Computing & reading 2:
The profits of anxiety & failure:
Critics & computers 1949-1991

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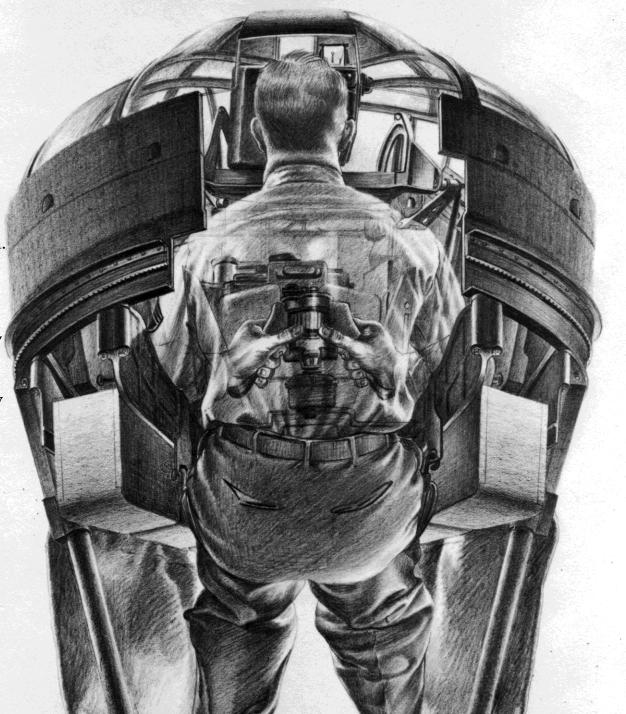King's College London
staff.cch.kcl.ac.uk/~wmccarty

FIGURE 1. The human "machine in the middle" in a wartime cybernetic system. Alfred Crimi, sketch of the Sperry ball-turret and gunner (1943, *Life Magazine* 1944), rendering the gunner's body transparent so as to show the controls.
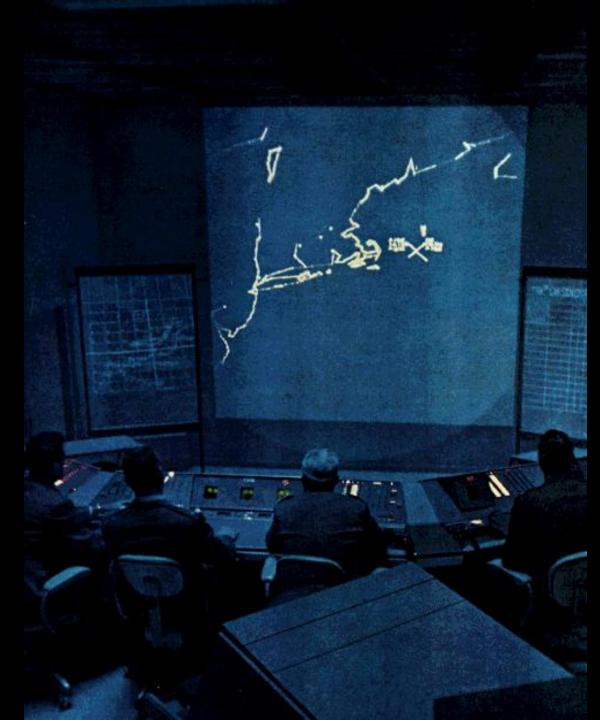
FIGURE 2.
Control Room,
SAGE Air Defence
System, 1950-80

IV. As of A.D. 1957 (even 1956) the essential steps have been taken
   to understand and simulate human judgmental heuristic activity.
   Newell, Shaw, Simon -- Selfridge and Dinneen
   What does this mean concretely:
   1. That machines can now perform///// certain problem-solving
      tasks for which no algorithms are available.
   2. That in doing so, the machines parallel closely human
      problem-solving processes.
   3. That, within limits, the machines learn to improve their
      performance on the basis of experience--they reprogram
      themselves.
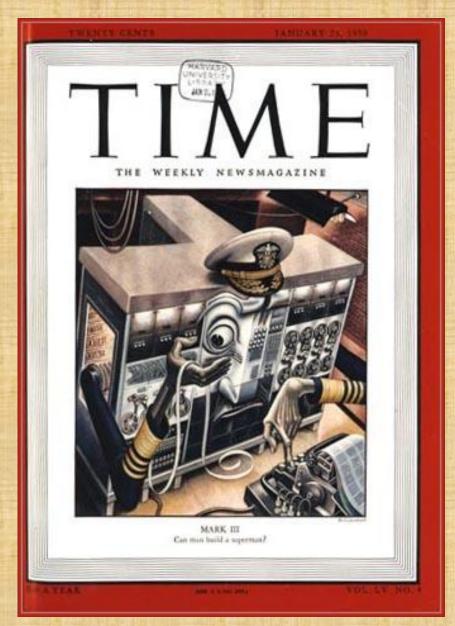
   That within ten years:
   1. A digital computer will be the world's chess champion.
   2. A digital computer will discover an important new
      mathematical theorem.
   3. A digital computer will write good music (already has)
   4. Most theories of in psychology will take the form of
      computer programs, or qualitative statements about
      computer programs.
   Put it bluntly (hard now to shock)--Machines think! learn! create!
V. What are the implications of this

FIGURE 3. Untitled lecture notes for Herbert Simon's lecture to the Operations Research Society of America, 14 November 1957.

FIGURE 4. *Time Magazine* covers

2 April 1965
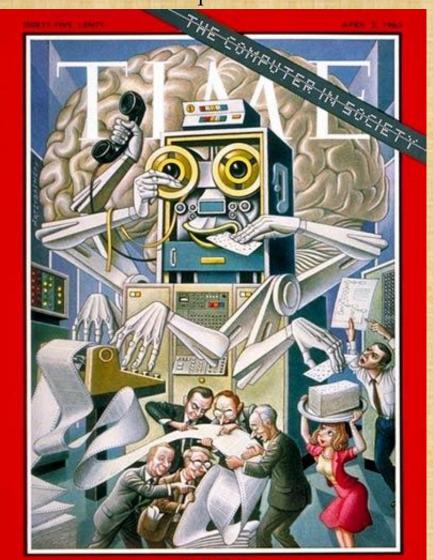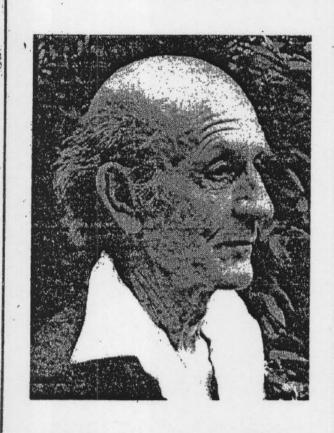
23 January 1950, from a drawing by Boris Artzybasheff

FIGURE 5.

'LITERARISM' VERSUS 'SCIENTISM'

The misconception and the menace

BY F. R. LEAVIS

A PUBLIC LECTURE GIVEN IN THE UNIVERSITY OF BRISTOL

"THE COMPUTER can in no way lift the responsibility from human shoulders." That reassuring statement caught my eye on the front page of the first issue might be in place as to ends, hasn't been forgotten; the reassurance, accordingly, is thrown out—or thrown in; but the idea of its being required that it should mean some- criteria, the statistical: "quality", that is, will look after itself. Clear implication? "Clear" isn't, per- haps, the right word: it might sug- gest that in any educated company, formula. "Literarism versus Scien- tism", as my own. The term "liter- arism" was in fact coined by the late Aldous Huxley for use against me, and I quote it as representa- that description, with its context of assumptions, is a dismissal. There's perhaps no reason why we shouldn't read them; they have, one gathers, what is claimed pre-eminently for

To some people a digital computer is a mark of doom : a symbol of Man's increasing servitude to the Machine. To others it is a gigantic multiple switch which, under favourable conditions, operates with the speed of light, but which only too often, e.g. when it gets too hot, will not operate at all. To others again it is puzzle-solving work of the most exhausting possible kind, punctuated by frustrations when the programs fail or 'get bugs'—which is normally.

To all of these, however, the computer is undoubtedly Science. I want to advocate a gayer and yet more creative use of it which is, by definition, Art : a use which, in the hands of a master, might indeed become art itself.

This use is making toy models of language. The models are *toys* because they are small, easy to construct and (so one fondly thinks at the beginning, when constructing them) easy to operate. They are *models* because they are designed to isolate, exaggerate and generate in quantity some feature of speech which normally human beings are not able to isolate ; and thus to throw light both on the habits of language-users and on the nature of conceptual thought itself.

Two such toy models have become widely known. The first of these was the program produced by Christopher Strachey, in which he made the Manchester University Computer write love-letters. A typical output of this program was the following :

* DEAR HONEY-DEW
  YOU ARE MY GREATEST
  WHISKERS MY UTTER
  MOONBEAM
  YOURS BEAUTIFULLY
  MANCHESTER UNI-
  VERSITY COMPUTER.

Developing the same idea, Professor Victor Yngve, of the Massachusetts Institute of Technology, devised a program for generating grammatically correct but semantically randomised sentences, using as a vocabulary and grammatical guide the first ten sentences of Lenski's *Little Train*. The actual sentences were : *Engineer*

MARGARET MASTERMAN:

Small has a little train. The engine is black and shiny. He keeps it oiled and polished. Engineer Small is proud of his little engine. The engine has a bell and a whistle. It has a sand-dome. It has a headlight and a smokestack. It has four big driving wheels. It has a firebox under its boiler. When the water in the boiler is heated it makes steam. The kind of thing which the computer produced was :

* WHEN HE IS PROUD AND
  OILED * ENGINEER *
  SMALL IS POLISHED
* ITS STEAM IS PROUD OF
  WHEELS
* A FIREBOX IS PROUD OF
  SMALL
* STEAM IS SHINY

The question whether such sentences as these are or are not nonsense is an extremely sophisticated one. Is

* WHEN HE IS OILED HE IS POLISHED, for instance, nonsense or not ?

It will be noted that these two toy models both take English grammar and syntax for granted, but isolate and exaggerate the factor of the wide range of choice which human beings have in the actual sequences of words

The use of Computers to make Semantic toy models of language

they write or say. The question arises, however, whether we could not make a Toy Model which was semantically constrained but syntactically simplified. For instance, take a set of 12 short questions and 12 short answers from an A.A. phrasebook : e.g. *When does it leave ? Are you feeling ill ? Where does he live ? Down that street. Early next week. I don't know.* Code these questions with semantic classifiers in any way which defines for you the range of sensible answers which the question could have ; and conversely for the answers ; and then let the computer loose to match questions and answers. Again, judging the result is a sophisticated activity. Is * WHY AREN'T YOU DRESSED ? † I THOUGHT I WAS a sensible piece of dialogue or not ? And granted that the computer

can thus be made to talk 'sense', with how ' pidgin ' a syntax could we get the meaning over ?

Once the toy-model-making idea is grasped, endless ideas suggest themselves ; and one has to ask " What is the underlying aim behind all this ? " Surely what is really being done here is making the computer talk not by painfully teaching it one new word after another, and then how to combine them, but by teaching it to damp down the enormous permutational resources of the whole language so that tolerable conceptual and semantic associations are formed. In other words, the computer does not behave as the child does ; *it behaves as the drunk poet does*. Huge sets of literal and metaphorical word-uses (e.g., from *Roget's Thesaurus*) have been fed into it, and it combines them. But why rely on Roget ? Why be so stereotyped ? Why not get a real poet to feed unusual strings of synonyms and usual rules of combination into the machine, and then see what sort of sequences come out ?

You will say that to use a computer to write poetry is like using a crane instead of a pen to write a letter. This is not so. The computer's advantage is that it does not tire ; it can produce an indefinitely large amount of an indefinitely large number of variants of any type of combination of words which the poet may desire to construct. By reading (and analysing, if necessary again with the computer) what it produces we can at last study the complexity of poetic pattern, which intuitively we all feel to exist, if only we were able to grasp it. And this increase of understanding of poetic pattern will, in the end, deepen our mastery of, and understanding of, poetry itself.

Fear and Trembling: The Humanist Approaches the Computer

ELLEN W. NOLD

In whatsoever way any come to Me, In that same way I grant them favor.
—*Bhagavad Gita*

THIS ARTICLE is a plea for power—for a decision by humanists to use to our own best interests the technological advances of our day. Unfortunately, too often does the lack of "willingness to be cause" appear in the letters and articles we humanists write each other. Take, for example, a recent missive to the mem-

The writer of this letter unfairly lumps computers and television together in their production of passive citizens and students. On the contrary, the hallmark of interactive computing is the response —both intellectual and muscular—of the student to the computer's words and the incorporation of the student's response

Keepers of rules versus players of roles

FIGURE 8

THOMAS L. WHISLER:
The Impact of Computers on Organizations
188pp. Praeger. £4.50.

JAMES MARTIN and ADRIAN R. D. NORMAN:
The Computerized Society
560pp. Prentice-Hall. £5.25.

The promise and threat of the computer—both clearly immense, though controversial—demand and allow the informed consideration of ordinary people. No technical barriers need prevent anyone from understanding the basic issues involved. The nature and function of computers is simple ; and although their limitations are obscure, the obscurity lies not in our understanding of computers but in our understanding of our own minds. The second of these books is a comprehensive study of these promises and threats directed to the general reader, but it has much also for the student of organization and of policy-making. The first is primarily for the student of organization but it also has something for the general reader.

Thomas L. Whisler's short and lucid study describes an inquiry into the effects which computers have had on some twenty large corporations in a single business field, that of insurance. The chief agents of the inquiry were officers of the corporations concerned, who responded to questions designed by Professor Whisler and then added their own estimates of future developments.

Their evidence illuminates the probable effect of computers on organizational structure and job content. It would appear to suggest that clerical and lower supervisory jobs will decline in number and importance, while the volume and content of higher management will grow. Hierarchic organization will grow less rigid and the number of its levels will decrease. Life seems likely to be more humanly satisfying at higher levels, less so at lower levels than it is now. The most significant general finding is the growth of a new kind of rigidity. Even if decision making does not become more centralized—and the evidence suggests that it will—the whole decision-making system is likely to become dependent on a computerized rule system, which will grow less easy to change as it becomes more elaborated.

Professor Whisler draws a clear distinction between the proper fields of men and computers. He argues that unless the expense is prohibitive, computers should be used for doing the many things which they can do more quickly and accurately than men. These include all computation and some communication. They do not include the perception of new patterns, discovering relationships among events in the environment that have not previously been noticed, nor deciding what an organization will do and where it will go, and other questions where values and preferences are involved. They do not include inter-personal communication through which human beings " motivate each other through words of praise, commendation or reproof ". Professor Whisler distinguishes this as " morale-associated " as opposed to the " work-associated " communication which can be left to the computer.

This division of fields is conceptually useful even though in two critical respects it cannot be fully achieved in practice. Men at work influence each other by all their communication and not only by that associated with their work. If they have less occasion to communicate about their work they will have less occasion to communicate at all. More important, the recognition of new pattern cannot be clearly separated from the process by which we recognize one that is familiar ; the assimilation of new instances to an old pattern changes the pattern, as can be seen alike in the psychology of perception and in the common law. Even the discrimination of radically new pattern is bred of the frustrating experience of using patterns which are becoming inept. Can we afford to leave this frustration to the computer ?

Professor Whisler is a professor of industrial relations. The authors of *The Computerized Society* are systems-analysts and designers of advanced computer systems. They aim to summarize the potential effect of computers on society as a whole. Their book is in three parts ; euphoria, alarm and protective action.

Computers, they tell us, can store facts compactly, retrieve them instantly, and communicate them at a speed limited in practice only by the capacity of the receiver. They can perform on them any logical operation which can be fully specified, including any degree of analysis and combination. Since they are shrinking in size and cost, as well as growing in speed, we may assume that in a few decades anyone with access to a terminal or even, for many purposes, a telephone, from ministers and executives to simple citizens, will in principle be able to command any services which these facilities can provide. Anyone will be able to inform himself of anything which authority has seen fit to record and make available.

Within these limits, the authors continue, the possibilities for self-education will be boundless. Further, police will be aided in detecting crime, doctors in diagnosing illness. Money and credit could be simplified and better controlled, traffic better regulated. The current course of all kinds of event could be monitored and its probable future predicted more confidently and the probable effect of alternative policies more reliably tested in advance.

The alarm springs from the euphoria. Such accessibility to information endangers privacy, enlarges the inescapable dominion of the policymaker and increases the relative power of the state and of all who can use the new techniques. Dependence on computerized processes exposes the citizen to undetectable error, and exposes society to crime and sabotage of unprecedented kind and scope. It will further distort, if not dissolve, the present ways of distributing function, income, wealth and power through work. The authors describe safeguards which they would like to see incorporated in the design of computerized systems and in the law, and they propose important institutional and educational changes.

This book supplies the reader with a factual background sufficient to enable him to question even those assumptions which the authors leave undisturbed. Need advertising continue ? Why should we tolerate this deluge of unsolicited input when all we could ever want to know about what is available and its relative merits, objectively tested and attested, could be ours for the turning of a dial ? More fundamentally, how, if at all, could such a world be made acceptable to all those whose skills cannot be amplified by computerized technology, be they artists, craftsmen or renderers of any other kind of personal service ? If not, will they, or we, accept a world where only men are abundant but only automated services are available ? The questions are endless ; and we need to answer them, before the new system imposes its answers on us.

Perhaps the most important question concerns a difference between men and computers which both books notice but neither develops. Computers, admirable rule-keepers, cannot play roles. But human societies depend on playing roles, no less than on keeping rules. Every human role-player has some discretion to decide what a situation requires of him. Where this is clearly rule-given, or alternatively, where it clearly calls for innovation far beyond his authority, he is only a slow and error-prone computer. But these are rare, limiting cases. Normally there are conflicts to be resolved between conflicting rules and incompatible criteria. Discretion is needed to resolve them ; and the exercise of this discretion also modifies the tacit criteria which will guide its exercise in the future. This is the essence of human and especially institutional learning and adaptation ; and this is what the computer, it seems, cannot supply. This is the new rigidity which both books notice.

Whether and, if so, how the playing of a role differs from the application of rules which could and should be made explicit and compatible—this is the major epistemological problem of our time. Computers raise it by implication. They may even help to resolve it—if their exponents can resist the temptation to bury it. The temptation will be dangerously strong. Slave labour is so seductive.

FIGURE 9. The "Computer Room", Dryden Flight Research Center, Summer 1949.

FIGURE 10.

The ICL Computer Room, Stevenage, Herts. 1974