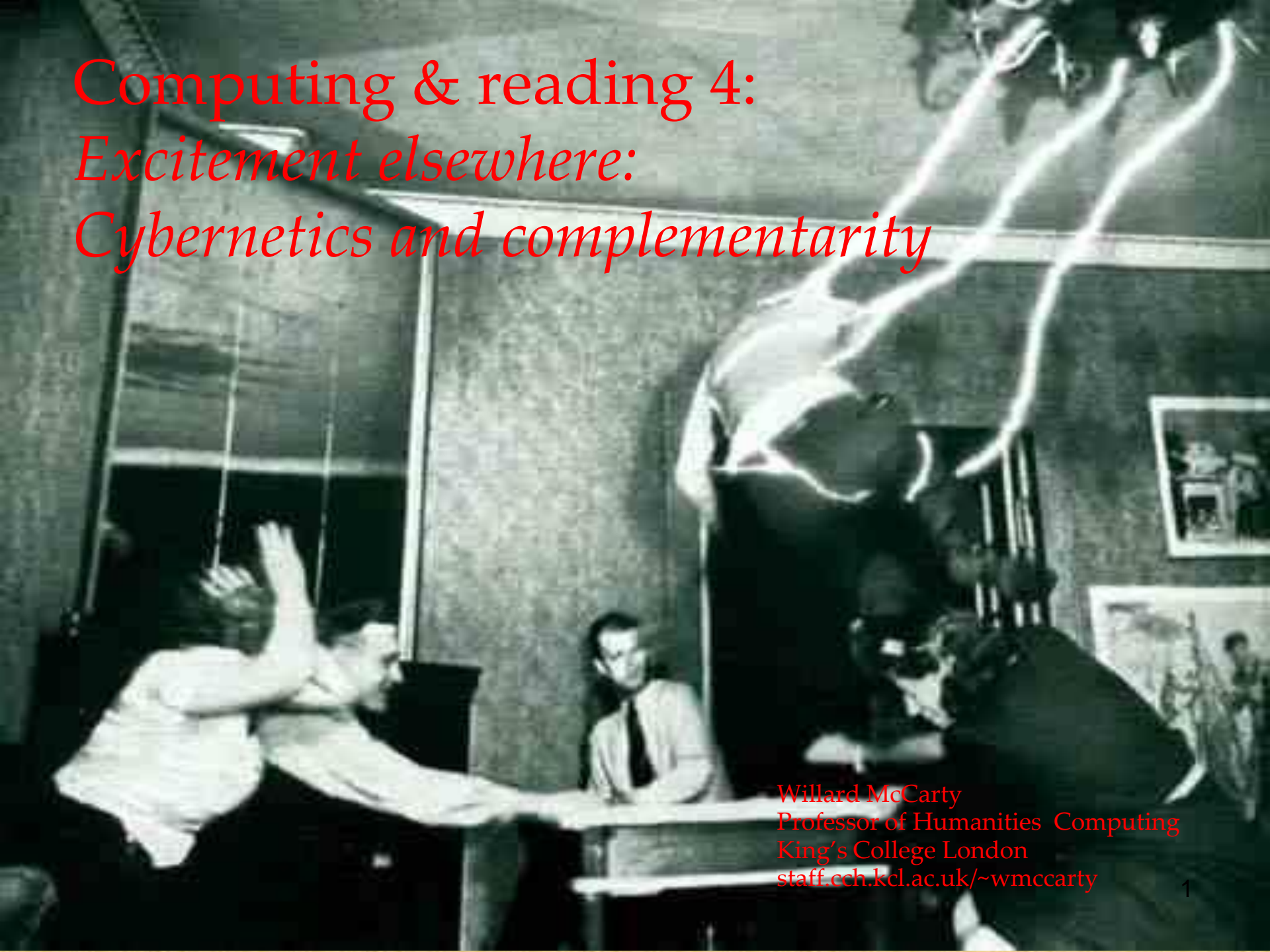


Computing & reading 4:
*Excitement elsewhere:
Cybernetics and complementarity*



Willard McCarty
Professor of Humanities Computing
King's College London
staff.cch.kcl.ac.uk/~wmccarty

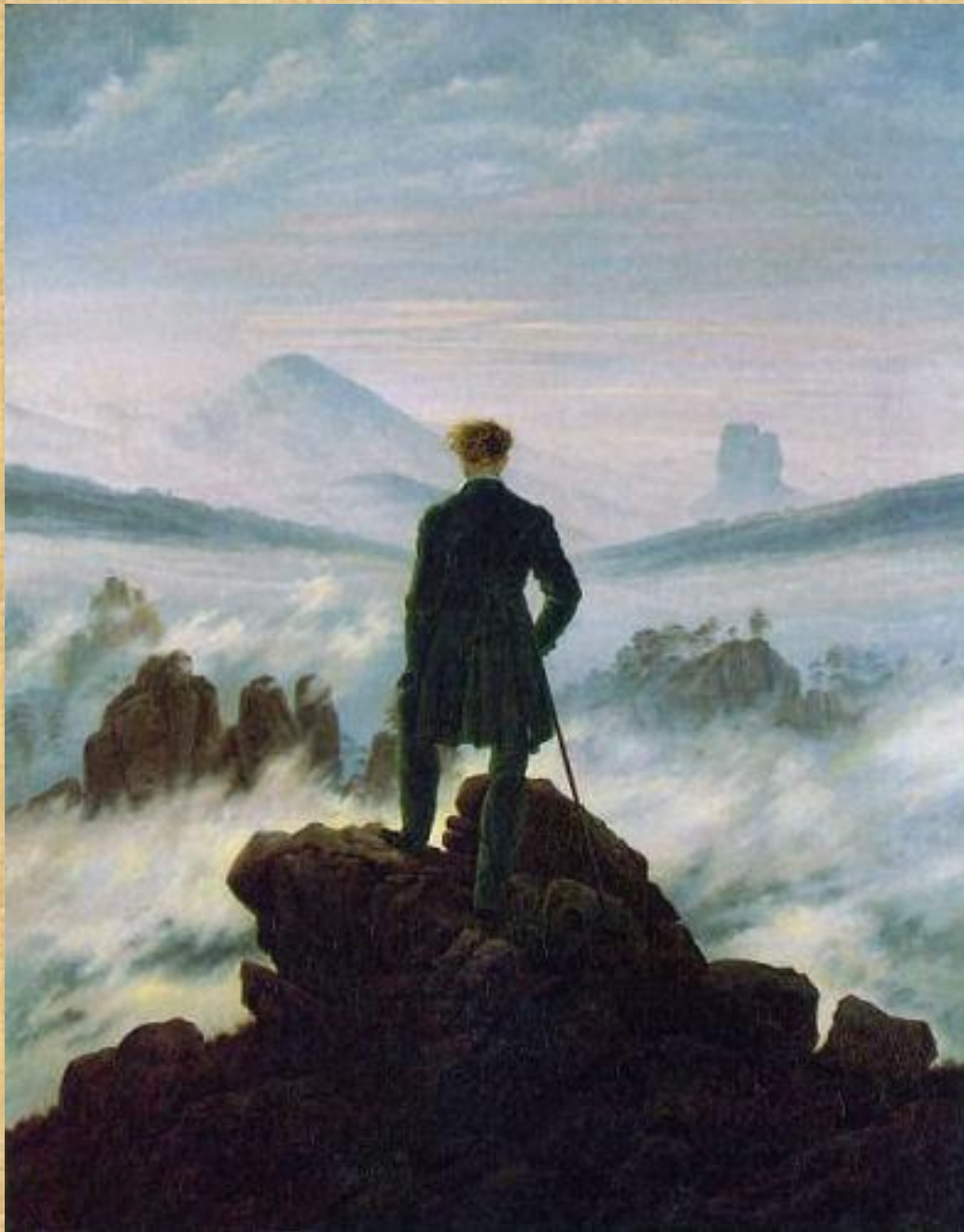


FIGURE 1.
Caspar David Friedrich,
*Wanderer über dem
Nebelmeer* (*Wanderer
above a sea of fog*, 1818)

Home News

AN ELECTRONIC BRAIN

SOLVING ABSTRUSE PROBLEMS

VALVES WITH A MEMORY

Admiral Lord Mountbatten of Burma, as president of the British Institution of Radio Engineers, paid warm tribute to the recent developments in radio and associated techniques at the twenty-first anniversary dinner of the institution, held at the Savoy Hotel last night. He announced that the King had intimated his readiness to become a patron of the institution.

During the war, the PRESIDENT said, a wonderful opportunity for closing the gap between scientific theory and practical application came to scientists in every field, and it would be impossible to over-estimate the part they played in bringing about victory. Great

SUSPICION BETWEEN NATIONS

MR. CHURCHILL ON FACTS AS REMEDY

Mr. Winston Churchill, unable to find an early date on which to go to Birmingham to receive the Freedom of that city, had it presented to him yesterday at his home in Hyde Park Gate, W.

The Lord Mayor of Birmingham, ALDERMAN A. J. GILES, with Mr. Churchill on his right and Mrs. Churchill on his left, presented the scroll of honour in a silver casket of exquisite workmanship, and said the city of Birmingham wished to confer on Mr. Churchill the highest honour possible as a mark of his unflinching leadership and outstanding courage during the war.

Mr. CHURCHILL recalled the associations of his father with Birmingham and said that he himself made his entry into the political scene when he was made president of Birmingham Conservative Club in 1899. He had participated in many famous meetings since then in the city.

It was, he continued, always possible when great achievements had been made that they were found less sweet and gratifying in the realization than they were while they were being struggled for. Though he did not consider that our dangers were past—and every one could see for himself that our troubles had by no means entirely fallen away—all Britons must move forward with confidence

POL

STRONG

Polling will be held in municipal elections in England and most of the country to-night. In no election will more councillors be elected for three years than in the third of the year.

In the municipal elections to be held since the war were sweeping changes, this year the results will not only to increase them.

An analysis of the principal boroughs shows the following: Conservatives, 1,191; Liberals, 1,191; Independents, 1,191; Labour, 44; and unopposed, 44. The results of the elections will be tested soon.



FIGURE 3. IBM SSEC ("Poppa") and console as seen from the entrance to and through the front window of IBM World Headquarters, Madison Avenue, New York, 1948-1952



GIANT BRAINS

OR

MACHINES THAT THINK

EDMUND CALLIS BERKELEY

Consultant in Modern Technology
President, E. C. Berkeley and Associates

JOHN WILEY & SONS, INC., NEW YORK
CHAPMAN & HALL, LIMITED, LONDON

FIGURE 4. 1946

PREFACE

The Subject, Purpose, and Method of this Book

The subject of this book is a type of machine that comes closer to being a brain that thinks than any machine ever did before 1940. These new machines are called sometimes mechanical brains and sometimes sequence-controlled calculators and sometimes by other names. Essentially, though, they are machines that can handle information with great skill and great speed. And that power is very similar to the power of a brain.

These new machines are important. They do the work of hundreds of human beings for the wages of a dozen. They are powerful instruments for obtaining new knowledge. They apply in science, business, government, and other activities. They apply in reasoning and computing, and, the harder the problem, the more useful they are. Along with the release of atomic energy, they are one of the great achievements of the present century. No one can afford to be unaware of their significance.

In this book I have sought to tell a part of the story of these new machines that think. Perhaps you, as you start this book, may not agree with me that a machine can think: the first chapter of this book is devoted to the discussion of this question.

My purpose has been to tell enough about these machines so that we can see in general how they work. I have sought to explain some giant brains that have been built and to show how they do thinking operations. I have sought also to talk about what these machines can do in the future and to judge their significance for us. It seems to me that they will take a load off men's minds as great as the load that printing took off men's writing: a tremendous burden lifted.

We need to examine several of the new mechanical brains: Massachusetts Institute of Technology's differential analyzer, Harvard's IBM automatic sequence-controlled calculator, Moore School's ENIAC (Electronic Numerical Integrator and Calcu-

TWENTY CENTS

JANUARY 23, 1950

TIME

THE WEEKLY NEWSMAGAZINE



MARK III
Can man build a superman?

FIGURE 5.
Cover of *Time Magazine*, 23 January 1950, "Mark III. Can man build a superman?", from a drawing by Boris Artzybasheff

JULY 14 1952

CHANGES

ENGLAND

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ES FOR

COMAN

BUMPER FRUIT CROP

HOME GROWERS AND IMPORTS POLICY

FROM OUR AGRICULTURAL CORRESPONDENT

Yields of most kinds of soft fruit have been good this season. Strawberries have done well and the weight and quality of blackcurrants and raspberries are exceptionally good. Cherries were a heavy crop and glasshouse tomatoes have been plentiful. Unfortunately for growers, hot weather has brought everything to maturity at the same time and market conditions have been far from satisfactory. The plum crop, with the branches weighed down with fruit, presents the next problem, of which much more will be heard in the next few weeks.

Commercial growers complain of imports of soft fruit, tomatoes, and new potatoes. They feel that supplies from the Continent should be drastically reduced in a season when there are good crops at home and the country is in difficulties over foreign exchange. Imports of most kinds of fruit and vegetables are due to be much reduced this year under the quota licensing system in order to save unnecessary expenditure abroad.

The President of the Board of Trade and

MENTALITY IN MACHINES

THE PHILOSOPHICAL VIEWPOINT

FROM OUR SPECIAL CORRESPONDENT

BIRMINGHAM, JULY 13

British philosophers, with a few visitors from Europe, the Commonwealth, and the United States, have been discussing this week-end a variety of problems in the architecturally curious university building at Edgbaston. They were meeting for a joint session of the Mind Association and the Aristotelian Society.

PROFESSOR A. DUNCAN-JONES, in his presidential address, was concerned with the puzzle that ethical statements in some ways resemble assertions that can be true or false and in others resemble commands. If the latter resemblance is the more important it is tempting to say that moral judgments and attitudes are matters of taste. If this were true, then ethical disagreement would be impossible.

Professor G. E. Moore used to think that any theory which entailed such a conclusion was plainly absurd. Philosophers to-day are not quite so sure, and some of them, as Professor Duncan-Jones remarked, think "the liquidation of moral philosophy as traditionally conceived a feat of intellectual and emotional emancipation." He added, however, that moral philosophers disagree without malice, and he hoped that patient analysis of

L.C.C. TE

QUO

"NO RELAT REQUIRE

A report by the general committee, to be submitted to the L.C.C. education committee on Wednesday, states that existing teachers have to be redeployed to teaching staff for London.

About 100 teachers in 120 in secondary schools authorized staff, have been against the impending staff cuts as services are being retained in educational year.

The report says that in the County of London for the year 1952-53 will be children of five years of age in the extra numbers. Teachers will be needed to teach a class of about 30 of them should be women of young children. The report, issued by the Ministry of Education, is still in force, the report states that the quota for 1952-53 bears the council's need. The staff are limited mainly to colleges and university teachers.

FIGURE 6. *Times*, 14 July 1952



ADA AUGUSTA
The Countess of Lovelace

Frontispiece

FIGURE 7. 1953

FASTER THAN THOUGHT

A SYMPOSIUM ON
DIGITAL COMPUTING MACHINES

EDITED BY
B. V. BOWDEN
M.A., Ph.D. (Cantab.)

With a Foreword by
THE RIGHT HON. THE EARL OF HALSBURY
Managing Director of the National Research Development Corporation



LONDON
SIR ISAAC PITMAN & SONS LTD.

GENIACS:

SIMPLE ELECTRIC BRAIN MACHINES, AND HOW TO MAKE THEM

Also:

Manual for Geniac Electric Brain Construction Kit No. 1

COPYRIGHTED 1955 by OLIVER GARFIELD

FIGURE 8.
GENIACS manual, with adverts

Introduction

In 1944 the first "electric brain", an automatic machine for reasoning and calculating, began to work. In the years since then, more and more people have studied and built machines that handle information in reasonable ways, machines that "think" or at least seem to think. Thousands of such machines have now been made. This development is becoming so important that it is often called the Second Industrial Revolution.

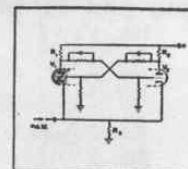
Since 1945 there has been interest in helping people understand these machines and how they behave. And we know that equipment that you can take into your own hands, play with, and do exciting things with, will often teach you more, and give you more fun besides, than any quantity of words and pictures.

In 1950, for educational purposes, a miniature electric brain called Simon was constructed. Although only $1\frac{1}{4}$ cubic feet in size, and limited in capacity, it was a complete automatic

LEARN HOW TO BUILD COMPUTERS!

DIGITAL COMPUTER COURSE

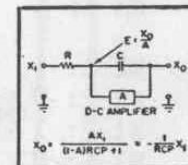
Have you ever wanted to build a small digital computing device? One that reproduces in miniature what computers like ENIAC, SEAC, BIZMAC, etc., do on a large scale? Our DIGITAL COMPUTER course shows how to set up and build computers and experiment with pulses, storage, gates, flip flops, adding, subtracting, multiplying and applications of Boolean Algebra to circuit design. You get an introduction to programming. More important, you learn how and where to buy computer parts to build your own computers. Manuals, wiring diagrams and texts provide a complete introduction to theory and practice of DIGITAL COMPUTERS clearly explained. We have a complete question answering service. This is the finest and only DIGITAL COMPUTER course on the market. C2- **\$28.00**



A modulo 2 counter. More commonly a flip-flop arrangement of 2 triodes. This is the main elementary component from which counters and accumulators are assembled.

ANALOG COMPUTER COURSE

ANALOG COMPUTERS are widely used in engineering and scientific research to duplicate actual physical conditions and to integrate and differentiate directly. Our ANALOG COMPUTERS course lists sources of materials, parts, theory and practical instructions, plus wiring diagrams and schematics for adding, multiplying, integrating and differentiating specific experiments, give practice in calculating scale factors, choice of time scales, machine equation and block diagrams, phase inverting amplifiers, use of parallel inputs, solution of simple differential equation. We show you how you can build computers at home. Texts discuss theory and design of computer elements, network and operational amplifiers, multiplication and function generation. This is your best and only comprehensive introduction to ANALOG COMPUTERS. Each course is a complete introduction to the subject with all necessary instructional material and parts. Course, Manuals. C3- **\$28.00**



Block diagram for a simple integrating circuit.

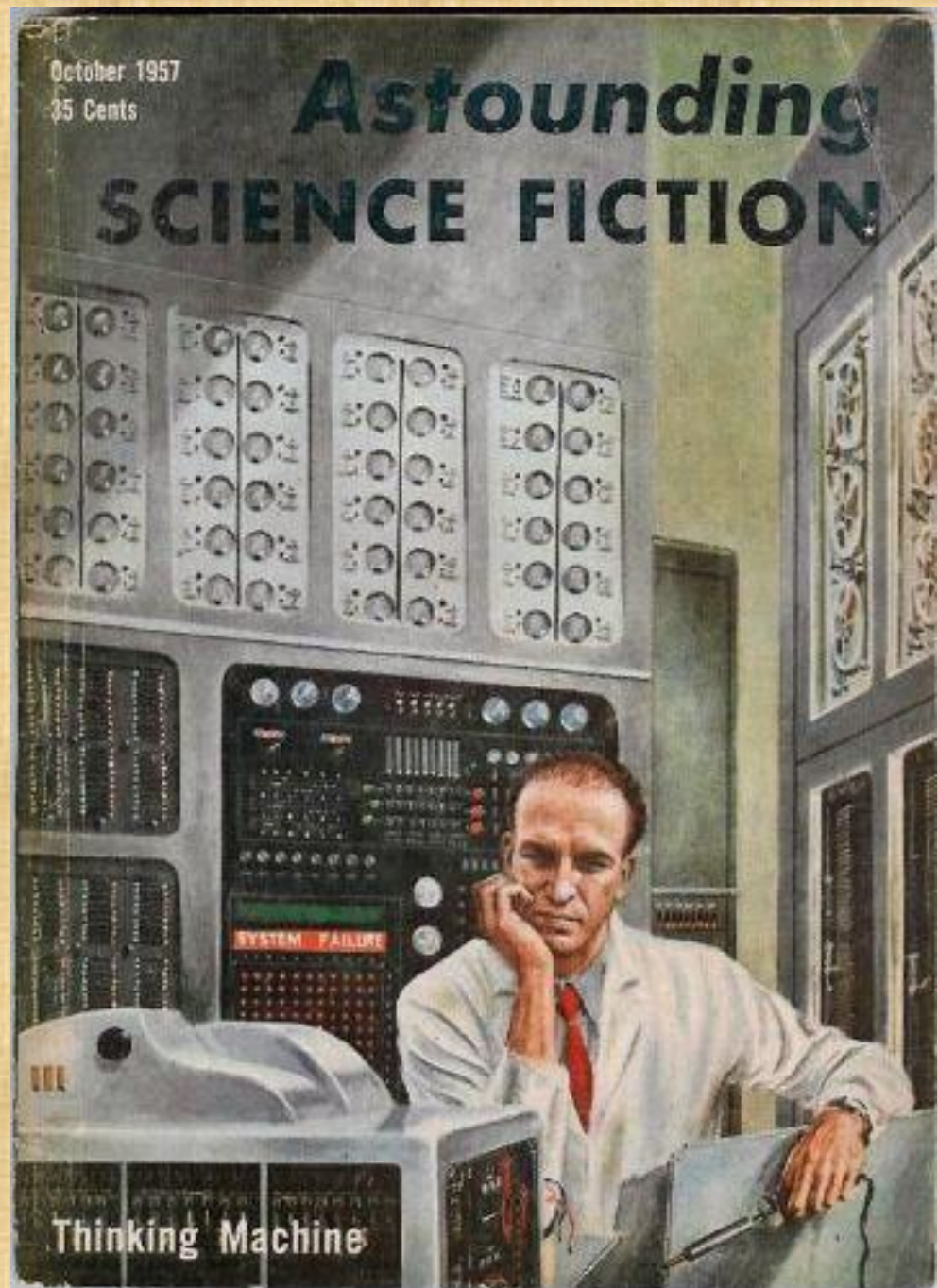
RADAR

Theoretical (Part 1) and practical (Part

ROBOTS

Construction and maintenance: DEVEL-

FIGURE 9. Cover of
Astounding Science Fiction,
October 1959



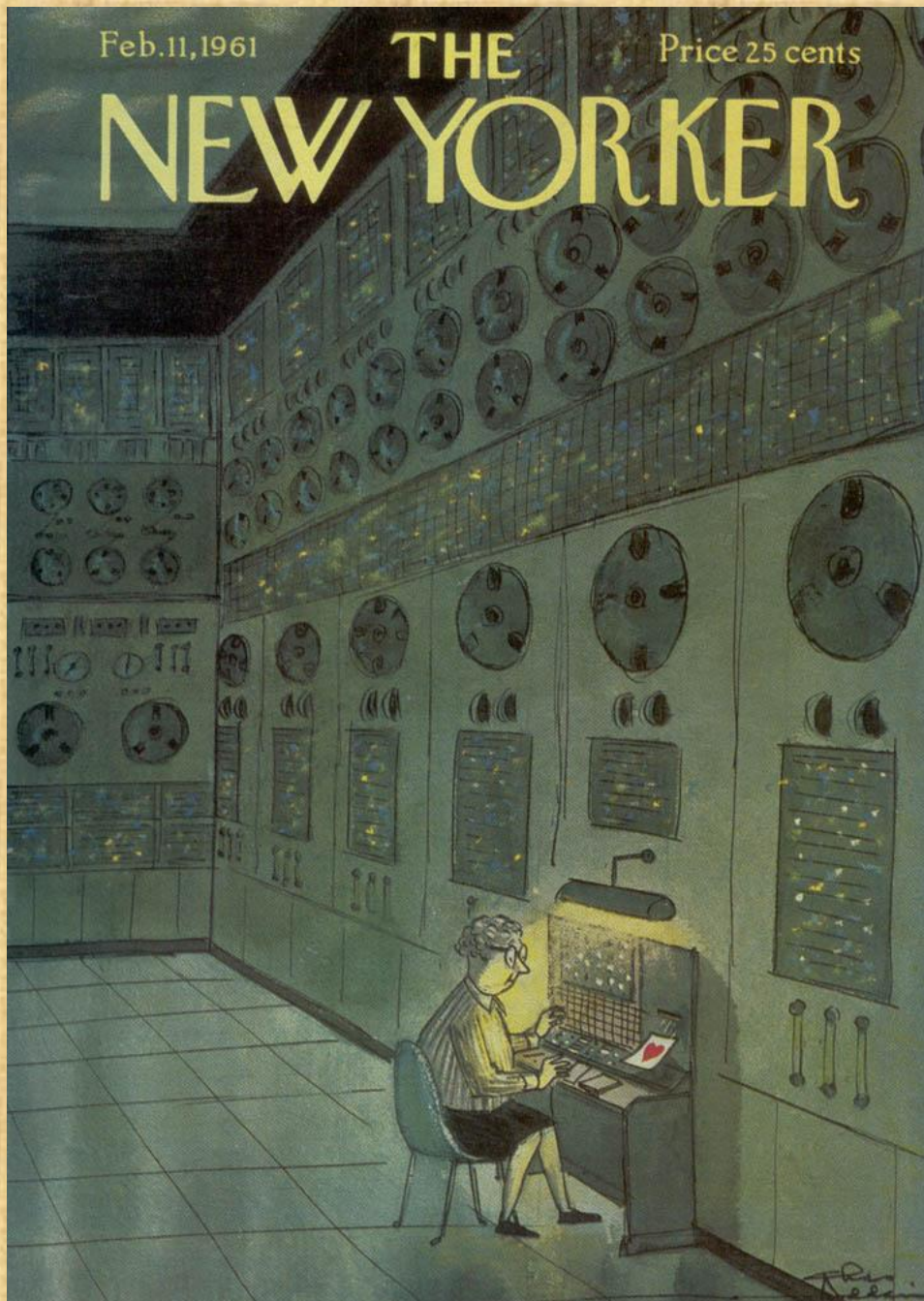


FIGURE 10.
Cover of *The New Yorker* for
Valentine's Day 1961.

CONTENTS

	<i>Page</i>
Introduction	4
Research and the Library of the Future: <i>D. J. Foskett</i> ..	10
Mechanization in Lexicography: <i>R. A. Wisbey</i>	15
Electronic Storage and Searching: <i>Ralph Shaw</i>	19
The Kinds of Machine now in Use: <i>Andrew D. Booth</i> ..	24
The Future of Machine Translation: <i>Yehoshua Bar-Hillel</i>	32
The Intellect's New Eye: <i>Margaret Masterman</i>	38
Poetry, Prose and the Machine	45
Selected Letters from Correspondents:—	
<i>J. G. Fraser</i>	50
<i>Roy Cole</i>	50
<i>R. M. Needham</i>	51
<i>K. Spärck Jones and T. R. McKinnon Wood</i>	52
<i>A. P. Van Teslaar</i>	57
<i>Margaret Masterman</i>	60
<i>J. S. L. Gilmour and S. M. Walters</i>	61
<i>Y. Bar-Hillel</i>	63
<i>Roger Needham</i>	64
Conclusions	65

THE TIMES PUBLISHING COMPANY LIMITED
PRINTING HOUSE SQUARE
EC4

FIGURE 11. *Freeing the Mind* (1962)

D 029 FRE

freeing the mind

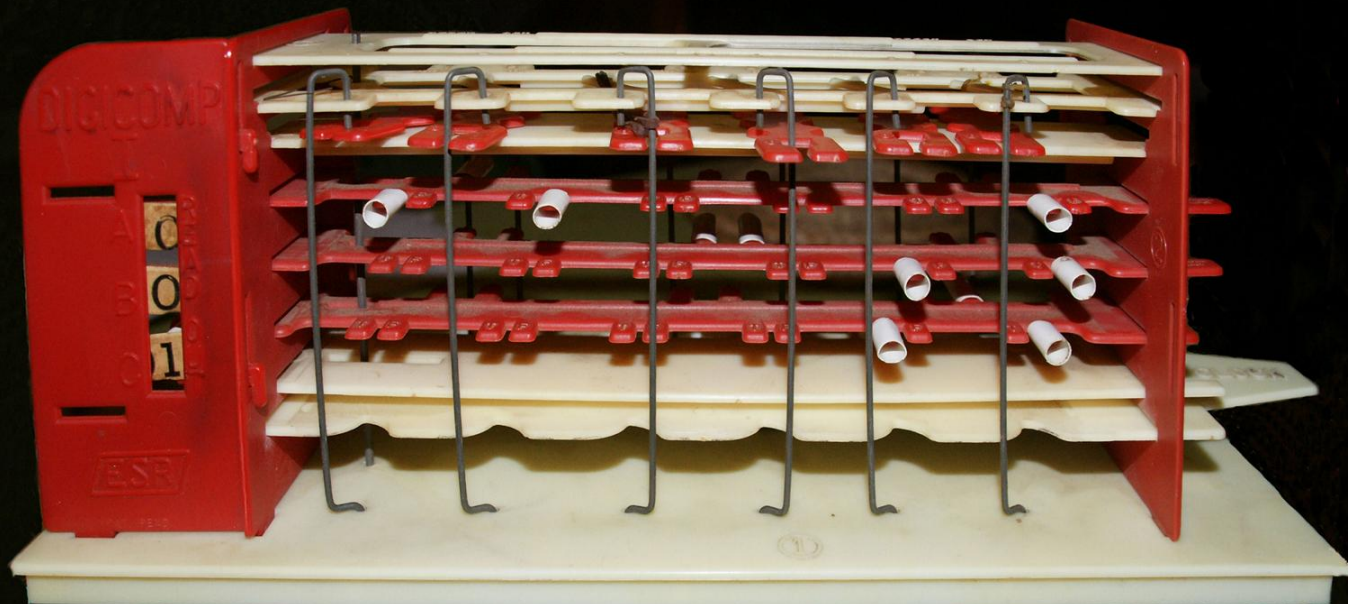


THE TIMES LITERARY SUPPLEMENT

ARTICLES AND
LETTERS FROM

DURING MARCH
—JUNE, 1962

3/6



DIGI-COMP[®] 1

first real operating digital computer in plastic

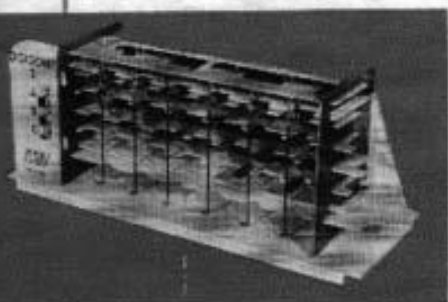
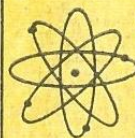


FIGURE 12.
The Digi-Comp I
(1963)

ELECTRONIC COMPUTER BRAIN



- EDUCATIONAL
- FUN AT PARTIES
- SOLVES RIDDLES
- EVEN TELLS FORTUNES

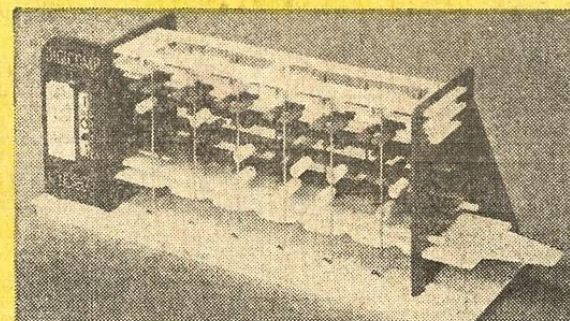
ONLY \$4.99

ADDS—SUBTRACTS—
MULTIPLIES—MEMORIZES

Digi Comp I is a miracle of the modern space age. It is an actual working digital computer that is designed simply and visually to demonstrate the apparatus hidden within the circuits of the giant brains of today. You will be able to add, subtract, multiply—solve problems—solve riddles—even check out Dad's bank balance and see that it's right. This magnificent little machine will shift, complement, carry, memorize, count, compare and sequence.

TRAIN IT TO DO YOUR BIDDING

Digi Comp I can even be trained for fun such as fortune telling, etc. And, think how amazed all your friends will be when you solve problems of missile countdown, satellite re-entry and missile checkout. Designed in plastic, this mechanical analog of a binary computer is 12" x 3 1/2" x 4" and is open so its fascinating operation can be viewed. In kit form, it can be assembled in less than one hour and is complete with all parts, assembly chart and full 28-page operations manual which shows how to check the unit out, program problems, solve riddles and try experiments. A wonderful project for school also.



Full 12" x 3 1/2" x 4", it is open so complete operations can be viewed.

30 DAY FREE TRIAL

Try Digi Comp I in your home for 30 days free. Have fun putting it together, and have fun and excitement solving problems, riddles, telling fortunes and studying space age miracles. If you don't agree with us that this is the most exciting new development in modern research, then simply return for full refund. But don't delay—fill in coupon now. Only 4.98 + 63¢ shipping charges.

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Rush me my Electronic Computer Brain at once. I understand if I am not 100% delighted, I may return it for prompt refund of my purchase price.
I enclose \$4.98 + 63¢ shipping charge. Same guarantee.
I enclose \$1.00 deposit. Balance C.O.D. I will pay postman on delivery plus C.O.D. and shipping.

NAME.....

ADDRESS.....



FIGURE 13. Thomas J. Watson, Sr. (1874-1956) and Thomas J. Watson, Jr. in 1956

IBM

LITERARY DATA PROCESSING CONFERENCE

TABLE OF CONTENTS

Foreword	1
Jess B. Bessinger, Jr. Department of English New York University	
Summary	3
Stephen M. Parrish Department of English Cornell University	
Computer Research and the Humanities	
The Humanist and the Computer: Vision and Actuality	11
Ephim G. Fogel Department of English Cornell University	
Homer, the Humanities, and IBM	25
James T. McDonough, Jr. Department of Classics Saint Joseph's College Philadelphia	
Litterae ex Machina	37
Alan Markman Department of English University of Pittsburgh	
Some Risks of Technological Overindulgence for the Humanities	55
Louis T. Milic Department of English Columbia University	

FIGURE 14. *Literary Data Processing Conference Proceedings (1964)*

GUEST EDITORIAL:

WHY CAN A COMPUTER DO SO LITTLE?¹

R. Busa, S.J. (*Member of Advisory Board*)

* * * *

Abstract

While in business, technology, and scientific computation, the electronic era is already providing us with monumental services, in processing texts by computer we are still at some laborious and primitive stage. In fact, we can operate on texts only in terms of individual words, which is a rather poor performance. Automatic indexing, automatic evaluating, and automatic summarizing are still to come. The reason is the fact that the levels of meaning which a word has when it is inserted in a sentence are more numerous than those it has when taken alone, isolated from context.

* *

I was the first one, back in 1949, who started to make use of automation for processing non-numerical, literary information, and consequently I have been able to follow its explosion during the last twenty-five years. During that time, as you may know, I have personally processed by computer some two million lines of text, a total of some fifteen million words in nine languages and four alphabets (Latin, Greek, Cyrillic, and Hebrew). Two-thirds of it are the *Index Thomisticus*, a linguistic analysis of the 118 works of St Thomas Aquinas plus sixty-one works of other authors ranging from the 13th to the 19th century. The rest is the product of much work of other workers. We estimate that the whole work is the product of much work of other workers. We estimate that the whole work is the product of much work of other workers.

Let me point out one consequence arising from the above. At the starting point of a new era there may be the temptation to ask the new techniques to do things in the same way as before. See, for example, some recent literature expressing critical remarks on computer use.³ My statement is confirmed that using the computer to prepare concordances, for example, with the same format and the same features as before is a poor use of a computer. I feel sympathetic to anyone in scholarly research who still thinks of using a computer just to do things easier and faster. The processing of my *Index Thomisticus* took one million man-hours for much less than five thousand machine hours. In language processing the use of computers is not aimed towards less human effort, or for doing things faster and with less labour, but for more human work, more mental effort; we must strive to know, more systematically, deeper, and better, what is in our mouth at every moment, the mysterious world of our words.

In transcribing a text onto tape, some scholars may still think of writing just the graphemes printed in the text and nothing else; the result is certainly acceptable, as something is better than nothing. But taking into consideration

FIGURE 15.

Roberto Busa, S.J., "Why can a computer do so little?"

FIGURE 16. Radar driving the M-9 gun director (1944, centre); Anti-Aircraft Predictor, Mark III (below); German pilots in the cockpit (right)

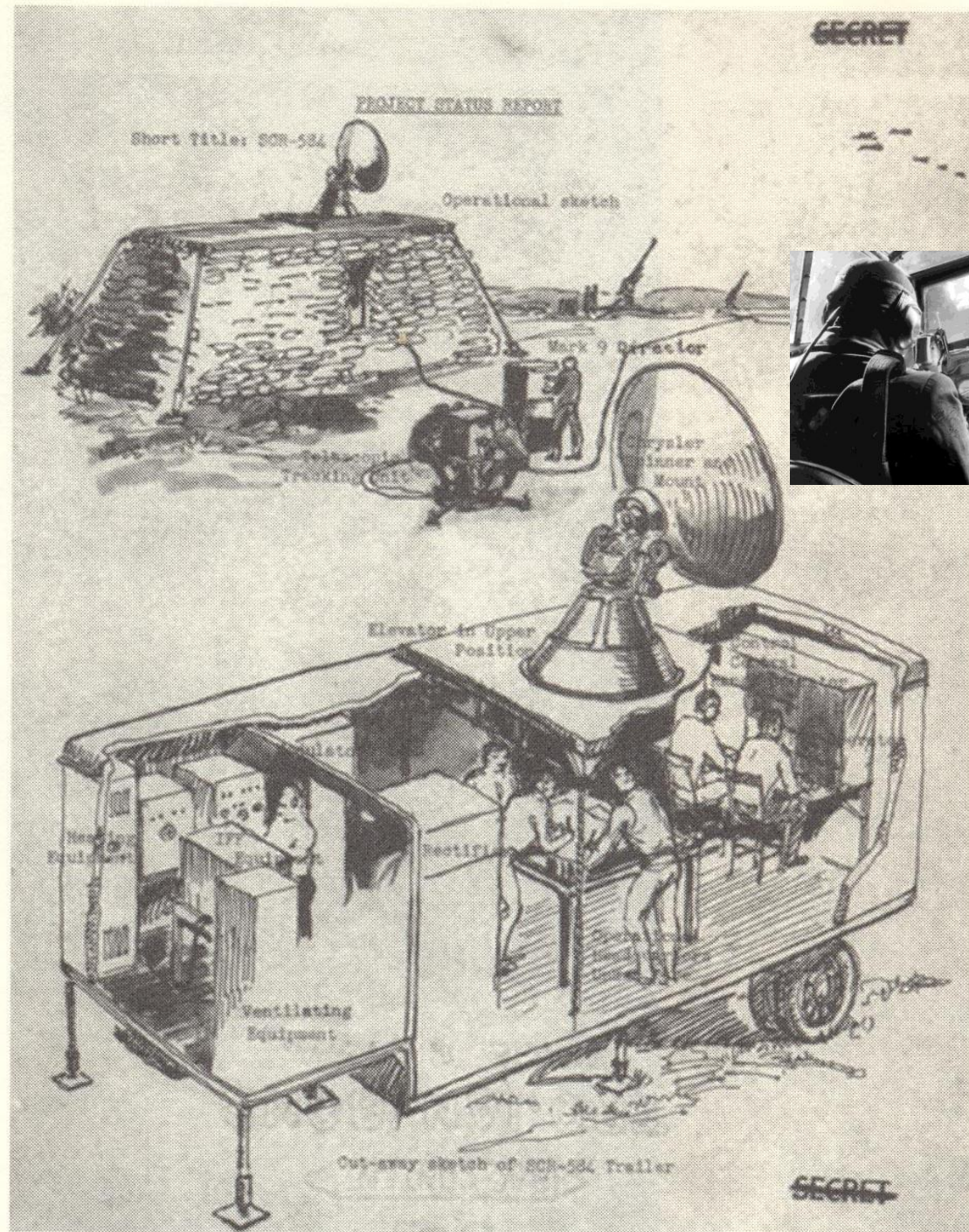
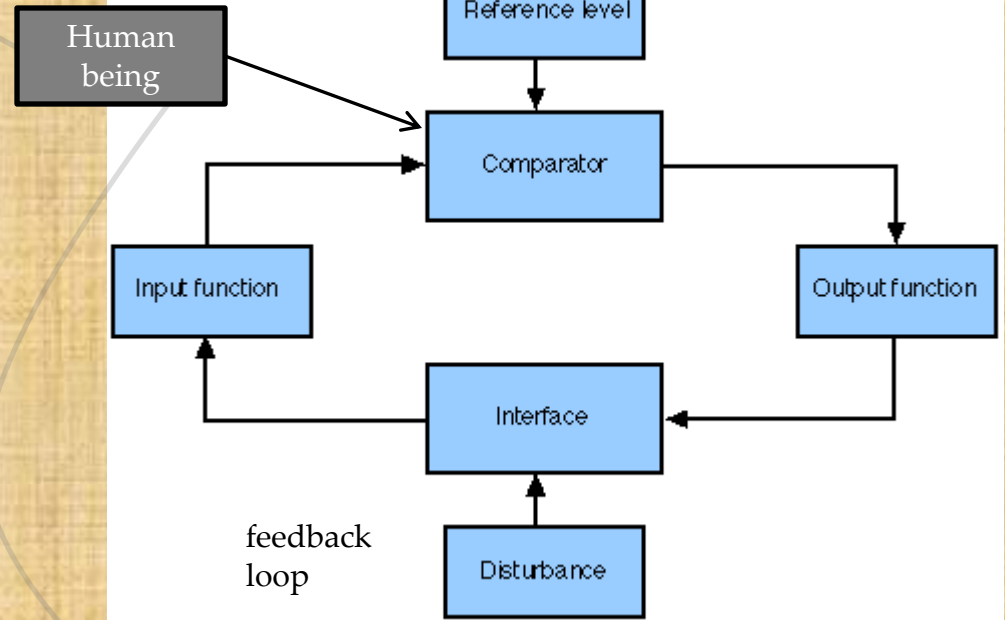
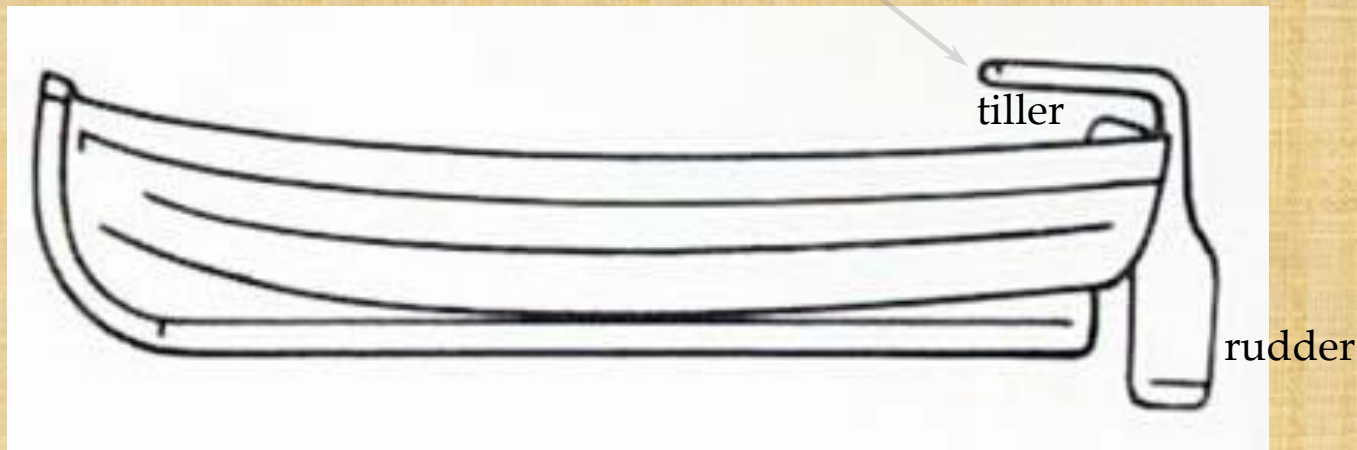


FIGURE 17. Feedback in homeostatic systems



κυβερνήτης
(*L. gubernator*)



Cybernetic Serendipity

Serendipity

the faculty of making
happy chance discoveries
by means of control and communication machines
both human and electronic

In exhibition

an exhibition
of the faculty of making
happy chance discoveries
by means of control and communication machines
both human and electronic

and
other
serendipitous
manifestations

Institute
of Contemporary
Arts

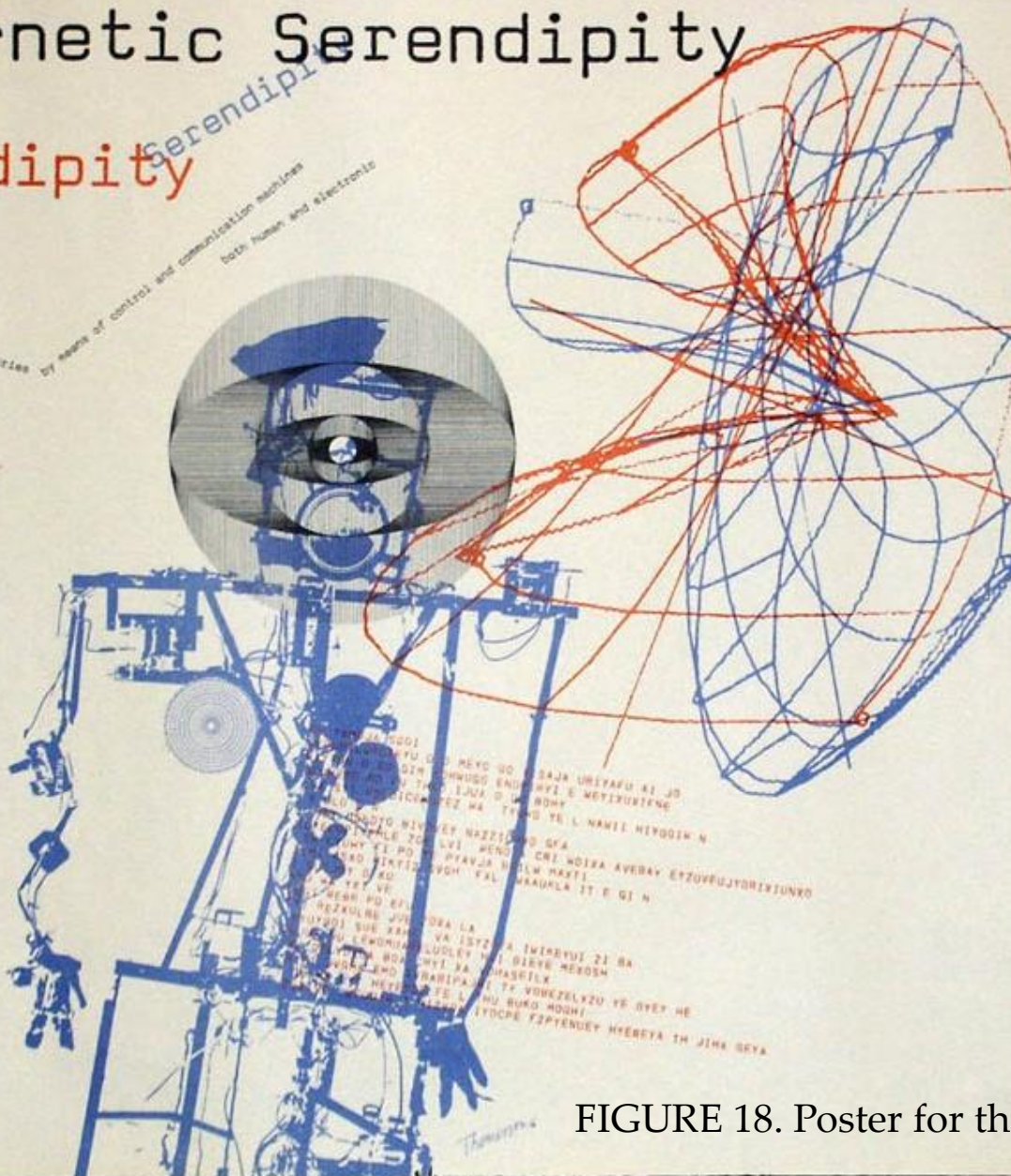
August 2 - October 20



Institute of Contemporary Arts
New House, The Mall, London WC1R 4EJ

Telephone: 7744444, 7744445
Telex: 7744444
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Admission: 10p, 5p, 2p
Children: 5p, 2p, 1p
Students: 5p, 2p, 1p
Seniors: 5p, 2p, 1p



CYBERNETIC
SERENDIPITY
LECTURES



August 2 - October 20, 1968
During the course
of the exhibition, a series of lectures
will be given at 7 pm
at New House, The Mall, London WC1R 4EJ
a series of lectures will be held
at 7 pm
at New House, The Mall, London WC1R 4EJ

Thursday
August 8

Tuesday
August 13

Thursday
August 15

Tuesday
August 20

Tuesday
August 27

Tuesday
September 3

Thursday
September 5

Tuesday
September 10

Thursday
September 12

Thursday
September 19

Tuesday
September 24

Thursday
September 26

Tuesday
October 1

Tuesday
October 8

Thursday
October 10

Thursday
October 17

David S. Miller
Member of the Faculty of Engineering,
University of Cambridge, will give a lecture
on the history and development of the
concept of cybernetics.

Professor Herbert A. Simon
President and Vice-Chancellor of the University of
Pittsburgh, will give a lecture on the
history and development of the concept of
cybernetics.

Professor John G. Kemeny
Professor of Mathematics, Harvard University,
will give a lecture on the history and
development of the concept of cybernetics.

A. G. Thomas
Professor of Engineering, University of
Cambridge, will give a lecture on the
history and development of the concept of
cybernetics.

Dr. Christopher Long
Professor of Engineering, University of
Cambridge, will give a lecture on the
history and development of the concept of
cybernetics.

Dr. John D. Cowie
Professor of Engineering, University of
Cambridge, will give a lecture on the
history and development of the concept of
cybernetics.

Professor R. S. Threlkeld
Professor of Engineering, University of
Cambridge, will give a lecture on the
history and development of the concept of
cybernetics.

Dr. John D. Cowie
Professor of Engineering, University of
Cambridge, will give a lecture on the
history and development of the concept of
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history and development of the concept of
cybernetics.

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Professor of Engineering, University of
Cambridge, will give a lecture on the
history and development of the concept of
cybernetics.

FIGURE 18. Poster for the exhibition in 1968

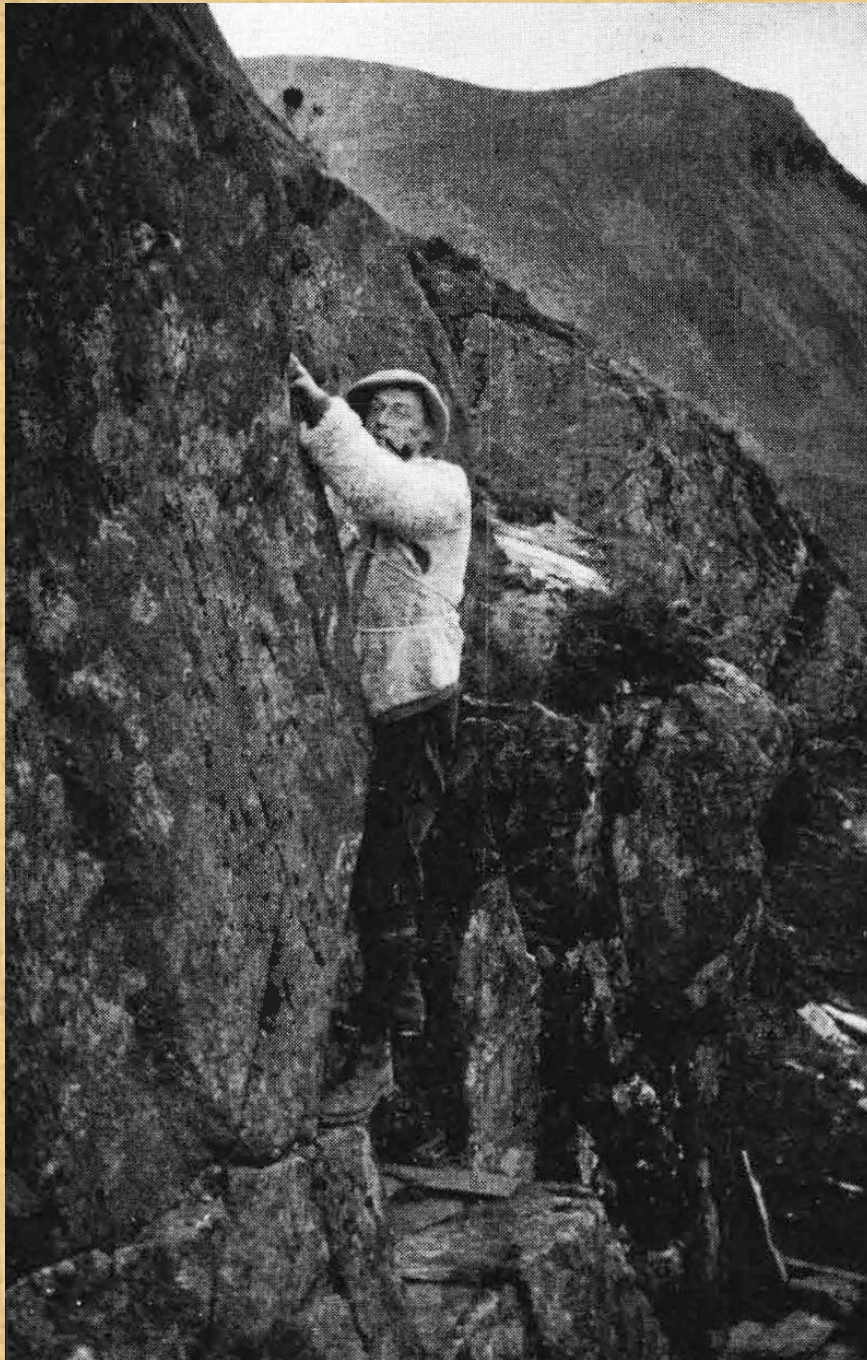


FIGURE 19. Richards in
Snowdonia, Wales, ca. 1917