from New Orleans, the local authorities at first detained Novel. Then the real fun started.

In reply to the official request for Novel's extradition made by the State of Louisiana in order to have him appear before the grand jury in the trial of Clay Shaw, the Governor of Ohio stated that Novel would be handed over only if the New Orleans D.A.. office gave a written affidavit that Novel would not be questioned about "events connected with the assassination of President Kennedy"!

Gordon Novel was a key witness in the Clay Shaw case because he was a CIA agent. This is not surmise or logical guesswork on the part of Garrison and his investigators. Here is the proof. On May 23, 1967, Novel's lawyer, Stephen Plotkin, was forced to admit that "(his) client served as an intermediary between the CIA and anti-Castro Cubans in New Orleans and Miami prior to the April 1961 Bay of Pigs invasion".

The same day the Associated Press reported that

> when Novel first fled from New Orleans, he headed straight for McLean, Virginia, which is the Central Intelligence Agency suburb. This is not surprising, because Gordon Novel was a CIA employee in the early sixties.

This did not represent the whole truth. In Novel's abandoned flat in New Orleans, a valuable document was found that testified to the fact that Novel had not only been a CIA agent in the past, but remained one up to the time he fled the city. The paper, written in Novel's hand (which handwriting experts testified to), was a draft of a report made by Novel to his CIA superior, "Mr. Weiss". It is an interesting fact that Novel's attorney also admitted later that: "Everything in the letter as far as Novel is concerned is actually the truth."

Here are the highlights of the draft report:

> I took the liberty of writing you direct and apprising you of current situation expecting you to forward this through appropriate channels. Our connection and activity of that period involved individuals presently about to be indicted as conspirators in Mr. Garrison's investigation.

Novel goes on to warn that Garrison's probe was threatening to expose his ties with the Double-Check Corporation in Miami and therefore it was essential to take necessary counter-measures through military intelligence since Novel himself, his associates and lawyers, had run out of legal loopholes to forestall the District Attorney.

Knowing enough about the ways and means resorted to by the CIA in the case of blown agents whose existence threatens to throw light on the super-secret operations of the "Langley Monster", Novel warned Mr. Weiss that his death would not be in the interests of his employers.

> Our attorneys and others are in possession of complete sealed files containing all information concerning this matter.

In case of his disappearance, accidental or otherwise, the files would be made public in different areas of the country simultaneously.

Apparently Novel's threat was duly noted. His life was spared and he himself was spared the necessity of giving evidence to Garrison.

Needless to say, Novel's report was couched in such a way that it does not reveal directly what actions are under discussion, but it does show that they are relevant to Garrison's investigation. The whole world knows that the District Attorney was investigating a conspiracy to kill President Kennedy. So after Novel's draft report, is it possible to doubt that the CIA was involved in some way in the events in Dallas? Also, Novel's reference to the Double-Check Corporation is additional evidence of CIA involvement. Back in 1965, in a book written by two Washington reporters, Thomas Ross and David Wise, entitled The Invisible Government, the Double-Check Corporation was unmasked as a CIA front engaged in preparations for the invasion of Cuba in April 1961. And now Double-Check had turned up in Dallas!

To anyone who followed the press, it became obvious that notwithstanding the law, Washington was interfering with the District Attorney of New Orleans and the President was maintaining a discreet silence with regard to the curious doings surrounding the case.

It is my deepest conviction that the facts concerning overt and covert obstacles placed in the way of Garrison provided the lacking weight on the scales of public opinion in the United States and abroad and sent the Warren Commission Report plunging to oblivion and conversely strengthened the feeling that Lyndon Johnson was behaving in a manner that suggested he was in some way mixed up in the Dallas crime.

That is why the actions (or inaction) of the Federal authorities, when they became known to the public, did not discredit the New Orleans District Attorney, but on the contrary, gave added substance to his inquiries.

The trial in New Orleans continued, as did the attempts of the Federal authorities to end it. A considerable section of the press accused Garrison, as he put it, of "every kind of unethical practice except child molesting" and he added with black humour, "I expect that allegation to come shortly ..." Garrison received many death threats by letter and telephone. He kept a gun beside him at all times and hung on. "On my tombstone," he joked, "may be inscribed: 'Curiosity killed the D.A.'" At one point he confessed that he was glad he had not known of the troubles in store for him when he launched his investigation. If he had, he might have had second thoughts, but as it was, he had no regrets.

So, after clearly demonstrating that Garrison's investigation was impeded, to put it mildly, let us now turn to the question of what new facts he was able to uncover. He told about them himself as soon as he realised that his best defence against both physical reprisals and newspaper slanders lay in making whatever information he possessed, public.

The following is the gist of two or three lengthy interviews given by Garrison with the absolute understanding that he had corroborative proof in the form of documents, photographs or statements by witnesses for each fact presented.

Q: Who was Lee Harvey Oswald and what was his role in the assassination?

A: Oswald was a CIA agent. He was recruited while still a US marine. He was sent to the Soviet Union by the CIA with two main tasks: to spy and to disinform. Oswald arrived in Moscow with data concerning the American radar network around and in Japan. He underwent special training on a US military base at Atsugi preparatory to his trip to the Soviet Union. He studied Russian and "communist theory" and was allowed to subscribe to Pravda. This is why, having failed in his mission due to the vigilance of Soviet counter-intelligence, Oswald was not prosecuted on his return to the USA for giving secret information to the Soviet Union. By request of the CIA, the American embassy in Moscow paid the plane fares to America for Oswald and his wife. Despite existing American laws, the CIA also arranged to have an entry visa issued to Oswald's Russian wife.

After returning to the United States, Oswald received a new assignment: to take part in the training of a special CIA terrorist group consisting of Cuban counter-revolutionary exiles. The terrorists were supposed to land in Cuba and assassinate Fidel Castro.

The organising of the group took place in the geographical triangle Miami - New Orleans - Dallas. They were trained in a special school on the shores of Lake Ponchartrain near New Orleans. Jack Ruby, David Ferrie and Gordon Novel were all there. Ruby was also a CIA agent, Ferrie and Novel were operatives.

Oswald's assignment was to pretend to be a "communist". With this in mind, he organised a fictitious branch of the Fair Play for Cuba Committee and distributed leaflets in its name and even spoke on the radio. However, Oswald made one serious error which almost cost him the game. He gave as the address of the New Orleans branch of the Committee the address of a private detective agency which was widely known in the city as the headquarters of ultra-right organisations and which served as a cover address for Cuban counter-revolutionary groups. Later this mistake of Oswald's cost the lives of both owners of the detective agency — they died in mysterious circumstances in 1964, just as did so many others who knew too much about the killing in Dallas.

In the summer of 1963 the CIA received strict instructions from the Administration to stop its preparations for an attempt on the life of Fidel Castro. However, the CIA did not carry out the orders, merely switched objectives. All the above-named participants in the preparations for terrorism in Cuba, both Amer-

icans and Cubans, were fascist-minded reactionaries who hated Kennedy. Oswald, who was a right-winger, as his connections in Dallas and New Orleans testify, also hated him. Garrison was able to pin-point these connections of Oswald's. Clay Shaw, under the name Clay Bertrand, took on the leadership of the conspirators who decided, "for the good of America" that Kennedy had to be liquidated.

From the very beginning, Oswald was assigned the role of sacrificial goat, though he himself did not suspect it. He was chosen because of his past contacts with communism — his "defection" to the USSR, his "work" with the Fair Play for Cuba Committee, his trip to Mexico to make contact with the Cuban and USSR embassies. At first the plan was to organise a trip to Cuba for Oswald just before the assassination to make the "communist conspiracy" more convincing. However, due to the vigilance of Soviet and Cuban security organs, Oswald was not allowed entry to Cuba.

Oswald participated in the conspiracy against Kennedy, but he did not shoot at him.

Garrison was not able to establish what Oswald's role in the conspiracy was, but he was able to show that others, not Oswald, fired the shots.

Footnotes

1. Retranslated from the Russian. Tr.

2. ibid.

(To be continued in the next issue.)

"THE COMPUTER DIRECTORY AND BUYERS GUIDE" ISSUE OF "COMPUTERS AND AUTOMATION"

NOTICE

The U.S. Postmaster, Boston, Mass., ruled in January 1972, that we may no longer include "The Computer Directory and Buyers' Guide" issue of "Computers and Automation", calling it an optional, thirteenth issue of "Computers and Automation" regularly published in June, and mailing it with second class mailing privileges.

The plan mentioned previously for publishing the directory as a quarterly with second class mailing privileges has been disapproved and disallowed by the Classification Section of the U.S. Postal Service in Washington, D.C.

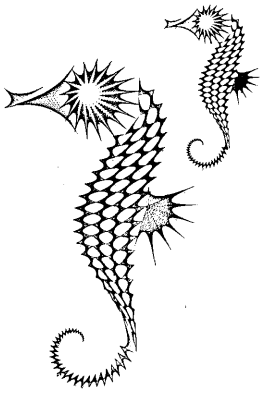
Accordingly, in 1972 "The Computer Directory and Buyers' Guide", 18th annual issue, will be published in one volume as a book, and mailed as a book.

The domestic price for "The Computer Directory and Buyers' Guide" will be $14.50, but regular subscribers to "Computers and Automation" may subscribe to the directory at $9.00 a year (there is thus no change for them).

"The Computer Directory and Buyers' Guide" issue of "Computers and Automation" has been published in every year from 1955 to 1971, and 1972 will not be an exception.

You are invited to enter our

Tenth Annual COMPUTER ART CONTEST



"Seahorses"
– Derby Scanlon

the special feature of the August, 1972 issue of

computers and automation

815 Washington St., Newtonville, Mass. 02160

The winning entry will appear on the cover of our August issue – more than 25 entries will be published inside, and other entries will be published later in other issues. The 1971 first prize winner, "Seahorses", is shown here at the left.

GUIDELINES FOR ENTRY

1. Any interesting and artistic drawing, design or sketch made by computer (analog or digital) may be entered.
2. Entries should be submitted on white paper in black ink for best reproduction. Color entries are acceptable, but they may be published in black and white.
3. The preferred size of entry is 8½ x 11 inches (or smaller); the maximum acceptable size is 12½ x 17 inches.
4. Each entry should be accompanied by an explanation in three to five sentences of how the drawing was programmed for a computer, the type of computer used, and how the art was produced by the computer.

There are no formal entry blanks; any letter submitting and describing the entry is acceptable. We cannot undertake to return artwork, and we ask that you NOT send originals.

DEADLINE FOR RECEIPT OF ENTRIES IN OUR OFFICE IS JULY 2, 1972.

ACROSS THE EDITOR'S DESK
Computing and Data Processing Newsletter

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APPLICATIONS

RESEARCHERS PREDICT OIL SPILL MOVEMENTS USING COMPUTER POWER

University of Missouri
Rolla, Missouri 65401

A research team in Rolla, Missouri is developing a computerized technique to predict oil spill movements in the open sea in hopes of:

— Giving the U.S. Coast Guard time to deploy clean-up gear before the oil hits the beaches, and,

— Tracing backward to determine what ship or ships spilled the oil in the first place.

Profs. Ronald Reisbig and Darryl Alofs of the University of Missouri-Rolla merchanical engineering department are in the second year of a long-range U.S. Coast Guard-sponsored research project involving the effects of waves and wind on oil spills.

"Knowing where a large oil slick is heading," Prof. Alofs said, "will give the Coast Guard time to deploy clean-up equipment. Knowing where it came from gives the Guard evidence to use in assessing fines and other penalties."

Initial findings include proof that deep-water waves have a greater impact on the speed of an oil slick's movement than was previously thought.

"We have taken actual data from previous ocean spills," Prof. Reisbig said, "and data from an experimental wave-analysis device we've constructed here. Both kinds of data were fed into an IBM System/360 Model 50 for evaluation which showed the assumptions of fluid mechanics made since the mid-19th Century have erred on the low side."

The researchers said waves affect oil spill movements to about the same degree that wind does. Efforts now are aimed at developing a computer program to predict movement based on a few wind and wave measurements.

"With present clean-up technology," Prof. Alofs said, "a computer-prepared map listing coordinates and times into the future would give Coast Guard officers lead-time enough to deploy the gear.

"With financial responsibility also an issue, having legal evidence of responsibility for damages will help assign the blame in the event no one admits to spilling the oil."

Oil spilled on water spreads to a relatively-even thickness of from one to two inches. Deep-water waves move the entire slick in one direction and, if the wind shifts, in a slightly different path. Traditional analysis suggested oil moved at 3.3 per cent of the wind's velocity," Prof. Resibig said. "However, computer analysis of actual movement demonstrates it is more on the order of 3.6 per cent. And, in addition, we found the effect of waves can be as high as 2.9 per cent of the wind velocity producing the waves."

The researchers constructed a wave tank and coated the water with oil corresponding in thickness to the scale used in the tests. The speed of the oil movement was recorded by a motion picture camera as a laser probe measured the thickness of the oil under both wave motion and calm conditions. Thickness measures were needed when the laboratory-produced slick broke up under differing kinds of wave conditions.

"So long as tankers and other seagoing vessels carry oil, the danger of large-scale spills will be with us," Prof. Reisbig said. "Having a prediction model to use in the event of spills will give the

U.S. Coast Guard another tool both in clean-up and in enforcement."

ARCHITECTURE STUDENTS TURNING TO COMPUTER TO IMPROVE DESIGN, CREATIVITY

College of Architecture
University of Kentucky
Lexington, Ky. 40506

"The architect is the last person to think about using the computer — and he is finding it's as useful a tool for him as for anyone else."

In this way Prof. Michael Kennedy described a series of computer exercises he has developed for students at the University of Kentucky's college of architecture.

"Instead of relying totally on his memory and intuitive reasoning," Prof. Kennedy said, "the new architect has the power of a computer system at his disposal in developing sketches, models, information systems and a wide variety of other functions."

Two such programs already are in use in the college, employing a high-performance computer in the university's computering center:

Environmental Sketches in Perspective (ESP) is a system to automate the time-consuming task of producing three-dimensional drawings. To use the system, a student defines a specific kind of building and its elements. To use the elements in different ways, the student has only to call out the appropriate symbol and the computer provides the scaling and calculations necessary to change the drawings, building up the perspective drawing systematically and producing a finished sketch by means of a computer-directed plotter.

Also, Pattern Generalization Language (PAGAN) is another set of computer programs which capitalize on a student's creativity by giving him opportunities to explore whatever options occur to him. Students suggest a variety of designs and design combinations. The computer takes over, generating — or developing — the designs into complex but eye-appealing drawings, again by means of the computer-linked plotter.

Under development are other systems for use by architects in cost projection and information retrieval.

"The architect's ability to accurately forecast the costs of a given structure is a key factor in his success," Prof. Kennedy said. "What makes and breaks architects is their ability to keep in their heads all the information needed for a building design. The computer, using a mathematical model of a given structure, can quickly provide specifications and dollar estimates.

"Not only can the computer do it faster and more accurately than humans, it also can provide design advantages much as ESP and PAGAN do, offering options and replacing intuition with precision."

ESP, PAGAN and related programs are freeing architects from relying on their memories. Professor Kennedy is exploring other ways of using the University's system, an IBM System/360 Model 65, to help architects turn out better designs in less time with a greater array of both academic and professional insights — enriching the learning experience for practical use later.

SUPERTANKER FEATURES COMPUTER SYSTEM

International Public Relations Co., Ltd.
230 Park Avenue
New York, N.Y. 10017

A 261,000-ton dead weight tanker featuring computer-supported navigation and operations systems has been delivered in New York by Nippon Kokan (NKK), Japan's only integrated shipbuilder-steelmaker-fabricator.

An OKITAC 4300 central computer unit with 16K fixed memory capacity is installed on the vessel, the Kinko Maru, and it supports the ship's radar, speed measurement, position plotting, and boiler-monitoring systems.

The computer and auxiliary data processing equipment was jointly developed by NKK, Showa Shipping, and the computer manufacturer, Oki Electric Co., Ltd.

There are four systems:

1. An anti-collision radar consists of three units a digital indicator display, a microwave transmitting-receiving system, and an antenna. The indicator has an automatic alarm which signals when other vessels come into the pre-set "warning ring."

Targets are manually tracked. Collision danger can be rapidly assessed with computer assistance and instantly exhibited on the display screen.

2. The speed measuring equipment consists of a Doppler Sonar system, especially designed to measure very low speed, which records speeds relative to the sea bottom. This system is especially effective as a navigation aid in narrow waters and ports.

3. An automatic chart position plotter continuously provides accurate calculations of estimated position on an optically projected chart by integrating ship's speed signals from the Doppler Sonar equipment. The plotter enables the ship's personnel to easily determine geographical position.

4. The boiler and engine room monitoring system is concentrated on the boiler, the single most important equipment in the turbine plant. Monitoring for abnormal boiler system conditions is conducted by scanning of primary measuring points. The location and cause of any possible problem are indicated by the computer. The monitoring system also maintains a constant survey of the turbine plant to permit more effective operations.

EDUCATION NEWS

FREE COMPUTER TRAINING CENTER COMING TO HARLEM, N.Y.

Opportunities Industrialization Center
360 Park Avenue South
New York, N.Y. 10010

Dr. Milton A. Galamison, board chairman of Opportunities Industrialization Center of New York (OIC), has announced that a new computer job training cen-

ter will open in the Harlem area of New York City early this summer. The center will be located at 213 East 125 St., and will provide free training, counseling, and job placement for careers in data processing, to trainees from all areas of New York City.

The center is being sponsored jointly by OIC, IBM, and the Sperry & Hutchinson Company (S&H).

The objective of the center is to prepare unemployed and underemployed people from minority communities within New York City for an area of growing opportunity.

The courses will be free of charge with training open to people based on their economic need and aptitude.

Complete training for jobs as computer operators, programmers and keypunch operators will be offered at the center. The courses of study will be compatible with industry demands and standards.

OIC will be responsible for the selection, counseling and placement of trainees as well as related administrative services, all being coordinated through the Computer Training Division.

The instruction staff is being provided by IBM. It will include an instruction manager and four instructors who will develop the course materials and work full-time at the center teaching the classes. They are IBM employees who were selected for their experience in teaching, systems engineering, and programming.

Equipment to be installed at the center by IBM will include a System 360 Model 40. Twenty-three other machines used in data processing operations — 17 keypunches, two data recorders, a verifier, a sorter, a collator and a reproducer — will also be installed.

At the end of two years OIC plans to assume complete responsibility for the center. From the beginning of the second year OIC personnel will be exposed to the teaching of computer training and will learn the techniques necessary to become proficient in giving instruction in the various courses. During the third year, IBM will provide consultation in training and technical matters.

The S&H Foundation, sponsored by the Sperry & Hutchinson Company, has contributed $25,000 to help establish the computer training center. The S&H Foundation also made an additional grant of $25,000 for OIC's city-wide expansion.

Dr. Leon H. Sullivan, a director of General Motors and presently the only Black on the Board, has led the growth of the OIC program from a meager beginning in an old abandoned jailhouse in Philadelphia to its present status as an international program, with over 95 operating training centers in the continental U.S.A. In its seven years of existence OIC of America has trained more than 162,000 underemployed, unemployed and so-called unemployable people. More than 85,000 of these individuals have completed their training and more than 45,000 of them have been placed in meaningful jobs. Outside the continental U.S.A., there are also OIC programs in various stages of development — in Africa, and in the Caribbean.

The center in New York will be similar to one in the Watts area of Los Angeles that has been in operation for the past three years. That center is sponsored jointly by the Urban League, the Bank of America Foundation, and IBM.

MISCELLANEOUS

X-RAYS AIR LUGGAGE FOR BOMBS AT HIGH SPEED

Cenco Technology Corporation
2205 Lee Street
Evanston, Ill. 60202

A trailer unit that combines conveyor-belt speed with X-ray vision is helping to combat the epidemic of bomb-extortion threats sweeping U.S. air terminals.

This equipment is the Calumet Coach Mobile Baggage Inspection Unit, now in use at the world's busiest airport, Chicago O'Hare International. It was developed by Calumet Coach Co. division of Cenco Instrument Corp. in cooperation with the Chicago Department of Aviation.

The Bomb Squad of the Chicago Fire Department, has brought the trailer to O'Hare to use it in checking many types and an immense volume of luggage and packages handled hourly at the huge terminal.

Two separate, parallel conveyor belts feed luggage and packages into the trailer, each moving the items past a fluoroscopic X-ray unit. Two operators man the unit. As the fluoroscopes reveal and photograph the internal contents of suitcases and parcels, the operators view the X-ray images. They can stop and remove any items needing more examination by security experts.

The trailer generates its own power to operate the fluoroscopic equipment, conveyors, lighting, heating, air conditioning, and communications. The mobile inspection facilities include conventional X-ray equipment, low-intensity X-ray units, direct readout systems, and a closed-circuit TV readout for the operators.

COMPUTER LOANED TO MASSACHUSETTS PRISONERS

Honeywell, Inc.
Waltham, Mass.

A small-scale computer will be "permanently loaned" to a group of computer programmers among inmates at the Massachusetts Correctional Institution at Walpole, Honeywell has announced.

The computer is a Honeywell Model 55, made in France and valued at approximately $55,000.

The computer is being loaned to a group of inmates who have been taught computer programming by Honeywell volunteers since the summer of 1967 as part of a rehabilitation program. The inmates teach other prisoners computer programming. They also do programming for various state agencies, including the departments of Education, Natural Resources, and Corporations and Taxation. State officials estimate that the inmates have saved Massachusetts more than $700,000 over the past four years.

Inmates will be taught to service and maintain the computer as well as use it in the programming activities. Malcolm Smith is the Honeywell official who initiated the program and who still coordinates the Honeywell activities at the prison.

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
ITT Canada Limited	Canada Post Office, Ottawa, Canada	Manufacture and delivery of a postal mechanized letter sorting system to complement new Canadian postal coding system	$70 million (approximate)
Computer Sciences Corp., Los Angeles, Calif.	General Services Administration	Teleprocessing network for Federal agencies nationwide; INFONET will provide a complete and integrated computer service	$43 million (approximate)
Control Data Corp., Minneapolis, Minn.	McDonnell-Douglas Astronautics Co.	Data processing for the Prototype Demonstration Program for Site Defense of Minuteman (SDM); McDonnell-Douglas is the prime contractor for the SDM	$30 million (approximate)
Univac Division of Sperry Rand Corp., Blue Bell, Pa.	Litton Industries, Van Nuys, Calif.	Basic shore station equipment and shipset electronic computer systems for 16 U.S. Navy Spruance-class destroyers (DD-963)	$28.1 million
Honeywell, Inc., Wellesley Hills, Mass.	General Services Administration	10 large-scale Series 6000 systems to major Navy shipyards on both coasts and Pearl Harbor; computers will perform logistic functions in support of Navy's construction, conversion and overhaul of ships and crafts	$12.9 million
Univac Division of Sperry Rand Corp., Blue Bell, Pa.	U.S. Navy, Washington, D.C.	Production of Navy's Mark 152 computer (UNIVAC 1219B) to modernize fire control systems for Tartar and Talos missiles; most will be for shipboard use	$4.6 million
GTE Information Systems Inc., New York, N.Y.	Block Automation System (BAS), New York Stock Exchange, New York, N.Y.	Computer and communications equipment and programming; installation of subscribers' equipment will begin in July	$4 million
International Computers Limited, London, England	Control Data Corp. of America	ICL's Model 11 magnetic tape units to be delivered over next three years	$3 million
System Development Corp. (SDC) Huntsville, Ala.	Army Advanced Ballistic Missile Defense Agency (ABMDA)	Development and operation of advanced computer and data processing research center for testing prototype ballistic missile defense hardware and software through real-time simulation of nuclear attack scenarios	$2 million
CMC France, subsidiary of Computer Machinery Corp.	Cheques Postaux	KeyProcessing™ Systems to be used primarily in a banking application	$1.6+ million
Computing and Software, Inc. Los Angeles, Calif.	Scott Paper Co., Philadelphia, Pa.	Processing and supplying comprehensive marketing information relating to defectiveness of Scott's national consumer couponing program (3 year contract)	$1 million (approximate)
Documation Incorporated, Melbourne, Fla.	Digital Equipment Corp., Maynard, Mass.	500 additional card readers to be delivered over the next 18 months	$1+ million
Ampex Corp., Marina del Rey, Calif.	New Mexico State University,	Plug-to-plug replacement core memories, disc storage systems and tape drives, to expand and improve an IBM 360/65 system	$600,000+
Pertec Corp., Business Systems Div., Santa Ana, Calif.	Computer Micro Services, Chicago, Ill.	Six Computer Output Microfilm (COM) systems service bureaus in Chicago, Detroit, Indianapolis, Milwaukee, and St. Louis	$500,000
Brokerage Transaction Services, Inc. (BTSI), New York, N.Y.	Thomson & McKinnon Auchincloss, Inc., New York, N.Y.	A message switching and order matching system incorporating dual CDC 3300s	$300,000
Datronics Systems Pty., Ltd., Australia	British and Australian Governments, Siding Spring Observatory, Australian National University	Supply and installation of computer system for 150-inch Optical Telescope; uses two Model 70s, one for actual telescope control, the other for astronomical instrumentation data logging	$178,746
Uniflo Systems Co., subsidiary of Rosemount Engineering Co. Minneapolis, Minn.	U.S. Department of Transportation, Cambridge, Mass.	Developmental testing of Personal Rapid Transit (PRT) system, a unique method of rapid transit applicable to many of today's transit problems	$98,000
Goodyear Aerospace Corp., Akron, Ohio	U.S. Army Safeguard System Command, Huntsville, Ala.	Developing concept of using an associative array processor (AP), Staran AP, to help sort incoming vehicles from accompanying dangerous debris reentering from outer space	$64,000
SAMA Boeing Computer Services, Inc., Dover, N.J.	Office of Naval Research, Washington, D.C.	Development of program to simulate mathematically the effects of aircraft crashes upon passengers; requires year-long study of structural characteristics of helicopters	$34,300
Honeywell, Inc., Wellesley Hills, Mass.	National Data Corp. Atlanta, Ga.	Leasing of 100 minicomputer systems over next four years for use in a credit checking system throughout the U.S. and Canada; systems are valued at $3.5 million	——
Information Equities, Inc. San Francisco, Calif.	Mount Sinai Hospital New York, N.Y.	Installation of HOSPACT, Information Equities' patient accounting system	——
National Cash Register Co., Dayton, Ohio	Grand Central Stores, Salt Lake City, Utah	An additional 104 electronic data collection systems for information control, sales analyses and general management in four more stores	——
Planning Research Corp., GDS, Los Angeles, Calif.	Frontier Airlines	Four year operation and maintenance of reservations system	——
Sanders Associates, Inc. Nashua, N.H.	Long Island Lighting Co.	"Can Do" information processing system to be used for customer information, customer service and other information systems	——

NEW INSTALLATIONS

OF	AT	FOR
Burroughs B2500 system	Berrien County Milk Producers, Inc., Benton Harbor, Mich.	Route settlement, production and inventory control and other financial management applications (system valued at $200,000)
	Liberty Travel Service, New York, N.Y.	Varied management applications including vendor analysis, sales analysis and government reports (system valued at $500,000)
	University of Wisconsin-LaCrosse, LaCrosse, Wisconsin	General administrative and financial functions, alumni and personnel records, budget projections (system valued at $426,000)
Burroughs B4700 system	Teachers College of Columbia University, New York, N.Y.	Diverse use including faculty research statistical work, administrative systems, student experimentation, library applications and alumni records (system valued at $575,000)
Control Data CYBER 70 Model 72 system	University of Melbourne, Melbourne, Victoria, Australia	Expanding existing capability; use includes heavy commercial workloads, administrative and scientific tasks, and control of a remote terminal network (system valued at $1 million)
	University of Western Australia, Perth, Australia	A regional center for educational, engineering and administrative tasks serving needs of tertiary education, state and federal government departments (system valued at $1.2 million)
Control Data 3400 system	Comision del Grijalva, Villahermosa, Tabasco, Mexico	Business (e.g., payroll, tax collections) and technical (e.g., flood control calculations) tasks (system valued at $276,000)
DECsystem-10	Computer Corp. of America, Cambridge, Mass.	Central data handler resource of the ARPANET network (Advanced Research Projects Agency) that links universities and research computer centers together (system valued at over $700,000)
Honeywell Model 58 system	Kona Kai, San Diego, Calif.	Financial management applications; future use includes forecasting and sales analysis applications
IBM System/3 Model 10	North Side Bank, Omaha, Nebraska	General banking applications, general ledger accounting, a commercial loan package and investment analysis
IBM System/7	Commonwealth Telephone Co., Prince William County, Manassas, Va.	Communication functions such as fewer busy signals, more trouble-free service, speed handling of direct-dial, long-distance calls, a more accurate billing system, and future expansion
IBM System/370 Model 145	Elgin National Industries, New York, N.Y.	Expansion of all applications from inventory forecasting to customer service
NCR Century 50 system	Cattaraugus County, Little Valley, N.Y.	General accounting, appropriations accounting and job costing for the highway department
	High Plains Baptist Hospital, Amarillo, Texas	In-patient accounting and for processing accounts receivable and payroll
NCR Century 100 system	Jefferson County, Beaumont, Texas	Voter registration, monitoring tax records, and several tasks previously done by two separate systems
	Mount Sinai Hospital, Hartford, Conn.	Process payroll and patient billing
	Nalle Clinic, Charlotte, N.C.	Patient billing and for crediting staff physicians with payments made for their services
	Varsity House, Columbus, Ohio	Inventory control, processing accounts receivable and payable, and payroll preparation
NCR Century 200 system	Delmarva Bank Data Processing Center, Inc., Denton, Md.	Monitoring demand deposit, savings, installment loan and Christmas Club accounts; replaces smaller system
	Farmers and Merchants Bank, Bridgeton, N.J.	Maintaining bank's Central Information File
	National Bank and Trust Co., Paulsboro, N.J.	Monitoring some 45,000 checking and savings accounts
	Northwest Texas Hospital, Amarillo, Texas	Financial management applications and for handling doctor billings
	Winnebago County, Rockford, Ill.	Utility billing, payroll, voter registration; also statistical reporting for sheriff's office, processing real estate and personal property taxes, dog licensing and preparation of vital statistics
UNIVAC 418-III system	North Carolina Police Information Network, North Carolina Dept. of Justice, Raleigh, N.C. (2 systems)	Implementing Police Information Network on vehicles, persons, and stolen property; also accesses data bank of Dept. of Motor Vehicles, and FBI's National Crime Information Center (NCIC) (system valued at $2.2 million)
UNIVAC 1106 system	Ciments LaFarge, Paris, France	General business-oriented work, data bank and scientific tasks (system valued at about $3.7 million)
UNIVAC 9200 system	William Bayley Co., Springfield, Ohio	Job scheduling, payroll processing, sales analysis, and general accounting
UNIVAC 9211B system	Community College, San Antonio, Texas	Use as a learning "tool" for students, and for handling administrative applications
UNIVAC 9300 system	Concord Telephone Co., Concord, N.C.	Toll rating, direct distance dialing, billing, payroll processing and general accounting
UNIVAC 9400 system	Protestant School Board of Greater Montreal, Montreal, Canada	Administration including student class scheduling
	Quebec Catholic School Commission, Quebec City, Canada	Administrative and business applications, including psychological testing

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 electronic digital computers manufactured and installed, or to be manufactured and on order. These figures are mailed to individual computer manufacturers from time to time for their information and review, and for any updating or comments they may care to provide. Please note the variation in dates and reliability of the information. Several important manufacturers refuse to give out, confirm, or comment on any figures.

Our census seeks to include all digital computers manufactured anywhere. We invite all manufacturers located anywhere to submit information for this census. We invite all our readers to submit information that would help make these figures as accurate and complete as possible.

Part I of the Monthly Computer Census contains reports for United States manufacturers. Part II contains reports for manufacturers outside of the United States. The two parts are published in alternate months.

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

SUMMARY AS OF APRIL 15, 1972

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 1. United States Manufacturers								
Autonetics	RECOMP II	11/58	2.5		30	0	30	X
Anaheim, Calif. (R) (1/69)	RECOMP III	6/61	1.5		6	0	6	X
Bailey Meter Co.	Metrotype	10/57	40-2000			(S) 8	0	8
Wickliffe, Ohio	Bailey 750	6/60	40-250	(S)	37	15	52	0
(A) (1/72)	Bailey 755	11/61	200-600	(S)	7	6	7	0
	Bailey 756	2/65	60-400	(S)	15	12	27	2
	Bailey 855/15	12/72	50-400	(S)	0	0	0	2
	Bailey 855/25	4/68	100-1000		16	0	16	0
	Bailey 855/50	3/72	100-1000	(S)	0	0	0	9
Bunker-Ramo Corp.	BR-130	10/61	2.0		160	-	-	X
Westlake Village, Calif.	BR-133	5/64	2.4		79	-	-	X
(A)	BR-230	8/63	2.7		15	-	-	X
(4/72)	BR-300	3/59	3.0		18	-	-	X
	BR-330	12/60	4.0		19	-	-	X
	BR-340	12/63	7.0		19	-	-	X
	BR-1018	6/71	23.0	(S)	-	-	-	-
Burroughs	205	1/54	4.6		25-38	2	27-40	X
Detroit, Mich.	220	10/58	14.0		28-31	2	30-33	X
(N)	B100/B500	7/65	2.8-9.0		-	-	-	-
(1/69-5/69)	B2500	2/67	4.0		52-57	12	64-49	117
	B3500	5/67	14.0		44	18	62	190
	B5500	3/63	23.5		65-74	7	72-81	8
	B6500	2/68	33.0		4	-	4	60
	B7500	4/69	44.0		-	-	-	13
	B8500	8/67	200.0		1	-	1	5
Computer Automation, Inc.	108/208/808	6/68	5.0	(S)	165	10	175	110
Newport Calif.	116/216/816	3/69	8.0	(S)	215	20	235	225
(A) (6/71)								
Control Data Corp.	G15	7/55	1.6		-	-	295	X
Minneapolis, Minn.	G20	4/61	15.5		-	-	20	X
(R)	LGP-21	12/62	0.7		-	-	165	X
(7/71)	LGP-30	9/56	1.3		-	-	322	X
	RPC4000	1/61	1.9		-	-	75	X
	636/136/046 Series	-	-		-	-	29	-
	160/8090 Series	5/60	2.1-14.0		-	-	610	X
	924/924-A	8/61	11.0		-	-	29	X
	1604/A/B	1/60	45.0		-	-	59	X
	1700/SC	5/66	3.8		-	-	400-450	0
	3100/3150	5/64	10-16		-	-	83-110	C
	3200	5/64	13.0		-	-	55-60	C
	3300	9/65	20-38		-	-	200	C
	3400	11/64	18.0		-	-	20	C
	3500	8/68	25.0		-	-	15	C
	3600	6/23	52.0		-	-	40	C
	3800	2/66	53.0		-	-	20	C
	6400/6500	8/64	58.0		-	-	105	C
	6600	8/64	115.0		-	-	85	C
	6700	6/67	130.9		-	-	5	C
	7600	12/68	235.0		-	-	5	C
								Total: 160 E
Data General Corp.	NOVA	2/69	8.0	(S)	-	-	891	-
Southboro, Mass.	SUPERNOVA	5/70	9.6	(S)	-	-	163	-
(A) (2/72)	NOVA 1200	12/71	5.4	(S)	-	-	950	-
	NOVA 800	3/71	6.9	(S)	-	-	122	-
	SUPERNOVA SC	6/71	11.9	(S)	-	-	15	-
Datacraft Corp.	6024/1	5/69	54-300	(S)	15	0	15	3
Ft. Lauderdale, Fla.	6024/3	2/70	33-200	(S)	91	13	104	54
(A) (4/72)	6024/5	12/71	16-50	(S)	0	0	0	31
Digiac Corp.	Digiac 3060	1/70	9.0	(S)	45	-	-	7
Plainview, N.Y.	Digiac 3080	12/64	19.5	(S)	16	-	-	0
(A) (7/71)	Digiac 3080C	10/67	25.0	(S)	8	-	-	1
Digital Computer Controls, Inc.	D-112	8/70	10.0	(S)	401	87	488	-
Fairfield, N.J.	D-116	1/72	10.0	(S)	36	0	36	-
(A) (4/72)								

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
DigitalEquipment Corp.	PDP-1	11/60	3.4		48	2	50	X
Maynard, Mass.	PDP-4	8/62	1.7		40	5	45	X
(A) (2/72)	PDP-5	9/63	0.9		90	10	100	X
	PDP-6	10/64	10.0		C	C	23	X
	PDP-7	11/64	0.4		C	C	160	X
	PDP-8	4/65	0.3		C	C	1440	C
	PDP-8/1	3/68	0.4		C	C	3698	C
	PDP-8/S	9/66	0.3		C	C	1024	C
	PDP-8/L	11/68	-		C	C	3902	C
	PDP-81E	-	-		-	-	3200	-
	PDP-9	12/66	1.1		C	C	436	C
	PDP-9L	11/68	-		C	C	48	C
	DECSystem-10	12/67	8.0		C	C	145	C
	PDP-11	3/70	10.5	(S)	C	C	2002	C
	PDP-12	9/69	-		C	C	593	C
	PDP-15	2/61	17.0		6	C	516	C
	LINC-8	9/66	-		C	C	142	C
								Total: 1350 E
Electronic Associates Inc.	640	4/67	1.2		107	60	167	4
Long Branch, N.J. (A) (4/72)	8400	7/67	12.0		20	8	28	1
EMR Computer	EMR 6020	4/65	5.4		C	-	-	C
Minneapolis, Minn.	EMR 6040	7/65	6.6		C	-	-	C
(A)	EMR 6050	2/66	9.0		C	-	-	C
(2/71)	EMR 6070	10/66	15.0		C	-	-	C
	EMR 6130	8/67	5.0		C	-	-	C
	EMR 6135	-	2.6		-	-	-	-
	EMR 6155	-	-		-	-	-	-
					Total: 107 E	12		Total: 15
General Automation, Inc.	SPC-12	1/68	-		-	-	1200	-
Anaheim, Calif.	SPC-16	5/70	-		-	-	400	-
(A) (4/72)	System 18/30	7/69	-		-	-	150	-
General Electric	GE-PAC 3010	5/70	2.0		5	0	5	22
West Lynn, Mass.	GE-PAC 4010	10/70	6.0		15	3	18	35
(Process Control Computers)	GE-PAC 4020	2/67	6.0		197	59	256	33
(A)	GE-PAC 4040	8/64	3.0		45	20	65	X
(4/72)	GE-PAC 4050	12/66	7.0		23	2	25	1
	GE-PAC 4060	6/65	2.0		18	2	20	X
Hewlett Packard	2114A, 2114B	10/68	0.25		-	-	1182	-
Cupertino, Calif.	2115A	11/67	0.41		-	-	333	-
(A) (8/71)	2116A, 2116B, 2116C	11/66	0.6		-	-	1171	-
Honeywell Information Systems	G58	5/70	1.0		-	-	-	-
Wellesley Hills, Mass.	G105A	6/69	1.3		-	-	-	-
(A) (2/71)	G105B	6/69	1.4		-	-	-	-
	G105RTS	7/69	1.2		-	-	-	-
	G115	4/66	2.2		200-400	420-680	620-1080	-
	G120	3/69	2.9		-	-	-	-
	G130	12/68	4.5		-	-	-	-
	G205	6/64	2.9		11	0	11	-
	G210	7/60	16.0		35	0	35	-
	G215	9/63	6.0		15	1	16	-
	G225	4/61	8.0		145	15	160	-
	G235	4/64	12.0		40-60	17	57-77	-
	G245	11/68	13.0		3	-	3	-
	G255 T/S	10/67	17.0		15-20	-	15-20	-
	G265 T/S	10/65	20.0		45-60	15-30	60-90	-
	G275 T/S	11/68	23.0		-	-	10	-
	G405	2/68	6.8		10-40	5	15-45	-
	G410 T/S	11/69	1.0		-	-	-	-
	G415	5/64	7.3		70-100	240-400	240-400	-
	G425	6/64	9.6		50-100	20-30	70-130	-
	G430 T/S	6/69	17.0		-	-	-	-
	G435	9/65	14.0		20	6	26	-
	G440 T/S	7/69	25.0		-	-	-	-
	G615	3/68	32.0		-	-	-	-
	G625	4/65	43.0		23	3	26	-
	G635	5/65	47.0		20-40	3	23-43	-
	G655	12/70	80.0		-	-	-	-
	H-110	868	2-7		180	7	255	0
	H-115	6/70	3.5		30	-	30	-
	H-120	1/66	4.8		800	160	960	-
	H-125	12/67	7.0		150	220	370	-
	H-200	3/64	7.5		800	275	1075	-
	H-400	12/61	10.5		46	40	86	X
	H-800	12/60	30.0		58	15	73	X
	H-1200	2/66	9.8		230	90	320	-
	H-1250	7/68	12.0		130	55	185	-
	H-1400	1/64	14.0		4	6	10	X
	H-1800	1/64	50.0		15	5	20	X
	H-2200	1/66	18.0		125	60	185	-
	H-3200	2/70	24.0		20	2	22	-
	H-4200	8/68	32.5		18	2	20	-
	H-8200	12/68	50.0		10	3	13	-
	DDP-24	5/63	2.65		-	-	90	X
	DDP-116	4/65	0.9		-	-	250	-
	DDP-124	3/66	2.2		-	-	250	-
	DDP-224	3/65	3.5		-	-	60	-
	DDP-316	6/69	0.6		-	-	450	-
	DDP-416	-	-		-	-	350	-
	DDP-516	9/66	1.2		-	-	900	-
	H112	10/69	-		-	-	75	-
	H632	12/68	3.2		-	-	12	-
	H1602	-	-		-	-	-	-
	H1642	-	-		-	-	-	-
	H1644	-	-		-	-	-	-

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
Honeywell (cont'd)	H1646	-	-	-	-	-	-
	H1648	11/68	12.0	-	-	20	-
	H1648A	-	-		-	-	-
IBM	305	12/57	3.6	40	15	55	-
White Plains, N.Y.	650	10/67	4.8	50	18	68	-
(N) (D)	1130	2/66	1.5	2580	1227	3807	-
(6/71)	1401	9/60	5.4	2210	1836	4046	-
	1401-G	5/64	2.3	420	450	870	-
Acknowledgment is given to	1401-H	6/67	1.3	180	140	320	-
G. M. Luhowy, GML Corp., Lexington, Mass., for help in estimating many of these figures.	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	415	148	563	-
	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	2	-
	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/Model 6	3/71	1.0	-	-	-	-
	System/3 Model 10	1/70	1.1	-	-	-	-
	System/7	11/71	0.35 and up	-	-	-	-
	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	2453	1524	3977	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	601	144	745	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	(S)	5	-	5	-
	360/190	-	-	13	2	15	-
	360/195	4/71	232.0	-	-	-	48
	370/135	5/72	14.4	-	-	-	-
	370/145	9/71	23.3	-	-	-	-
	370/155	2/71	48.0	-	-	-	-
	370/165	5/71	98.7	-	-	-	-
	370/195	6/73	190.0-270.0	-	-	-	-
Interdata	Model 1	12/70	3.7	150	50	200	50
Oceanport, N.J.	Model 3	5/67	-	N/A	-	200	X
(A) (10/71)	Model 4	8/68	8.5	260	115	375	40
	Model 5	11/70	10.5	70	20	90	10
	Model 15	1/69	20.0	40	24	64	X
	Model 16	5/71	14.7	1	5	6	12
	Model 18	6/71	24.7	2	6	8	8
	Model 70	10/71	6.8	0	0	0	60
Microdata Corp.	Micro 400	12/70	1.8-30	100	0	100	-
Santa Ana, Calif.	Micro 800	12/68	1.8-30	1340	400	1740	-
(A) (4/72)	Micro 1600	12/71	1.8-30	50	2	52	-
NCR	304	1/60	10.0	5	2	7	X
Dayton, Ohio	310	5/61	2.5	8	0	8	X
(A) (1/72)	315	5/62	7.0	425	300	725	-
	315 RMC	9/65	9.0	125	50	175	-
	390	5/61	0.8	250	375	625	-
	500	10/65	1.0	1000	1700	2700	-
	Century 50	2/71	1.6	200	-	200	-
	Century 100	9/68	2.6	1500	525	2025	-
	Century 200	6/69	7.0	460	215	765	-
	Century 300	2/72	20.0	0	0	0	-
Philco	1000	6/63	7.0	16	-	-	X
Willow Grove, Pa.	200-210,211	10/58	40.0	16	-	-	X
(N) (1/69)	2000-212	1/63	52.0	12	-	-	X
RCA (see UNIVAC - Series 70)							
Raytheon Data Systems Co.	250	12/60	1.2	115	20	135	X
Norwood, Mass.	440	3/64	3.6	20	-	20	X
(A)	520	10/65	3.2	26	1	27	X
(2/72)	703	10/67	12.5 (S)	175	31	206	0
	704	3/70	8.0 (S)	180	40	220	40
	706	5/69	19.0 (S)	67	14	81	2
Scientific Control Corp.	4700	4/69	1.8	18	0	18	-
Dallas, Texas	DCT-132	5/69	0.9	24	35	59	-
(A) (10/71)							
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) (2/72)	IC 7000	8/70	17.0	3	0	4	1
	IC-9000	5/71	400.0 (S)	1	0	1	-
Systems Engineering Laboratories	SYSTEMS 810B	9/68	2.6	156	7	163	(N)
Ft. Lauderdale, Fla.	SYSTEMS 72	9/71	1.0	12	3	15	(N)
(A)	SYSTEMS 85	7/72	6.0	-	-	-	(N)
(4/72)	SYSTEMS 86	6/70	10.0	23	1	24	(N)
UNIVAC Div. of Sperry Rand	I & II	3/51 & 11/57	25.0	23	-	-	X
New York, N.Y.	III	8/62	21.0	25	6	31	X
(A) (4/72)	File Computers	8/56	15.0	13	-	-	X
	Solid-State 80 I,II, 90, I, II, & Step	8/58	8.0	210	-	-	X
	418	6/63	11.0	80	39	119	23
	490 Series	12/61	30.9	70	14	90	35

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
UNIVAC Div. of Sperry Rand (cont'd)	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	35.0	9	0	9	X
	1107	10/62	57.0	8	3	11	X
	1108	9/65	68.0	103	129	232	58
	9200	6/67	1.5	1106	835	1941	725
	9300	9/67	3.4	412	62	474	510
	9400	5/69	7.0	82	41	123	83
	LARC	5/60	135.0	2	0	2	-
UNIVAC - Series 70 Blue Bell, Pa. (A) (1/1/72)	301	2/61	7.0	184	-	-	-
	501	6/59	14.0-18.0	16	-	-	-
	601	11/62	14.0-35.0	3	-	-	-
	3301	7/64	17.0-35.0	60	-	-	-
	Spectra 70/15, 25	9/65	4.3	17	-	-	-
	Spectra 70/35	1/67	9.2	112	-	-	-
	Spectra 70/45	11/65	22.5	330	-	-	-
	Spectra 70/46	-	33.5	30	-	-	-
	Spectra 70/55	11/66	34.0	13	-	-	-
	Spectra 70/60	11/70	32.0	12	-	-	-
	Spectra 70/61	4/70	42.0	9	-	-	-
	70/2	5/71	16.0	51	-	-	-
	70/3	9/71	25.0	3	-	-	-
	70/6	9/71	25.0	11	-	-	-
	70/7	12/71	35.0	1	-	-	-
Varian Data Machines Newport Beach, Calif. (A) (4/72)	620	11/65	-	-	-	75	X
	620i	6/67	-	-	-	1300	X
	R-260i	4/69	-	-	-	80	-
	520/DC, 520i	12/69;10/68	-	-	-	350	-
	620/f	11/70	-	-	-	150	-
	620/L	4/71	-	-	-	330	-
	620/f-100	-	-	-	-	-	1
	620/L-100	-	-	-	-	-	5
Xerox Data Systems El Segundo, Calif. (N) (2/72)	XDS-92	4/65	1.5	10-6-	2	12-62	-
	XDS-910	8/62	2.0	150-170	7-10	157-180	-
	XDS-920	9/62	2.9	93-120	5-12	98-132	-
	XDS-925	12/64	3.0	20	1	21	-
	XDS-930	6/64	3.4	159	14	173	-
	XDS-940	4/66	14.0	28-35	0	28-35	-
	XDS-9300	11/64	8.5	21-25	1	22-26	-
	Sigma 2	12/66	1.8	60-110	10-15	70-125	-
	Sigma 3	12/69	2.0	10	0	10	-
	Sigma 5	8/67	6.0	15-40	6-18	21-58	-
	Sigma 6	6/70	12.0	-	-	-	-
	Sigma 7	12/66	12.0	24-35	5-9	29-44	-
	Sigma 9	-	35.0	-	-	-	-

c.a

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:

Andrew M. Langer
Newton High School
Newton, Mass.

NUMBLE 725

```
  N A U G H T
        x I S          SH = RG
  ---------------
  E N I H A I
D T T H I U
---------------
G N I N N N I     19897  41531  697
```

Solution to Numble 724

In Numble 724 in the April issue, the digits 0 through 9 are represented by letters as follows:

D = 0	L = 5
O, U = 1	K = 6
I = 2	H = 7
T = 3	F, C = 8
S = 4	E = 9

The message is: Luck is the idol of the idle.

Our thanks to the following individuals for submitting their solutions — **to Numble 723:** Ed Balke, Bellwood, Ill.; A. Sanford Brown, El Paso, Texas; (Mrs.) Barbara Cutler, Evanston, Ill.; Howard B. Wilson, Richmond, Va.; and David P. Zerbe, Reading, Pa. — **to Numble 714:** Jean Zawisza, Orleans, France.

Assassination articles — *Continued from page 7*

April 1971

32 THE RIGHT OF EQUAL ACCESS TO GOVERNMENT INFORMATION
by the National Committee to Investigate Assassinations, Washington, D.C.

May 1971

27 THE ASSASSINATION OF PRESIDENT KENNEDY: The Spatial Chart of Events in Dealey Plaza
by Robert B. Cutler, Architect
The chart, first published in May 1970, is revised and brought up to date.

June 1971

41 THE CASE OF SECRET SERVICE AGENT ABRAHAM W. BOLDEN
by Bernard Fensterwald, Attorney, Executive Director, National Committee to Investigate Assassinations
Bolden wanted to tell the Warren Commission about a Chicago plot to kill President Kennedy, and was jailed six years on a framed-up charge for trying to do so.

July 1971

51 THE CENTRAL INTELLIGENCE AGENCY AND THE NEW YORK TIMES
by Samuel F. Thurston, President, Responsive Information Systems, Newton, Mass.
The issue of systematic suppression of questions about the assassination of President John F. Kennedy, and a hypothesis.

August 1971

37 JIM GARRISON, DISTRICT ATTORNEY, ORLEANS PARISH, VS. THE FEDERAL GOVERNMENT
by Bernard Fensterwald, Attorney, Executive Director, National Committee to Investigate Assassinations
How District Attorney Jim Garrison of New Orleans became interested in the New Orleans phase of the assassination of President Kennedy; and how the Federal government frustrated and blocked his investigation in more than a dozen ways.

September 1971

26 THE FEDERAL BUREAU OF INVESTIGATION AND THE ASSASSINATION OF PRESIDENT KENNEDY
by Bernard Fensterwald, Attorney
How J. Edgar Hoover and the FBI withheld much pertinent information from the Warren Commission, flooded them with irrelevant information, and altered some important evidence, thus concealing Oswald's connections with the FBI.

October 1971

41 THE ASSASSINATION OF PRESIDENT KENNEDY — DECLASSIFICATION OF RELEVANT DOCUMENTS FROM THE NATIONAL ARCHIVES
by Richard E. Sprague
The titles of the documents and other evidence indicate convincingly that Lee Harvey Oswald was trained in spy work by the CIA before his visit to Russia; etc. Like the Pentagon Papers, these documents should be declassified.

November 1971

24 THE ASSASSINATION OF PRESIDENT KENNEDY: THE PATTERN OF COUP D'ETAT AND PUBLIC DECEPTION
by Edmund C. Berkeley, Editor, "Computers and Automation"
Five significant, eye-opening events from May 1970 to October 1971, showing patterns of coup d'etat, assassination, and concealment; and some predictions.

December 1971

32 THE ASSASSINATION OF PRESIDENT JOHN F. KENNEDY: A MODEL FOR EXPLANATION
by Vincent J. Salandria, Attorney, Philadelphia, Pa.
A study of the reasons why a great deal of the Federal government's own evidence in the assassination of President John F. Kennedy declared "conspiracy" — and a hypothesis, supported by considerable evidence, about why the President was assassinated and how the implications of that action were to be signaled to those who could read the signals.

January 1972

57 SPOTLIGHT ON McGEORGE BUNDY AND THE WHITE HOUSE SITUATION ROOM
by Robert B. Cutler, Manchester, Mass.
An argument that the "lone assassin — no conspiracy" announcement from the White House Situation Room could have resulted from information available in Dallas and Washington prior to the announcement — and thus does not actually demonstrate that someone there had a guilty foreknowledge of the shooting.

February 1972

43 WHO SHOT PRESIDENT KENNEDY? — OR FACT AND FABLE IN HISTORY
by Gareth Jenkins, Weston, Mass.
How the physical evidence actually published by the Warren Commission relating to the assassination of President John F. Kennedy shows conclusively that more than one man was responsible for the shooting — contrary to the Commission's own report.

March 1972

28 DALLAS: WHO, HOW, WHY?
by Mikhail Sagatelyan, Moscow, USSR
A report published in Leningrad, USSR, by an ace Soviet reporter about the circumstances of the assassination of President John F. Kennedy, and their significance from a Soviet point of view: Part I.

April 1972

37 DALLAS: WHO, HOW, WHY? — Part II
Continuation

May 1972

34 DALLAS: WHO, HOW, WHY? — Part III
Continuation

CALENDAR OF COMING EVENTS

May 15-18, 1972: Spring Joint Computer Conference, Convention Ctr., Atlantic City, N.J. / contact: AFIPS Headquarters, 210 Summit Ave., Montvale, N.J. 07645

May 16-17, 1972: IIT Research Institute Second International Symposium on Industrial Robots, Chicago, Ill. / contact: K. G. Johnson, Symposium Chairman, IIT Research Institute, 10 West 35 St., Chicago, Ill. 60616

May 21-24, 1972: 7th Annual Mass Retailers' Convention and Product Exposition, Marriott Motor Hotel, Atlanta, Ga. / contact: MRI Headquarters, 570 Seventh Ave., New York, N. Y. 10018

May 21-24, 1972: 1972 International Systems Meeting, Fontainebleau Hotel, Miami Beach, Fla. / contact: R. B. McCaffrey, Assoc. for Systems Management, 24587 Bagley Rd., Cleveland, Ohio 44138

May 23-25, 1972: Annual Society for Information Display International Symposium, Jack Tar Hotel, San Francisco, Calif. / contact: Mr. J. L. Simonds, Eastman Kodak Co., Rochester, N.Y. 14650

May 24-26, 1972: Second Annual Regulatory Information Systems Conference, Chase-Park Plaza Hotel, St. Louis, Mo. / contact: William R. Clark, Missouri Public Service Commission, Jefferson City, Mo. 65101

June 5-9, 1972: International Switching Symposium, Massachusetts Institute of Technology, Cambridge, Mass. / contact: International Switching Symposium, Conference Secretariat, P.O. Box 188, Waltham, Mass. 02154

June 12-14, 1972: Conference on Computers in the Undergraduate Curricula, Sheraton-Biltmore Hotel and Georgia Institute of Technology, Atlanta, Ga. / contact: Computer Sciences Project, Southern Regional Education Board, 130 Sixth St, N.W., Atlanta, Ga. 30313

June 12-14, 1972: International Conference on Communications, Sheraton Hotel, Philadelphia, Pa. / contact: Stanley Zebrowitz, Philco-Ford Corp., 4700 Wissahickon Ave., Philadelphia, Pa. 19144

June 12-14, 1972: Third International Congress on Advances in Automated Analysis, New York Hilton Hotel, New York, N.Y. / contact: Dept. R 39, Technicon Instruments Corp., Tarrytown, N.Y. 10591

June 15-16, 1972: ACM SIG/CPR Tenth Annual Conference on Computer Personnel Research, Ontario Institute for Studies in Education, Univ. of Toronto, Toronto, Canada / contact: SIGCPR, c/o ACM, 1133 Ave. of the Americas, New York, N.Y. 10036

June 19-21, 1972: International Symposium on Fault-Tolerant Computing, Boston, Mass. / contact: John Kirkley, IEEE Computer Society, 8949 Reseda Blvd., Suite 202, Northridge, Calif. 91324

June 19-21, 1972: Ninth Annual Design Automation Workshop, Statler Hilton Hotel, Dallas, Tex. / contact: R. B. Hitchcock, IBM Watson Research Center, P.O. Box 218, Yorktown Heights, N.Y. 10598

June 19-24, 1972: COMPCONTROL '72, Sopron, Hungary / contact: Scientific Society of Mechanical Engineers, POB 451, Budapest 5, Hungary

June 22-25, 1972: Society of Women Engineers 1972 Convention, Sheraton Commander Hotel, Cambridge, Mass. / contact: Mrs. Amy C. Spear, RCA, Aerospace Systems Div., Burlington, Mass. 01803

June 26-27, 1972: First Annual Government Data Systems Conference, New York City, N.Y. / contact: William A. Kulok, New York Univ., Div. of Business and Management, Suite 2G, 1 Fifth Ave., New York, N.Y. 10003

June 27-30, 1972: DPMA 1972 International Data Processing Conference & Business Exposition, New York Hilton at Rockefeller Center, New York, N.Y. / contact: Richard H. Torp, (conference director), or Thomas W. Waters (exposition manager), Data Processing Management Association, 505 Busse Hwy., Park Ridge, Ill. 60068

July 3-6, 1972: First Conference on Management Science and Computer Applications in Developing Countries, Cairo Hilton, Cairo, U.A.R. / contact: Dr. Mostafa El Agizy or Dr. William H. Evers, IBM Corporation, Armonk, N.Y. 10504

Aug. 6-12, 1972: Rio Symposium on Computer Education for Developing Countries, Rio de Janeiro, Brazil / contact: Luiz de Castro Martins, C.P. 38015 - ZC-20, Rio de Janeiro — GB Brazil

Aug. 7-11, 1972: SHARE Meeting, Toronto, Canada / contact: D. M. Smith, SHARE, Inc., Suite 750, 25 Broadway, New York, N.Y.

Sept. 19-22, 1972: Western Electronic Show & Convention (WESCON), Los Angeles Convention Ctr., Los Angeles, Calif. / contact: WESCON, 3600 Wilshire Blvd., Los Angeles, Calif. 90005

Oct. 3-5, 1972: AFIPS and IPSJ USA-Japan Computer Conference, Tokyo, Japan / contact: Robert B. Steel, Informatics Inc., 21050 Vanowen St., Canoga Park, Calif. 91303

Oct. 8-11, 1972: International Conference on Systems, Man and Cybernetics, Shoreham Hotel, Washington, D.C. / contact: K. S. Nurendra, Yale Univ., 10 Hill House, New Haven, Conn. 06520

Oct. 16-20, 1972: IBI-ICC World Conference on Informatics in Government, Venice, Italy / contact: Intergovernmental Bureau for Informatics (IBI-ICC), 23 Viale Cività del Lavoro, 00144 Rome, Italy

Nov. 1-3, 1972: Northeast Electronics Research & Engineering Meeting (NEREM), Boston, Mass. / contact: IEEE Boston Office, 31 Channing St., Newton, Mass. 02158

Nov. 9-10, 1972: Canadian Symposium on Communications, Queen Elizabeth Hotel, Montreal, Quebec, Canada / contact: IEEE Headquarters, Technical Conference Svcs., 345 E. 47th St., New York, N.Y. 10017

Nov. 15-17, 1972: Danish IAG-IFIP International Conference on Data Service Centres, Copenhagen, Denmark / contact: Danish IAG (DIAG), c/o Danish EDP-Council, 58 Bredgade, DK 1260 Copenhagen K, Denmark

December 5-7, 1972: Fall Joint Computer Conference, Anaheim Convention Center, Anaheim, Calif. / contact AFIPS Headquarters, 210 Summit Ave., Montvale, N.J. 07645

Jan. 17-19, 1973: 1973 Winter Simulation Conference, San Francisco, Calif. / contact: Robert D. Dickey, Bank of California, 400 California St., San Francisco, Calif. 94120

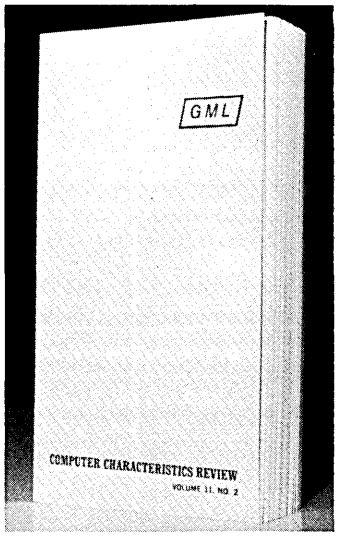
Mar. 4-9, 1973: SHARE Meeting, Denver, Colo. / Contact: D.M. Smith, SHARE, Inc., Suite 750, 25 Broadway, New York, N.Y.

April 10-12, 1973: Datafair 73, Nottingham University, Nottingham, England / contact: John Fowler & Partners Ltd., 6-8 Emerald St., London, WC1N 3QA, England

April 10-13, 1973 PROLAMAT '73, Second International Conference on Programming Languages for Numerically Controlled Machine Tools, Budapest, Hungary / contact: IFIP Prolamat, '73, P.O. Box 63, Budapest 112, Hungary

July 9-12, 1973: IFAC/IFORS International Conference on Dynamic Modelling and Control of National Economies, University of Warwick, Coventry, England / contact: Dr. P. C. Parks, Control Theory Centre, University of Warwick, Coventry CV4 7AL, England

A Quick, Easy, Fingertip Reference



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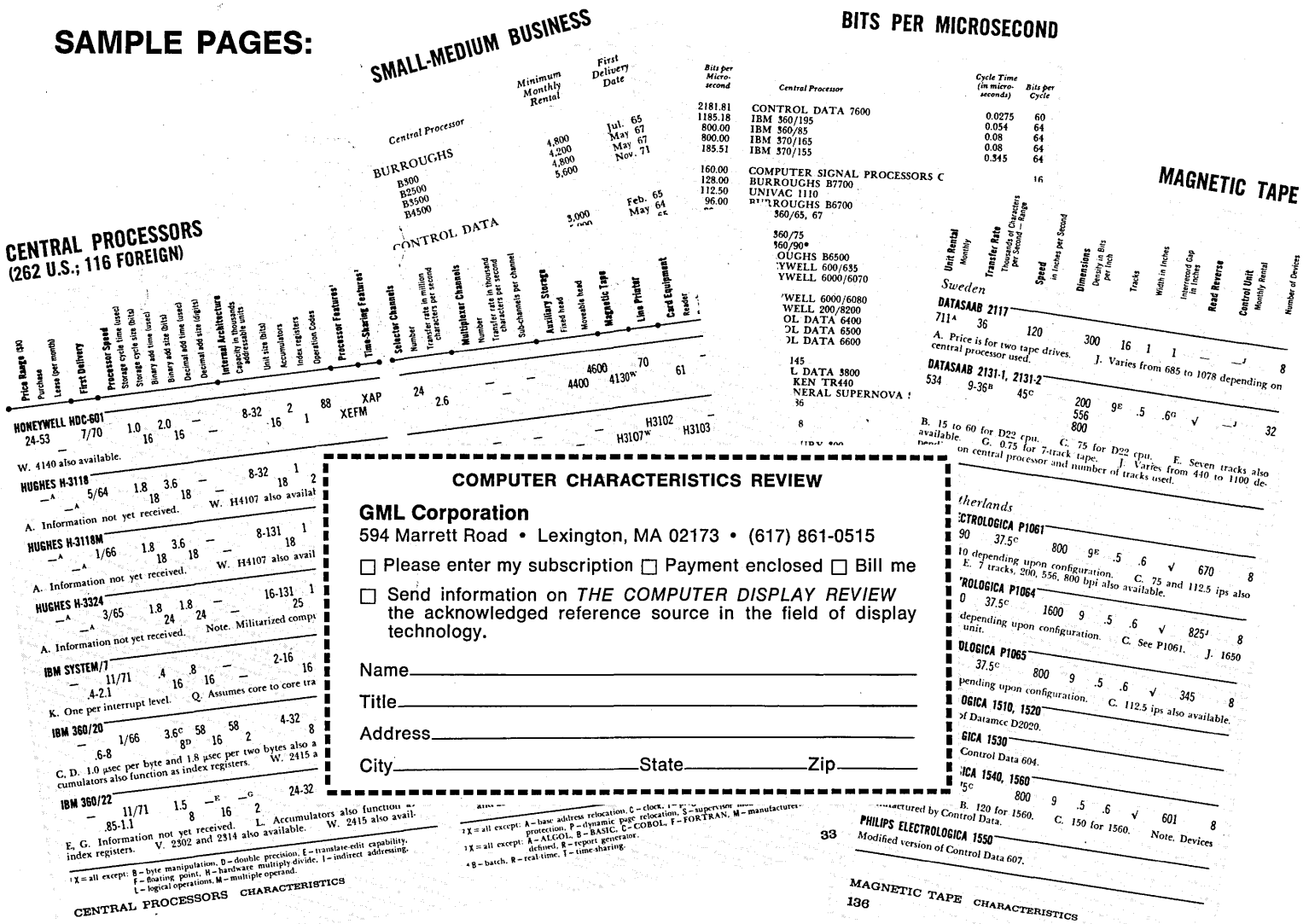

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