On IPW's

(A position paper for a panel discussion on "Computers and Society".)

"Computers and Society" is a ghastly topic to talk about, for I can hardly think of any other topic, traditionally so loaded with half-truths and full falsities. For me, the first symptom of the profound confusion was the popular book from the fifties by Edmund C.Berkeley with the ominous title "Giant Brains, or Machines that Think". I am still eagerly waiting for the companion volume "Giant Hearts, or Machines that Fall in Love". It was, however, not only the popular press that contributed to the confusion. In a moment of failing self-criticism, John von Neumann wrote a more speculative than scientific booklet on Computers and the Human Brain, and even Alan M.Turing allowed himself to be drawn into the discussion of the question whether computers can think. The question is just as relevant and just as meaningful as the question whether submarines can swim. But in the fifties it was a hot issue, and perhaps it still is: the title of Pamela McCorduck's most recent book refers --tongue in cheek, no doubt-- to "Machines who Think".

In those early days, one of the most sober articles appeared on the solemn pages of The Financial Times. It discussed the possibility of replacing a secretary by a computer: after having estimated the huge number of cubic feet that, at the very least, would have to be filled with radio valves, the article ends with the conclusion that the traditional secretary is much cheaper and more pleasant to produce.

Regrettably, this sobering warning has not been heard; by the time the article appeared, exaggerated expectations, and their unavoidable companion: exaggerated fears, were too firmly established. I think the wide-spread confusion started at the moment computers became industrial products, to be manufactured in series and to be sold at a profit. Prior to that moment, we only had the singletons, the laboratory machines that were designed, built, and used on University Campuses. The scientists involved knew full well that successful computer usage required a precise knowledge of what had to be achieved and a very clear idea how to achieve that goal, and were beginning to suspect

that programming would present a formidable intellectual challenge. The public at large hardly had a perception of what was going on there; it only started to notice automatic computers when they became industrial products and its perception of them has been greatly influenced by the commercial propaganda that accompanied the introduction of those machines.

In retrospect, this accident of history has been a disaster, since almost all the opinions pushed by the commercial propaganda were false, and, in addition, the propaganda has been so effective that for many those opinions have become dogmata that can no longer be challenged without committing heresy.

The first way of overselling computers was to postulate their universal usefulness and to present them as The Philosopher's Stone that at the same time would cure all our ills and would turn anything into gold. As an example from those days I remember the recommendation that such-and-such computer could take for you "200.000 business decisions per second".

The second way of overselling computers was by contrasting them to people --machines are fast, while people are slow, machines are reliable whereas people make mistakes, etc.-- and in general suggesting that machines are very good at whatever we are poor at.

The third way of overselling computers was by reassuring every potential customer that programming the machine would be no problem. To this end, programming was presented as "a translation problem" --remember that FORTRAN stands for FORmula TRANslation!-- of which the machine itself could take care. As late as 1968 we had in DATAMATION the notorious advertisement in which Susie Mayer, smiling and in full colour, assures the reader that she has solved all her programming problems by switching to PL/I ! On the crucial question whether Susie Mayer could still smile in 1972, DATAMATION gives no further information.

The sad consequence of all this has been that not only the laymen have been misled, but large sections of the computing community as well. And as a result, the tortuous path of automatic computing so far has been paved with most ambitious projects that gloriously failed to meet their major objective.

I wish I were exaggerating, but I am not. From the wealth of failures I can only mention a few. My guess is that most of you have never heard of the exciting project called "the augmented knowledge workshop" that would exploit computers as "intelligence amplifiers". If you have not heard of this exciting project, my point has been made: if anything had come out of it, you would have heard from it by now. This was a major undertaking 10 years ago; right from the start, one thing was forgotten in the euphoria, viz. that if computers could amplify intelligence, they could amplify stupidity as well. (As an aside it could be remarked that the latter is probably precisely what they have done in this project.)

Let us take a better known one: COBOL. COBOL's explicitly stated major objective was to circumvent the need of the professional programmer: it should be so much like ordinary English that without any further education or training the average military officer or business manager could use it. Today we need 80 per cent of the professional programmers for our struggle with COBOL programs.

Lest you believe that we have outgrown such stupid mistakes, let me mention as final example a recent one: Ada. The explicitly stated major objective of this project of the DoD is to reduce the cost of software development by means of standardization. It will fail to meet this objective because you really cannot expect people or organizations to stick to a standard if the standard has grown so complicated that no one can be sure what it is. I completely lost interest in that effort by the time there were two competing formal definitions of Ada because establishing their equivalence (under the assumption that they are equivalent) within the next 10 or 20 years is way beyond our abilities: both texts comprise more than 500 pages densily packed with formulae.

The most crazy thing of all this is that, in all the more spectacular cases, the failure has been predicted, quite convincingly and well in advance. Apparently, the lure of the dream is still so strong that people become deaf for warnings: the computer represents Babbage's Dream Come True, and no one wants to hear that the Dream has deteriorated into a fully transistorized nightmare.

Enough examples of unbelievable nonsense to raise two questions. Firstly, what made all this quackery possible, and, secondly, how do we protect the layman against it.

To the first question I have an answer that satisfies myself, but it would take too far to go into it in great detail now. In a short summary it says that inadequate reactions are only to be expected in the face of drastic novelty such as technology can inflict upon us. We have had a few of such novelties lately: besides the computer I just mention the atomic bomb and the pill.

In the course of this panel discussion, the protection of the laymen seems more relevant. And among the laymen I include the average housewife, child, businessman, mathematician, electronic engineer, and educationist.

Ideally, people would understand that in their capacity of tools, computers cause only a ripple on the surface of our culture compared with the influence they will have in their capacity of intellectual challenge without precedent. Ideally, people would understand that , in the decades to come, computing science can be expected to have an influence on mathematics in general at least as profound as the influence physics has had on analysis during the last century. But this is perhaps a bit too much to hope for.

Setting our aims more modestly, we should try to make them more immune for all the humbug and dishonesty in which the world of computing abounds. I believe that that can be done. We should teach them the critical, sceptical reading of advertisements. Advertisements are very significant in two respects: they reveal the manufacurer's perception of his customers' appreciation of his products, and, furthermore, they are for the layman a major source of information.

You may, for instance, have noticed that now microprocessors are sold with precisely the same aggressive blackmail as was customary in the selling of encyclopedias. If you care about the future of your children, you had better acquaint them now.... etc. Only the ones blind beyond redemption will fail to see the similarity. Seeing the similarity, however, means a beginning

ability not to exclude that microprocessors will be equally helpful, reliable, and hence dispensable, as the average encyclopedia.

It must be possible to make even the public at large immune for advertisements such as the recent one that, under the slogan "You can't reach the top by being a pencil pusher" suggested that, in order to become vice president, it sufficed to buy one of the company's "Thought Processors".

People should first learn to identify the misleading messages coming from the professional public relations men, viz. the advertisers. This should give them some immunity against more subtle misrepresentation as the one given by the enthusiastic computer user. The trouble with the latter is that he need not be dishonest: he may be a propaganda victim himself.

I refer to the wide-spread, but in general unchallenged, belief that making something "computer-aided" amounts to making it better. Computer-aided design, computer-aided management, computer-aided composition, computer-aided manufacturing, computer-assisted learning, computerized examinations, you name it. Under no circumstances the dogma of improvement should be accepted without challenge: in no time we would have computerized jurisdiction.

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I thought once that the early glorification of computer assistance was mainly possible because machines were so expensive, and thought in my innocence that all this exaggeration would die its natural death when hardware would become cheaper. But nothing of the sort. The advent of the low-priced microcomputer has made things only worse. The ration between design cost and production cost is so high that they have to be sold in huge volume to as many customers as conceivable, whether they need them or not.

My favourite application of the so-called home computer is CAD: Computer-Assisted Devotion. Like the Tibetan prayer wheel, my home computer generates prayers, but with a much greater productivity than the old mechanical device; besides that, it generates prayers never prayed before, and in the jargon my little machine should be called an intelligent prayer wheel.

I told you of the intelligent prayer wheel --IPW for the cognoscente-- not because the project is so valuable, but because it is so typical: the discerning observer will encounter IPW's all the time.

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An Appendix of Theses, added to oil the discussion.

Thesis 0: Computing Science, rather than Mathematics, will shortly attract the brightest students, initially perhaps for the material reward, but eventually for the intellectual one.

Thesis 1: Society's own perception of its own needs are too unstable to act as a guideline for the educational enterprise. For instance: one day, automation and microprocessors were the indispensable motor of our economy; overnight they turned into the greatest threat of the employment situation.

Thesis 2: No group of computer users has ever contributed significantly to Computing Science; the reason is that computer users have another axe to grind and regard computers primarily as tools, i.e. in one of their less interesting capacities.

Thesis 3: Fascination with the equipment is the hallmark of the amateur.

Thesis 4: To the world of Computing, Electronic Engineering can only contribute digital equipment.

Thesis 5: The argument in favour of Information Technology that presents widespread application of Information Technology as an aid to the democratic process is at least suspect, and probably wrong in the sense that totalitarian regimes have at least as much use for Information Technology. Better than by equipment, democracy is served by the art of debunking; so is Computing Science.

Thesis 6: Software Engineering no longer means what it used to mean: today it has accepted as its charter how to program if you can't.

Thesis 7: Theoretical Computing Science and Applied Computing Science are equally far beside the point.

Thesis 8: So-called Expert Systems are more the product of a public relations effort than of a scientific one.

Plataanstraat 5
5671 AL NUENEN
The Netherlands

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prof.dr.Edsger W.Dijkstra
Burroughs Research Fellow