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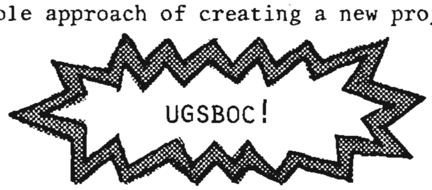
When I was first asked by the SIGIPS program committee to talk about relationships among systems, projects, etc., I almost laughed out loud, because we had wrestled with a similar request by Admiral Phillips a couple of years ago. What made Admiral Phillips' request impossible to answer was that, I presume, he wanted an official reply -- that is, one which had been coordinated with the several thousand people -- almost everyone in the Agency -- who consider themselves systems designers and the like. I am not sure I remember to whom Admiral Phillips' request was addressed, but it was not addressed to C, so we did not answer it.

All of this is by way of explaining that what I am going to say is pretty much my own opinion and that I hope you understand that there is not a single, simple chart which will relate everything. That is, unless we take the simple approach of creating a new project --



standing for "Universes, Galaxies, etc."

Every one of these items I will discuss is multifaceted -- and many are perceived differently by different viewers. Thus, it is not surprising that one viewer can see a pair of projects as badly interfaced and another viewer can see them as having a satisfactory interface.

One more bit of philosophy before I talk about some of the specific projects. I think that project management has a bad side as well as a good side. On the good side, it probably leads to better-defined projects, bounded projects, and, hopefully, to timely and correct completion of projects. On the bad side, it leads to introspective, parochial views of the world and narrow problem approaches. I believe project management needs a little more tempering -- with some input from disorganized geniuses. Don't ask me how to distinguish geniuses from cranks. I don't know the answer to this, but I think we have a lot of both.

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Fig. 2

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NSA CISI

The preceding article is the text of a presentation given by Mr. Phillips to members of the Special Interest Group on Information Processing Systems (SIG/IPS) in August 1976. SIG/IPS is an organization, under the auspices of the NSA Computer and Information Sciences Institute (CISI), which addresses problems and technical developments in the fields of data storage, data processing, and data retrieval.

Mr. Phillips' presentation was one of a series of monthly programs which SIG/IPS sponsors for the benefit of all interested NSA employees. Additional programs include seminars and technical films.

Persons wishing to join SIG/IPS or to suggest topics for programs are invited to contact [redacted] *SIG/IPS Chairman, on x5504s.*

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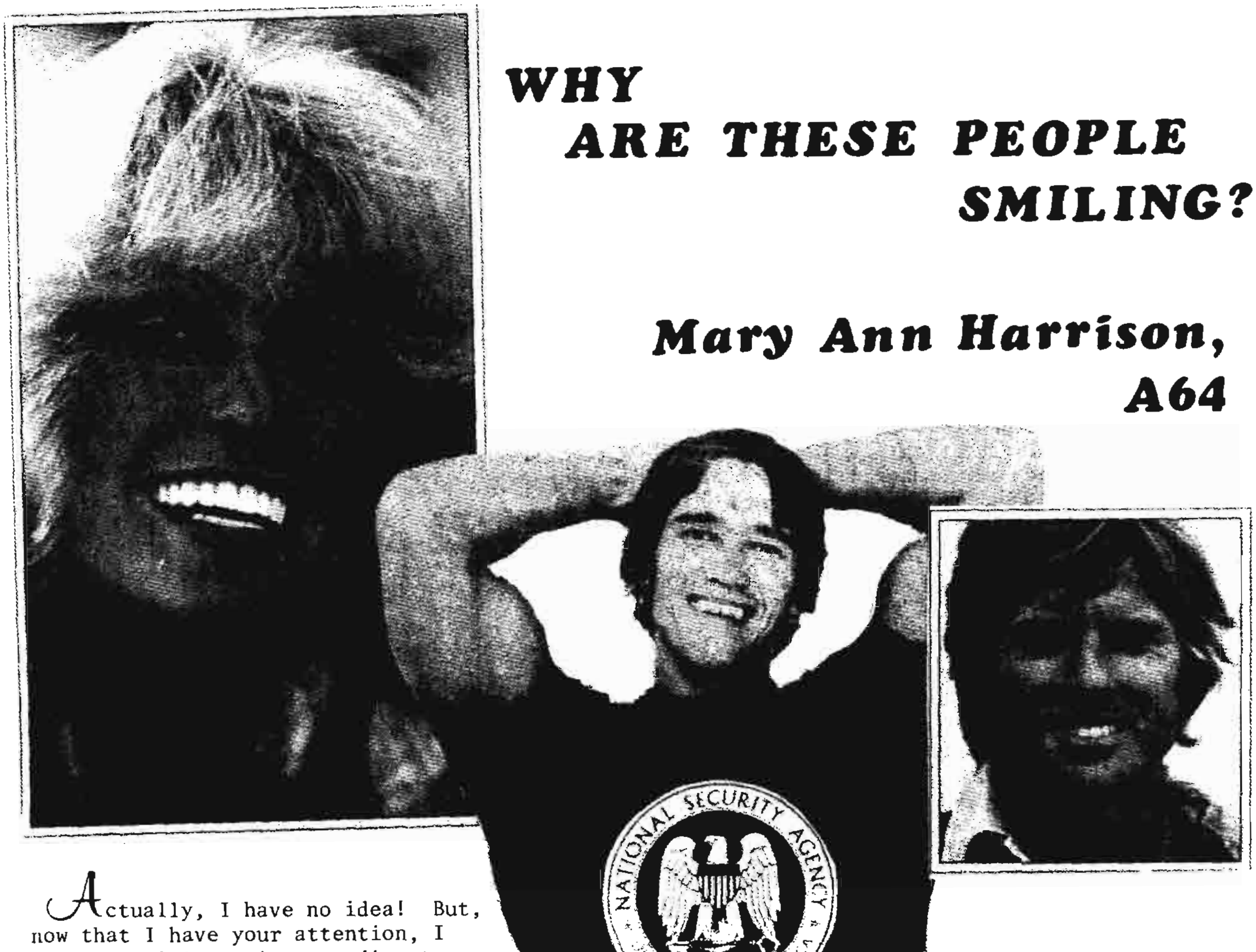
WHY ARE THESE PEOPLE SMILING?

Mary Ann Harrison, A64



Actually, I have no idea! But, now that I have your attention, I hope you will continue reading to find out why certain other people -- the Agency's foreign-language transcribers -- are definitely *not* smiling.

Despite his[1] position as the linchpin in the SIGINT process, the transcriber has for many years been the stepchild of the intelligence-processing family. While most professionals in the SIGINT business acknowledge the importance of transcription, there is widespread lack of understanding and, for that matter, concern about what a transcriber does and what it takes to be a transcriber. Many NSA managers and supervisors, especially those who themselves have no foreign-language training, do not realize how difficult transcription is. In their ignorance they dismiss the work as a purely mechanical function and transcribers as near-automatons.

Unfortunately, this attitude toward transcription is not confined to those in management and supervisory positions. Newly hired linguists are indoctrinated with this negative evaluation of transcription even before they are on the job. It is not unusual to hear recently arrived college-trained linguists say they will quit rather than go into transcription, even before they know what transcription *is*! The anti-transcription virus has apparently spread to recruiting and personnel offices.

Every transcription shop has its own horror stories to illustrate the prevailing ignorance, indifference, and outright hostility to transcribers and transcription. I will not burden you with many of them, but I believe a few excerpts will illustrate my point.

---

[1] I shall use the masculine forms throughout, in order to avoid the cumbersome "he or she" constructions, and also because the majority of transcribers are, currently at least, men.

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What other group of NSA professionals has heard themselves described by a senior management official as "plumbers"? The connotation was unmistakable: transcribers are the day-laborers of the intelligence world. Analyst-reporters and others with whom the Russian transcribers work on a daily basis have asked, "Where do you keep your transcribers?" Or have issued instructions to "take these tapes and run 'em through your transcribing machines." There is a real and apparently widespread belief that transcribers do nothing but thread tape through a machine, turn it on, and collect page-print as it pours out the other end. Many of those who understand that a real live human being is involved in the transcription process still fail to appreciate the difficulties of the job. These persons' assessment of transcription is that "any idiot with a dictionary can handle this stuff."

So much for the transcription myth. Now, please allow me to present a thumbnail sketch of who a transcriber is, what he does, and how [redacted]

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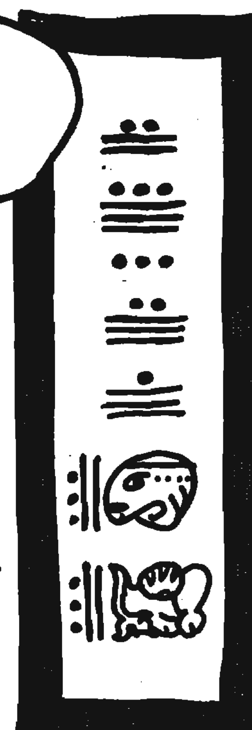
Remember this date!



The date "12.18.3.17.16 - 13 Men 13 Zotz" in the Maya calendar is an important one for those interested in the ancient Maya civilization. On that date Charles Lacombe will make the question "Does Anyone Here Speak Ancient Mayan?" the theme of his speech at the annual banquet of the Crypto-Linguistic Association. Last July, during a visit here from his home base in Miami, Mr. Lacombe, a former NSAer, spoke to a joint meeting of CLA's special interest groups on lexicography (SIGLEX) and translation (SIGTRAN), on computer techniques for decryption of Maya climatic records.

To make your banquet reservation, call Steve Bladey, P16, x5236s.

Oh, incidentally, for those who are a bit rusty on Maya dates, the banquet will be on:

Thursday, 23 JUNE

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Another Controversial Book on ARTIFICIAL INTELLIGENCE

REVIEWED BY

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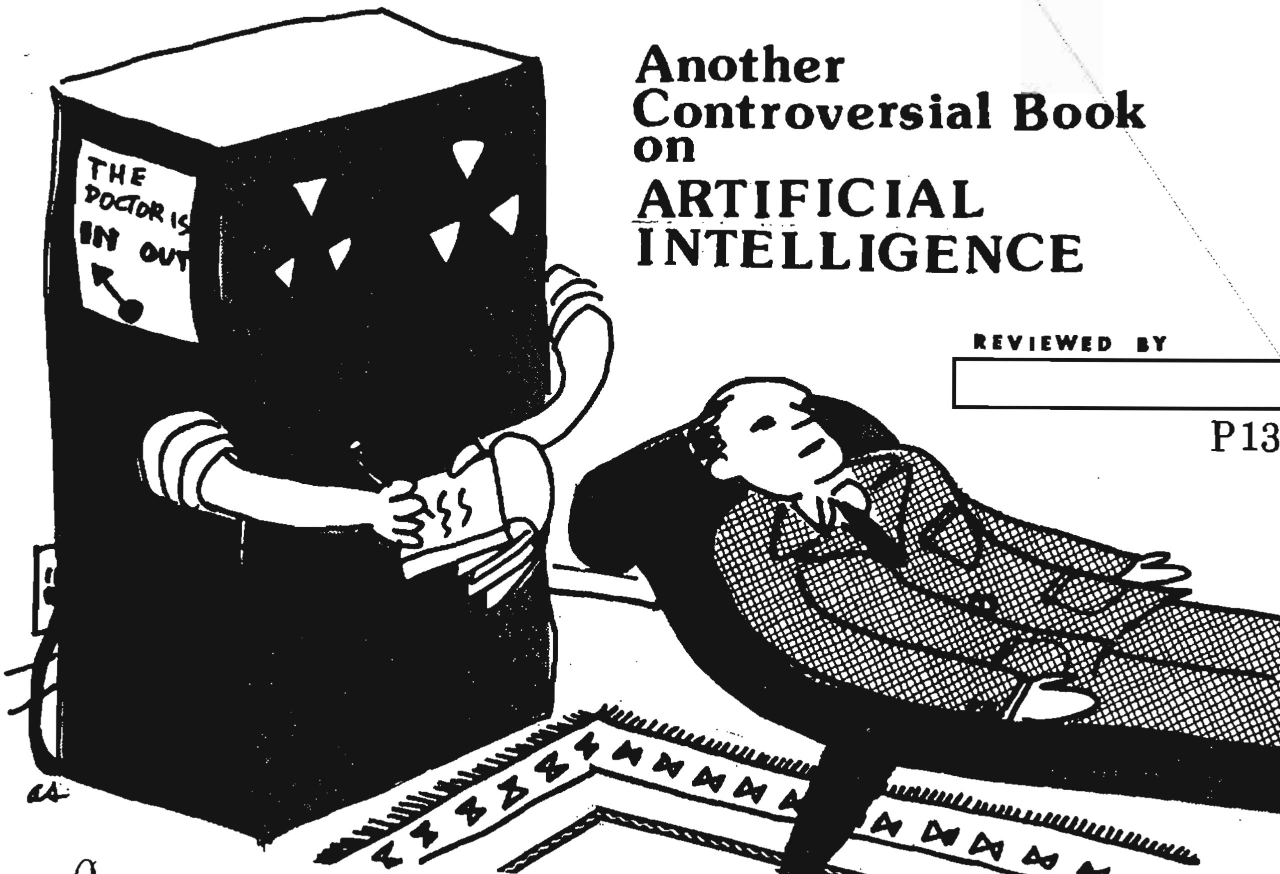
P13



In 1972 Hubert Dreyfus published a book entitled *What Computers Can't Do* (Dreyfus 1972). This book created somewhat of a stir in computer circles; a number of provocative challenges were made, and considerable healthy and constructive self-examination was stimulated in the minds of many workers in the field of Artificial Intelligence (AI). It seemed that Dreyfus had raised so many basic questions that his book deserved a careful reading by anyone interested in the future of computer science, even if only to strengthen and clarify the grounds for disagreeing with him (see my review, "Machine Intelligence: Promise or Delusion?", CRYPTOLOG, July 1975).

Now we find ourselves challenged again, and this time on even more fundamental and extensive grounds, in a new book, *Computer Power and Human Reason*, by Joseph Weizenbaum of MIT (published by W. H. Freeman and Co., San Francisco, 1976). Dreyfus is a professional philosopher, and his expertise lies entirely outside of computer science; thus, he was assailing the bastions of AI research from an external position. In Weizenbaum, by contrast, we see an insider -- a very highly respected and creative worker in the field of AI research -- breaching the walls of the citadel from within.

Weizenbaum's accomplishments include the development of a useful list-processing computer language called SLIP ("Symmetric List Processor") and various other work centering around the problem of making computers capable of language understanding and other intelligent human activities (cf. Weizenbaum 1963, 1967a, 1967b). Along with his technical work, Weizenbaum has also consistently carried forward an interest in and concern for the social implications of computer technology. Perhaps his best-known AI work was the development of a natural language analysis program called ELIZA, which could carry on a dialog on some preselected topic with a human conversational partner. ELIZA created considerable interest and excitement, and also enjoyed substantial popularity as a demonstration vehicle in computer science centers around the United States, in a version called "DOCTOR," which was programmed to parody the interview of a Rogerian "nondirective" psychotherapist with a new patient.

In his introduction, Weizenbaum sets the stage for the reader by describing his own frame of reference and stating his reasons for writing the book. As a practicing computer scientist, and a teacher of computer science in the great temple of technology which is MIT, Weizenbaum became acutely aware of his students' questions and doubts about the value of what they were learning and doing. On the one hand, they were bending all their efforts toward learning their craft, and many of them were seeking only to increase their dogmatic dependence on and polarization around science and technology. On the other hand, many were aware that they were not learning anything that would help them to choose the right questions to ask, or to evaluate the answers they got. Some were rebelling openly "at working on projects that appear to address themselves neither to answering interesting questions of fact nor to solving problems in theory" (p. 11).

In addition to the questions raised in the classroom, Weizenbaum was confronted with a more abrupt and compelling philosophical shock as a result of his work with ELIZA. He saw practicing psychiatrists hailing what was really no more than a technical trick, of parodying one particular interviewing method, as a breakthrough in automated psychotherapy. He was further dismayed to see how quickly and easily people of all walks of life and degrees of education became emotionally involved with ELIZA playing "DOCTOR," accepting it as a therapist, and personifying it to the extent of asking Weizenbaum to leave the room so that they could converse with the "DOCTOR" in private. A third unpleasant surprise emerged when he became aware of a widespread belief that ELIZA represented a general solution to the problem of computer understanding of natural language. These disproportionate overevaluations of his successful but modestly-framed experiment made him realize that most people do not understand anything about computers, and are ready and eager to believe that these magical machines and those who program them can do anything under the sun.

Weizenbaum tells us that he felt himself thus suddenly faced with a terrifying responsibility, that seem to compel him to step back and reconsider in a new light what he had been doing. His book is the result of a 2-year leave of absence from teaching: one year spent at the Stanford Center for Advanced Study in the Behaviorial Sciences, and the other year at Harvard University, both on research grants. His work at these institutions benefited greatly by contacts with many other workers in a variety of fields, some of them well-known authorities, and his manuscript was read and commented upon by these new colleagues.

How have we reached the point where practicing psychiatrists can so overvalue a computer program as a therapeutic breakthrough? What historical process has brought the "man in the street" to the place where he can unquestioningly accept a computer program as an appropriate receptacle for his deepest emotional and personal confidences? Weizenbaum poses these questions and seeks to answer them by tracing the transformations wrought upon human thought and experience through the growth of new tools and techniques that laid the foundations for modern empirical science. He seeks to show that this history, and the particular paths it has taken, have brought us to a scientific outlook that seems to have produced a mechanistic conception of man. We have made ourselves and all our institutions over into the image of the computer. A practicing psychiatrist, under this mechanistic spell, sees nothing amiss in a picture of himself "not as an engaged human being acting as a healer, but as an information processor following rules. . ." (p. 6).

Weizenbaum's trip back into the history of Western thought begins with the clock -- man's first truly "autonomous" machine, capable of running for long periods without human guidance or intervention. He follows Mumford (1963) in stressing the importance of the clock, and its use by medieval monks to time their devotions in the monasteries. With Mumford, Weizenbaum sees the widespread use of clocks and measuring devices producing "pointer readings" and numbers as the cause of a crucial change in man's perception of time and, consequently, of space. The concept of time as disassociated from particular events made possible the creation of "'an independent world of mathematically measurable sequences: the special world of science'" (Mumford's words, quoted by Weizenbaum, p. 23). The clock, as man's first autonomous machine, foreshadowed the programmable computer; both, once started, continue operating "on the basis of an internalized model of some aspect of the real world. Clocks are fundamentally models of the planetary system" (p. 23).

The growth of our dependence on machines of various kinds, and the changes that brought the modern scientific world view into wide acceptance, resulted, Weizenbaum continues, in a wholesale rejection of direct experience. "Gradually at first, then ever more rapidly and, it is fair to say, ever more compulsively, experiences of reality had to be representable as numbers in order to appear legitimate in the eyes of the common wisdom" (p. 25). The value of everything, and especially of human labor, became quantified as money. These developments set the stage for such devout and impassioned statements of the ascetic faith of science as that of Pearson (dating from 1892) which Weizenbaum quotes: "'The scientific man has above all things to strive at self-elimination in his judgements'" (p. 25). This statement, as Weizenbaum points out, urges man to make himself into a disembodied intelligence, a sort of dispassionate, dehumanized machine.

The computer arrived on the scene after the scientific transformation of human thought was essentially complete. Weizenbaum describes the first widespread practical use of computers, automating the great "tab rooms" of business and industry in performing their accounting operations. In this use, the computer took over, essentially unchanged, the work of punched-card accounting machines that sorted, summarized, and printed office records. Then businesses and government agencies found that the very techniques they had developed to study and model their own operations, often motivated by the acquisition of their first computer, could be programmed and carried out by means of the new machines. "The crucial transition, from the business computer as a mere substitute for work-horse tab machines to its present status as a versatile information engine, began when the power of the computer was projected onto the framework already established by operations research and systems analysis" (pp. 33-34).

It has become a truism among spokesmen for technology that the computer came along just in time to save our society from breaking down under the strain of population growth and exploding complexity. Weizenbaum, while agreeing that our institutions could not now exist in their present form without the computer, provides a different slant on the matter. He shows how the computer was seized upon by business and government as a God-given means of maintaining the status quo, and sidestepping the creative reshaping of our institutions that might have been called forth by the crises in complexity that threatened after World War II. The bottlenecks and breakdowns that motivated us to "augment or replace the low-internal-speed human organizations with computers, might in some other historical situation have been an incentive for modifying the task to be accomplished, perhaps doing away with it altogether, or for restructuring the human organizations whose inherent limitations were, after all, seen as the root of the trouble" (p. 30). Weizenbaum condemns the choice that was made, and the use that was made of computers as a result of that choice, in words recalling some of Dreyfus' statements: "Of the many paths to social innovation the invention of the computer opened to man, the most fateful was to make it possible for him to eschew all deliberate thought of substantive change. That was the option man chose to exercise" (pp. 31-32). The computer has now become truly indispensable to the survival of our society, *in the present specific form in which the computer itself has helped to freeze and fossilize one way of doing things.*

Weizenbaum devotes several very readable and interesting chapters to an explanation of what computers are, how they work, and whence they gain their unique and awesome power to change our world. His excellent, clear discussion of the Turing machine, the nature of programs and programming, and other computer concepts, are in my opinion worthy of unreserved recommendation to any reader who wants a good insight into the matter. Whatever disagreements one may have with his value judgments, Weizenbaum must certainly be a superlative teacher of computer science.

The computer, Weizenbaum continues, perhaps more than any other tool, has altered Man's concept of his own identity, mind, and experience. An all-pervasive computer metaphor has taken hold of the minds of scientists, many humanists, and the "man in the street." According to this view, man and computer are merely two subspecies of the genus "information processor." Weizenbaum singles out for special attack the Simon and Newell General Problem Solver (GPS) and its "means-end" analysis of human problem-solving behavior. This theory sought to found a new "information processing psychology," based on a hierarchical set of modular actions and tests which described all goal-directed behavior in terms of reducing differences between the object in hand and a desired object (Simon and Newell 1958).

The broad and ambitious general claims made for the GPS theory by its authors are roundly condemned by Weizenbaum, who dismisses it as a limited metaphor and not a scientific theory at all in any proper sense. Its worst consequence in his eyes is the production of an image of Man as a "GPS-like machine." This impoverished metaphor, says Weizenbaum, has made it possible for a psychiatrist to regard his patient as "an object different from the desired object. The therapist's task is to detect the difference, using difference-detecting operators, and then to reduce it, using difference-reducing operators, and so on. That is his 'problem'! And that is how far the computer metaphor has brought some of us" (p. 181).

Weizenbaum points out a number of other consequences of the overenthusiastic and unbalanced application of computer technology. While new tools can open up new horizons for people, he warns us that they can also have the effect of closing off certain possibilities of social action, and distancing us from some domains of data and experience that were previously accessible. "A computing system that permits the asking of only certain kinds of questions, that accepts only certain kinds of 'data,' and that cannot even in principle be understood by those who rely on it. . . has effectively closed many doors that were open before it was installed" (p. 38).

Another important adverse consequence of the modern scientific world view, and especially of its latest manifestation, the computer, is an abdication of individual human autonomy and responsibility, and a new tyranny of technical expertise. Weizenbaum condemns a number of recent theories and research efforts (among them GPS, Forrester's "Limits to Growth" model, and B. F. Skinner's psychological theories), accusing them of distorting and abusing language, advertising easy "scientifically-endorsed" panaceas for every ill, and exploiting the myth of expertise. The language "is mystifying . . . All contact with concrete situations is abstracted away. Then only graphs, data sets, printouts are left. And only 'we,' the experts, can understand them . . . The expert will take care of everything, even of the problems he himself creates" (pp. 253-254).

Weizenbaum presents a provocative viewpoint on science itself, that most sacred of sacred cows. He accuses it of having become, in our present overemphasis and abuse, an "addictive drug" and even a "slow-acting poison," in spite of the admitted benefits we have obtained from some of its accomplishments. Science, directly contrary to the generally accepted belief in its solid foundation in absolute objectivity and the validated work of the past, can only be anchored ultimately on "the shifting sand of fallible human judgment, conjecture, and intuition" (p. 15). The myth of scientific objectivity would have us believe than any clearly demonstrated counter-instance is sufficient to force revision of the most cherished theory. On the contrary, Weizenbaum shows, scientists routinely explain away counter-instances as erroneous or inconsequential, and cling to their pet theories in the hope that they will be rescued by some later discovery. "The man in the street surely believes. . . scientific facts to be as well-established, as well-proven, as his own existence. His certitude is an illusion" (p. 15).

Drawing a trenchant and amusing parallel between the compulsive gambler, the compulsive programmer, and the "mad scientist," Weizenbaum drives home some telling points. All three share these characteristics in common: they are certain they will succeed, regardless of any number of setbacks; they have an invincible faith in their own cleverness; and they are convinced that all of life can be reduced to the terms of their "system," whether it be gambling, programming, or empirical science. All three disciplines are revealed by Weizenbaum as "magical" and "self-validating" belief systems, capable of being unrestrainedly abused by people with an overriding passion for absolute certainty and control over artificial worlds of their own making. "The compulsive programmer is merely the proverbial mad scientist who has been given a theater, the computer, in which he can, and does, play out his fantasies" (p. 126).

In an interesting discussion of theories and models, Weizenbaum contrasts the theory-based application of computers in such successful AI projects as MACSYMA and DENDRAL to the ad hoc, patchwork approach in most other areas where no strong theoretical base exists or has been applied. DENDRAL, at Stanford University, produces descriptions of those molecular structures that can explain a given record from a mass spectrograph. Its competence is as good as, or better than, that of the human postdoctoral chemists who have traditionally performed this task (Buchanan, Sutherland, and Feigenbaum 1969). MACSYMA, at MIT, performs symbolic mathematical manipulations also usually carried out by highly-skilled specialists (Martin and Fateman 1971). "Such theory-based programs," Weizenbaum suggests, "enjoy the enormously important advantage that, when they misbehave, their human monitors can detect that their performance does not correspond to the dictates of their theory and can diagnose the reason for the failure from the theory" (p. 232).

Most existing programs in use by business, industry, and government can be based on no such theory; they are, Weizenbaum maintains, patched and "hacked" together from hit-and-miss strategies that seemed to work for this or that case. Such programs are typically written by large, loose "teams" of programmers, many of whom have left or been reassigned before the program goes into operation. Thus, there is no one around who really knows how the program works; in the absence of any theoretical base, no one can even tell *whether* it is working properly in all cases, let alone correct it when it fails.

Weizenbaum justly devotes considerable attention to Terry Winograd's language-understanding research. This work undoubtedly constitutes one of the most successful and creative recent AI accomplishments, and has been hailed by many as a major breakthrough. I strongly recommend Winograd's report (1970) to any reader interested in gaining an idea of what can be done by computers in the analysis of natural language; it is enjoyable reading and represents a very fine piece of research. Weizenbaum does not see it, however, as a theory-based accomplishment comparable to MACSYMA or DENDRAL. He praises it as an "important achievement," which "shows how a specific view of certain aspects of language can really be filled in with enough detail to provide a working model" (p. 195). Winograd's heuristics, however, according to Weizenbaum, "express no interesting general principles" (p. 197). Winograd's effort shares with GPS and many other AI projects the fault of appearing to present general theories when they really provide only "virtually empty heuristic slogans." They seek to verify these "theories" by constructing models "that do perform some tasks, but in a way that fails to give insight into general principles" (p. 196).

Weizenbaum bases his deeper philosophical objections to such AI research, and to the abuse of computers and of technology in general, on two main grounds. His first argument is an attempt to show that much of human thought is not amenable to formal expression. His second basic position concerns the ways in which man must differ in essence from any machine. In much of what he says on these topics, Weizenbaum comes close to many of Dreyfus' points, but with a rather different emphasis. Human thought and behavior cannot ever be entirely expressed in terms of the "effective procedures: which can be carried out by a Universal Turing Machine. The reasons he presents for this view can be summarized as follows:

- *Much human thought, action, and speech is context-dependent.* It matters quite a lot to us *which* values of "x" and "y" are plugged into an expression. The human participant in a conversation or other social act brings to it a frame of reference that establishes what the talk or action is "about." Weizenbaum maintains that we can never get a sufficiently inclusive "knowledge base" into a computer to permit it to do this for any significant task or context.

(Continued on p. 23)

From  to the undrawable...

THE POLYHEDRAL WAR

[redacted] P12

ILLUSTRATED BY [redacted] P12

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Some time ago, a model of a polyhedron appeared in the P1 office. For those of you who have forgotten -- or never had -- three-dimensional geometry, a polyhedron is the space-filling analog of the area-filling polygon. A square is a two-dimensional polygon; a cube is its three-dimensional analog, a polyhedron. In their idealized form, polyhedra are examples of some of the most beautiful shapes and can often be seen incorporated into the works of contemporary artists. Yet the model of the polyhedron in the P1 office, a "flexible" dodecahedron (12-faced figure) in basic black, was at the opposite end of the beauty scale (see Fig. 1). It was, in my opinion, one of the most pitiful examples of a polyhedral model I had ever seen. To add insult to injury, in addition to being unaesthetic, it was constructed by using a most inefficient method. Both of these considerations led me to state that I, with my background in geometry and my interest in model-building, could easily build a better polyhedral model, the only criterion of "better" being its aesthetic quality as judged by an unbiased observer.

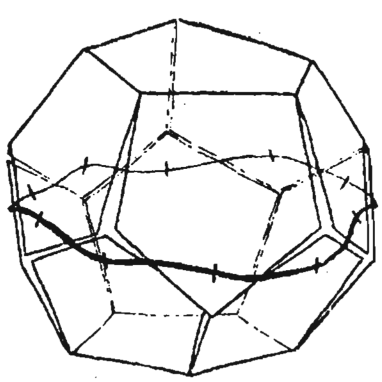


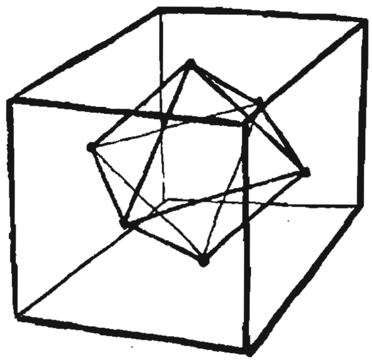
Fig. 1. Pitiful polyhedron

Little did I know that my innocent boast would begin the now-famous Polyhedral War. The same one-upsmanship that led me to build a better model would also lead another young mathematician, the illustrator of this article, [redacted] to do the same. Yet consider the issue about which the War was being waged: the beauty of models of abstract geometric entities. This may serve to show the only real distinction between the outlook of mathematicians and that of others. Often the mathematician is concerned with more abstract things than the general person, yet the manifestation of that concern takes on very familiar, practical forms, e. g. a contest. This contest, the "War," is a good example of this dichotomy between the planes of thought and of action. The War was fought at two levels -- an abstract level with choices of polyhedra or polyhedral combinations, and a practical level with construction methods, materials, colors, and glue.

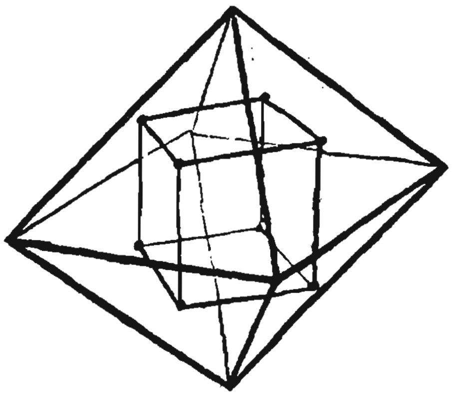
Michael chose models of interpenetrating polyhedra as the most beautiful. These figures, known since the time of Gauss and Euler, often depict graphically the interrelationships among the five most basic polyhedra, the Platonic solids. These solids are:

- tetrahedron [*tetra* = "four" + *hedron* = "face"],
- cube (figure with six square sides),
- octahedron [*octa* = "eight"],
- dodecahedron [*dodeca* = "twelve"], and
- icosahedron [*icosa* = "twenty"].

They exhibit a surprising degree of interdependence. The cube and the octahedron, for example, are duals, i.e. "mirror images" in a certain sense. More specifically, the cube's six faces, eight vertices, and 12 edges correspond directly to the octahedron's six vertices, eight faces, and 12 edges. Indeed, if you connect the centers of the six square faces of a cube, you obtain an octahedron, and vice versa with the eight triangular faces of the octahedron, as can be seen from Figs. 2a and 2b. These and



a



b

Fig. 2. Duality of cube and octahedron.
a - Octahedron in cube;
b - Cube in octahedron.

other unexpected and unusual properties have fascinated mathematicians and mystics alike, even so far as to have inspired various schools of cosmology into varied and numerous misguided interpretations of the mathematics involved. With this wealth of history behind him, Michael decided to build a model of five intersecting tetrahedra, intersecting in such a way as to outline the largest of the Platonic solids[1], the dodecahedron. This polyhedral configuration is pictured in Fig. 3. After choosing the basic strategy for using these models of interpenetrating polyhedra, Michael worked out the tactics of construction. He chose to use the traditional method of cutting and pasting faces which are especially constructed for the particular model. This method requires extreme exactitude in the preparation of the faces and great patience in the assembly, and is suited only for permanent-display models which represent polyhedra whose geometry has been completely described.

[1]While the dodecahedron has fewer *faces* than the icosahedron, it is "larger" in terms of volume. The ancient Greeks knew this and made balls for their sporting events with 12 pentagonal faces sewn together.

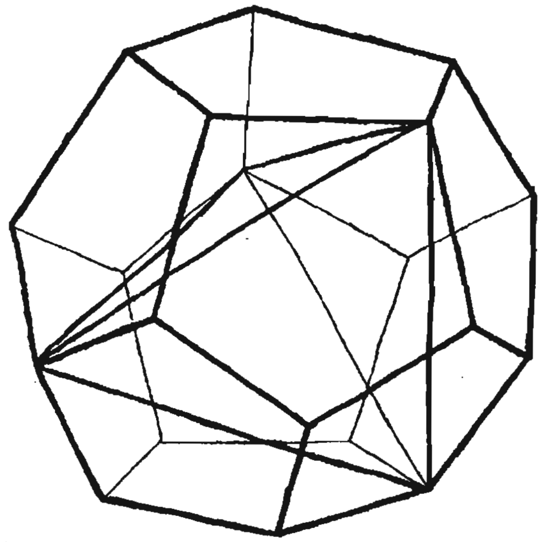


Fig. 3a. One tetrahedron in a dodecahedron

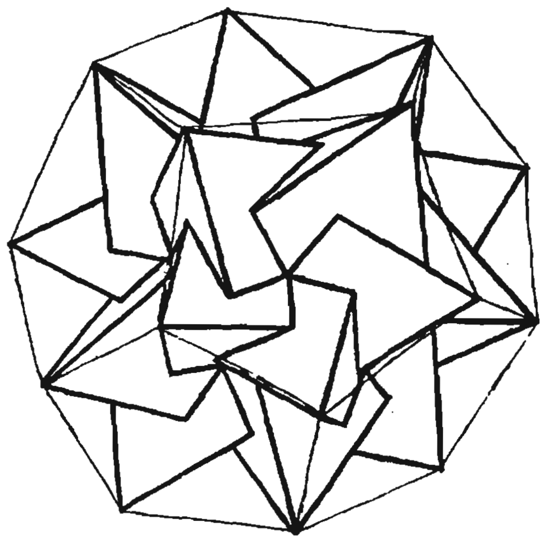


Fig. 3b. Five tetrahedra (visible edges only) in an imaginary dodecahedron

The family of polyhedra I chose, however, is known as the toroids. A toroid is a polyhedron out of which a "polyhedral hole" has been cut. As an example, consider Fig. 4, a square orthobicupola with a cuboctahedron "hole" cut out of its inside. These types of polyhedral combinations show the relationships between the altitudes and angles of the various polyhedra as opposed to the interpenetration figures which tend to reveal the symmetry relationships. Also unlike the interpenetration figures, toroids are relatively new, most having been discovered since 1970. As an example of one of the most aesthetic toroids, I chose a three-holed truncated octahedron. Since this toroid is extremely difficult to visualize from a drawing, Fig. 5 shows how it is constructed, as well as the final result.

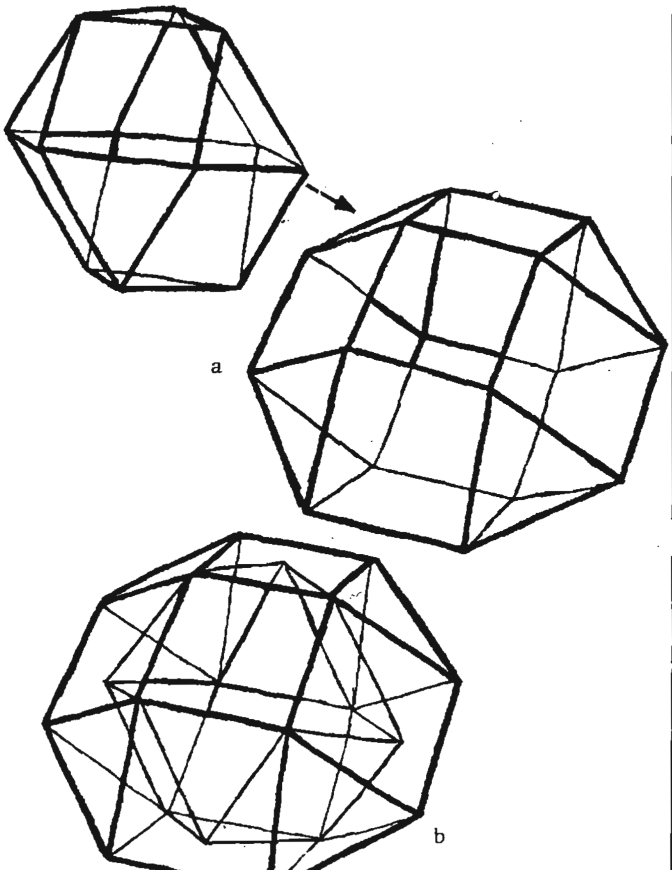


Fig. 4. The construction of a simple toroid. a - Components; b -- Final result

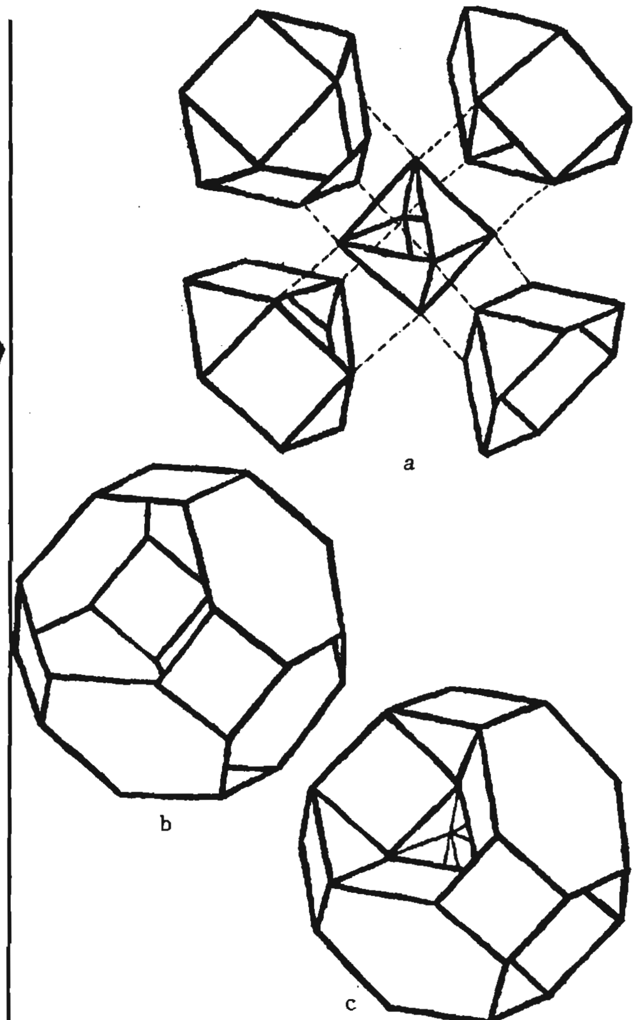


Fig. 5. a - Exploded view of the "hole"; b - "Shell" into which components of "hole" are fitted; c - Final result -- a three-holed toroid

Toroids, as a group, represent a real challenge to the model-builder. The traditional cut-and-paste method fails in two important areas. The construction of a many-holed toroid, as that depicted in Fig. 5, requires an almost unattainable degree of dexterity and patience. The experience of using this method is so discouraging that some mathematicians have suggested that the lack of an appropriate model-building technique may account for the fact that toroids have been unknown for so long. Also, the cut-and-paste method is totally unsuited for any kind of "exploring." Often it would be nice to build a quick model to assist one in working out the geometry involved in a polyhedron, in a manner comparable to the way in which proofs in high-school geometry are solved with the aid of a rough sketch. One cannot quickly "test out" an idea for a toroid with the cut-and-paste method. In the first place, the inspiration for the idea would probably die before a model could be constructed with this laborious method, and, in the second place, this method requires that the geometry of the polyhedron be entirely determined before building the model. But the model was being built to assist in the working out of the geometry!

These weaknesses have led to the so-called cardboard-and-rubberband method. In this method, regular polygons are constructed in great numbers, without having any specific polyhedron in mind. These polygons are appended with flaps on each side. The flaps are bent to be at right angles to the polygon and notched at each vertex. Two such polygons can be joined, in the process of building a polyhedral model, by a rubberband surrounding the flaps, which is caught securely in the notches. While it is true that the resulting models have flaps and rubberbands on the outside, which tend somewhat to highlight the edges and vertices of the polyhedron, they are mainly an aid in construction and are not a part of the idealized, geometric entity. Fig. 6a shows a polyhedral model complete with these flaps and rubberbands. For "explorations" this method yields an unexpected bonus. Models made in this way may be quickly disassembled and the pieces can then be used, in a mild form of cannibalism, for new models. The effort expended to construct the original polygonal pieces then becomes an investment as the pieces can be re-used. While the ease of use and the economy of effort of the cardboard-and-rubberband method cannot be overemphasized, it must be remarked that the final model lacks the professional appearance of the cut-and-paste models, and also that, unfortunately, rubberbands do not last forever. After a year or so, one can be horrified to find his cherished model as a tangled jumble of polygons and decayed rubberbands. The cardboard-and-rubberband method of construction, along with a lengthy and delightful exploration of the world of toroids, is fully described in Stewart's *Adventures Among the Toroids*.

The toroid in Figs. 6a and 6b, a pentagonal orthobicupola with a pentagonal prism as a hole, reminds us that the War is fought on two levels and not merely on one. For, in reality, Fig. 6 represents nothing at all! While examination of the figure or even the model itself reveals nothing suspicious, a detailed analysis of the geometry of the model shows us that such a toroid is nonexistent. Assuming an edge length of one for all polygons, the altitude from the parallel pentagonal faces of the bicupola would have to be precisely one for the prism to fit exactly inside. After a small amount of computation, the altitude of the bicupola is found to be:

$$h = \frac{2}{\sqrt{R + 2}},$$

where $R = \dfrac{1 + \sqrt{5}}{2}$

This yields:

$$1.05 < h < 1.06$$

Thus the idealized pentagonal prism could not possibly fit inside the idealized pentagonal bicupola. The model appears to fit together because there is just enough stretch in the rubberbands so that the distortion is not noticed when the model of the bicupola is compressed. The War requires not only attractive models, but also that the models represent an actual geometric form. Cardboard and rubberbands do not a polyhedron make.

While the tide of the War was decidely in my favor with the submission of the three-holed truncated octahedron built by using the cardboard-and-rubberband method, Michael, after much secretive delay and deception, countered with two flawlessly constructed interpenetration figures. One was the nonsuperimposable mirror image of the five intersecting tetrahedra, and the other (Figs. 7a and 7b) was a model of five intersecting cubes, also intersecting in such a way as to outline the dodecahedron.

At this point, however, because of time and space limitations (the P1 office was beginning

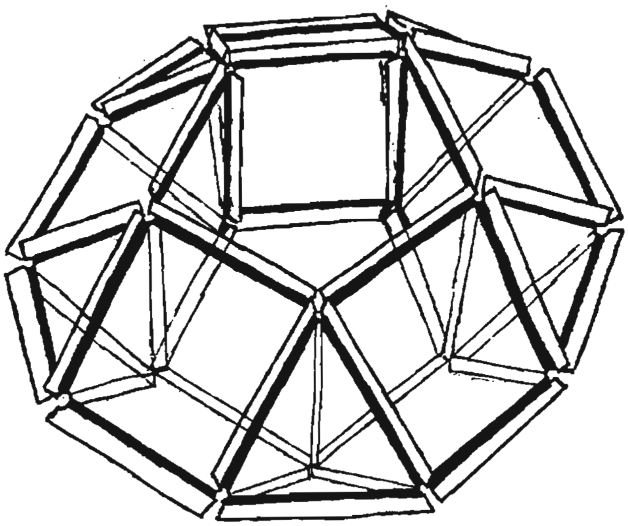


Fig. 6a. Cardboard-and-rubberband model

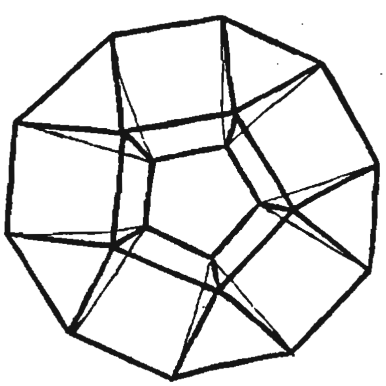


Fig. 6b. Top view of "idealized" cardboard-and-rubberband model (rubberbands and flaps removed)

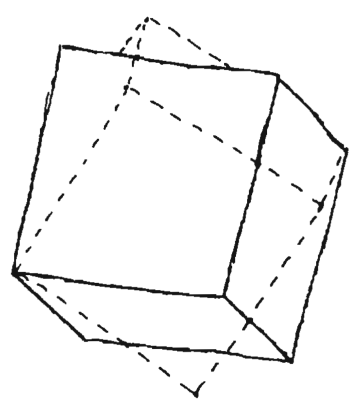


Fig. 7a. One cube (solid lines), with positioning of next cube (dotted lines)

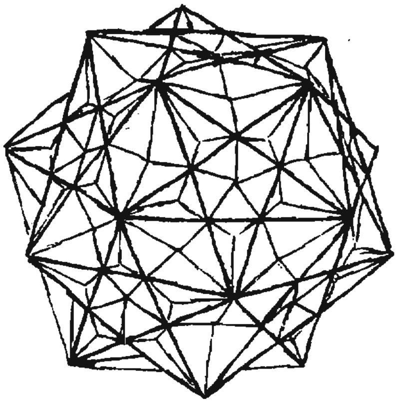


Fig. 7b. Five cubes in a dodecahedron (visible edges only)

to get rather crowded), a truce was declared and the War officially ended by the joint submission[2] of a model of a toroid constructed by the cut-and-paste method. The toroid chosen was Stewart's "Gem of the Expedition," a truncated dodecahedron with 11 holes, constructed of pentagonal cupolas and antiprisms. This gargantuan effort consisting of 260 faces was declared unsurpassable by the unbiased judge of the contest and can now be viewed in the P1 office (Room 3W090). Since a drawing can hardly do justice to a model of such complexity and beauty, none is even attempted here.

Perhaps the average person thinks that the mathematician gets his fun out of standing hip-deep in computer output as he mutters absent-mindedly about some obscure calculation, or by filling in blackboards with theoretical equations, so much so that he is completely unable to enjoy ordinary pleasures. Actually, mathematicians are pretty much like everyone else, and can appreciate a lot of other things too, including beauty wherever they see it. And one of the biggest joys of the mathematician is to use mathematical principles to construct a beautiful object that everyone can enjoy in his or her own way -- the mathematician because it is a "truncated dodecahedron" logically derived from one of the Platonic solids, and the average person just because it "looks absolutely beautiful!"

All the models illustrated in this article, plus the undrawable "Gem of the Expedition," will be shown in the Headquarters Building display case (in the passageway toward the Operations Building), from 16 through 31 May.

[2] [redacted] provided invaluable assistance in the construction of this model.

P.L. 86-36

PLAIN ENGLISH

[redacted]

C22

Reprinted from C-LINERS, Final issue.

Look, Mary.
See Bobby write.
Bobby writes bad.
He writes long words.
Bad, bad Bobby.

See me write. I write good. I write little words. Good, good me. And I am a college graduate.

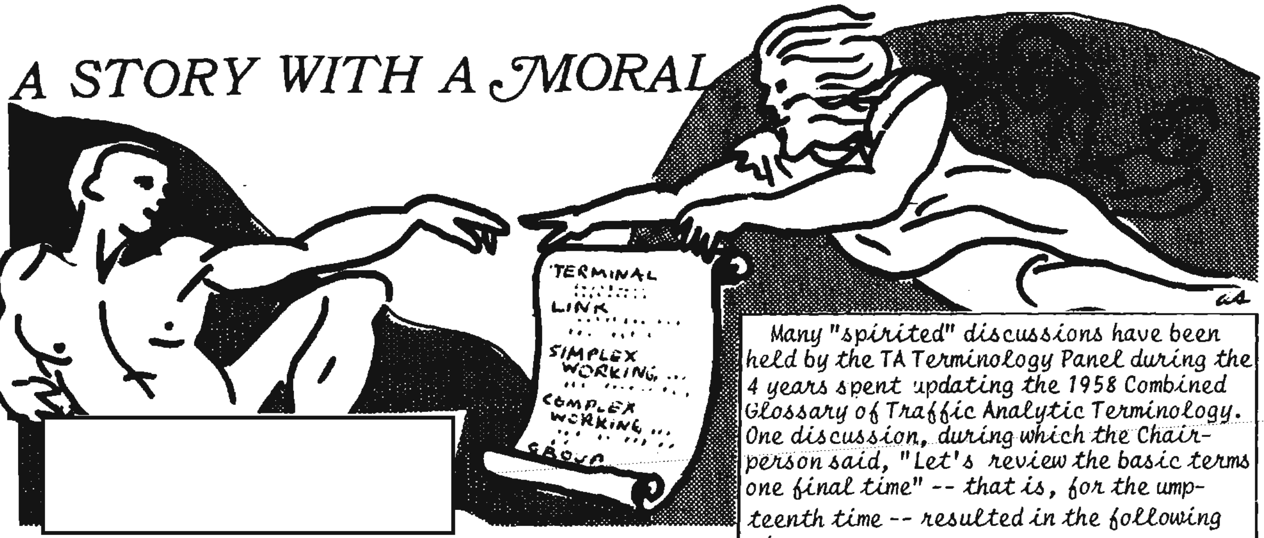
Daddy paid lots and lots of money so I could speak English good. I was an English major. Now I work. I work at NSA. Now I use APE (Agency Plain English). Now I am good. I even got a letter of appre. . . appri. . . apre . . . I forgot how to spell it.

Rubbish. Understand that I am not against plain communication, straightforward communication, where each word must be justified must add a necessary and vital ingredient to the communication. But our nation's universities are horrified at what they have come to call "college-level illiteracy." This year in the California state colleges, nearly 50 percent of the incoming freshman class was required to take mandatory, noncredit, remedial English. Yet at NSA we are encouraged to all but abandon what we used to call the English language. We have actually been told not to worry too much about formal sentence structure. We have been criticized for using a dictionary and thesaurus.

But did it ever occur to anyone that wordy, passive, confusing memos might be a weapon, or, more correctly, a shield? If we want all Agency personnel to speak and write plain English, perhaps we should first teach Agency personnel English. If we want Agency management to write concise, active, decisive memos, perhaps we should first teach Agency management to be concise, active, and decisive.

Let us attack the problem, not just hide the symptom.

A STORY WITH A MORAL



Many "spirited" discussions have been held by the TA Terminology Panel during the 4 years spent updating the 1958 Combined Glossary of Traffic Analytic Terminology. One discussion, during which the Chairperson said, "Let's review the basic terms one final time" -- that is, for the umpteenth time -- resulted in the following story. N.G.

P.L. 86-36

To all the members of the TA Terminology Panel:

In the beginning God created a TERMINAL.

For a while this terminal was happy. He had a transmitter and a receiver. He played with the transmitter, sending little signals throughout the ionosphere. But, although he could send, he never received any answers. So the little terminal became unhappy. After much thought, God created another terminal, and He called the two terminals a LINK. Because He was a kind God, He assigned them a single frequency to use for communication, and He called this SIMPLEX WORKING.

Time passed and, as is wont to happen in the best of families, the two little terminals each wanted to claim the frequency for its very own. So God, in His infinite wisdom, gave each terminal its own frequency, and He called this COMPLEX WORKING.

More time passed, and almost nine months later, to the day (give or take a few days), a new terminal appeared. God decided He would call these terminals a GROUP.

Now He knew, from past experience, that trouble could arise, so He made the first terminal CONTROL. And He told Control, "You are the boss of this group, and you tell 'em how it's gonna be!"

And He left on vacation.

Now, Control decided that there was only one way to make everybody happy, so he gave each terminal a different transmitting frequency to use to contact the other terminals, and he called it COMPLEX SENDING.

Additionally, because he had some smarts of his own, Control gave each terminal a different receiving frequency, and all terminals, when sending to a particular terminal, used the frequency allotted to it. And he called it COMPLEX RECEIVING.

Still more time passed and the group grew. More terminals appeared and these terminals all chatted happily together. One day, as happens in all good stories, one of these terminals decided that he wanted to talk to two of his friends simultaneously, and he needed *two* frequencies to do so. Control agreed and called it DUALING.

Now Jealousy reared its ugly head! Another terminal decided he also wanted two frequencies, but he wanted to transmit *different* information simultaneously. Control was shook! But he said okay, and he called it DOUBLE CHANNEL OPERATION.

Two other little terminals, who had been watching all this byplay, decided they too should get into the act. They wanted to simultaneously transmit and receive messages in both directions between themselves, each using his one transmitter and his one receiver. Control began to worry, thinking, "This is getting out of hand!" But he said okay, and he called it DUPLEX OPERATION.

But, he added, just in case it should arise, the normal practice of transmitting and receiving messages between two terminals in either direction alternately would be called HALF DUPLEX OPERATION. And he went home and threw up.

Then God came home.

He looked around. He could not believe what He saw.

He called Control and asked, "What happened?"

Control replied, "The devil made me do it!"

God said, "I thought, when I told you you're the boss, you would have sense enough to use the KISS principle. That's Keep It Simple, Stupid!"

The moral of the story is:

"Terminals, and panels, should not mess with God's creations."

Artificial Intelligence

(Continued from p. 16)

• *Much human thought is essentially beyond formalization.* Weizenbaum refers to the recent work of Ornstein (1972) and the psychological discoveries concerning differences of function in the left and right hemispheres of the human brain. According to this (still somewhat new and controversial) finding, the left hemisphere specializes in sequential, logical, and verbal thought, while the right specializes in holistic, global, intuitive concepts, and movement in space. We have, thus, at least two major "modes" of thought: the "left-brained" mode produces structures like computer programs and formal descriptions, but the "right-brained" mode so far completely escapes our ability to pin it down in formal terms. We must use our "left-brained" methods to think rationally, and science singles these out as the sole avenues of thought for its purposes. Unfortunately for science and for AI research, human problem-solving and communication require that both "halves" of the brain work together in close cooperation. Dreyfus' distinction between "digital" and "nondigital" modes of thought, and his mention of "fringe consciousness," "insight," and "perspicuous grouping" as nondigital features of human thinking, appear to be closely related concepts.

• *Formal systems and empirical observations are essentially incomplete.* Weizenbaum alludes to Heisenberg's Uncertainty Principle as undermining the basis of emprical observation on which science is founded; further, Gödel's Proof exposed "the shakiness of the foundations of mathematics and logic itself," and proved that they "must necessarily be forever incomplete" (p. 221). Thus, there must always be things that we can never measure accurately, or describe completely.

• *Human beings are embodied.* Here Weizenbaum echoes, in almost the same words, one of Dreyfus' most important and interesting points. "It is not obvious that all human knowledge is encodable in 'information structures,' however complex . . . there are. . . some things humans know by virtue of having a human body. No organism that does not have a human body can know these things in the same way humans know them. Every symbolic representation of them must lose some information that is essential for some human purposes" (pp. 208-209).

• *Human beings are socialized by other humans.* "The human infant. . . is born prematurely, that is, in a state of utter helplessness. . . An infant will die if he is fed and cleaned but not, from the very beginning of his life, fondled and caressed -- if, in other words, he is not treated as a human being by other human beings. . . Thus begins the individual human's imaginative reconstruction of the world. And this world. . . is the repository of his subjectivity, the stimulator of his consciousness, and ultimately the constructor of the apparently external forces he is to confront all his life" (pp. 210-211). By virtue of facing and solving human problems, man's thought is determined in ways forever and essentially alien to the procedures and representations of a computer. "Man is not a machine. . . Computers and men are not species of the same genus" (p.203).

We are faced, as Weizenbaum vividly demonstrates, with a basic epistemological and moral dilemma. Science provides us with tools, in the form of descriptions, algorithms, and computer programs; we have employed these tools to gain an unprecedented degree of apparent control over the physical world. Science also provides us with a seductive and all-encompassing way of perceiving the world in terms of numbers, rules, and formalisms. We are armed with a plethora of instruments and devices, but we have cut out from under ourselves the basis of making value judgments, or for choosing whither we shall direct our armament of techniques. Science rules out by definition all the vast domain of reality that is subjective, that cannot be counted, measured, or proved, and where the bases of human choice truly reside.

Weizenbaum makes repeated use of a metaphor drawn from an old joke involving a drunk who has lost his keys on a dark street at night, but persists in looking for them only under the street lamp because "the light is so much better over here." This is the way science, and indeed all of man's "left-brained" undertakings, must proceed. The trouble comes when the scientist or programmer deliberately and consciously simplifies (and thereby impoverishes and distorts) reality, and then proceeds to accept that distortion as a complete and final picture, claiming to have produced a theory about the world when he has only pulled off a limited technical trick. "Indeed, what is sought can be found only where there is illumination. Sometimes one even finds a new source of light in the circle within which one is searching. Two things matter: the size of the circle of light that is the universe of one's inquiry, and the spirit of one's inquiry. The latter must include an acute awareness that there is an outer darkness, and that there are sources of illumination of which one as yet knows very little" (p. 127).

Since our scientific lamppost has no light to throw on any matter concerned with human values or purposes, we are in the position of the "compulsive programmer" who has forgotten, if he ever cared, what his program was supposed to do in the first place. "He has only technique, not knowledge. He has nothing he can analyze or synthesize; in short, he has nothing to form theories about. His skill is therefore aimless, even disembodied. It is simply not connected with anything other than the instrument on which it may be exercised" (p. 118). Enthroned in the midst of our artificial world and all our expensive gadgets, "we can count, but we are rapidly forgetting how to say what is worth counting and why" (p. 16).

Weizenbaum anticipates some of the objections that will be raised against his positions. The " technologist" will dismiss his arguments as "merely philosphical," and condemn them as polemical and subjective. Such objections are, essentially, just another way of saying that Weizenbaum's points belong to the world beyond the edges of that circle of light cast by the scientist's lamppost. He makes the only answer he can, repeatedly reminding the technologist that his keys are not where he is looking, however good the light may be there. A common defense of our total reliance on science and technology maintains that the only alternative is chaos, destruction, and mindless irrationality. Weizenbaum counters this argument in a forthright statement: "In fact, I *am* arguing for rationality. But I argue that rationality may not be separated from intuition and feeling. I argue for a rational use of science and technology. . . I urge the introduction of ethical thought into science planning" (pp. 255-256).

The inevitable refusal of those on the opposite side of the debate to accept as legitimate any of the grounds on which he bases his arguments confronts Weizenbaum with an impossible dilemma. "Anyone who wishes to persuade his colleagues to cooperate in imposing some limits on their research. . . risks being excommunicated as a sort of comic fool" (p. 266). Nevertheless, Weizenbaum states three kinds of uses to which he feels, on moral grounds, computer ought not to be applied. These are:

- projects that seek to substitute machines for parts of living animals to create hybrid bionic systems (for example, coupling an animal's brain and visual system to computers). Such projects are "obscene" and represent "an attack on life itself." "One must wonder what conceivable need of man could be fulfilled by such a 'device' at all. . ." (p. 269).

- projects involving the substitution of a computer system for a human social function. The use of computers or machines of any sort to take the place of a human participant in a "function that involves interpersonal respect, understanding, and love" is also "obscene" and ought not to be attempted, Weizenbahum maintains, because "respect, understanding, and love are not technical problems" (pp. 269-270). The obvious example of such projects is the use of computers as psychotherapists.

- projects that may clearly be seen to have unpredictable and irreversible side effects. As an example of this kind of application, Weizenbaum cites the automatic recognition of human speech. "I have no objection to serious scientists studying the psycho-physiology of human speech recognition," he says; the work he objects to is "mere tinkering," aimed ultimately at facilitating electronic snooping and wiretapping. He specifically mentions ARPA-funded speech research as the sort of work he means to condemn (p. 271).

Weizenbaum ends his book with a chapter which honestly and eloquently states his own personal position. Whether or not one agrees with anything he has said in the book, I feel that this frank personal statement deserves the greatest respect. He refers to his work as a teacher, with which he began, and which is obviously of great importance to him, much to his credit. He says that much of his message is directed in particular to teachers of computer science. Such a teacher, "no more nor less than any other faculty member, is in effect constantly inviting his students to become what he himself is. If he views himself as a mere trainer, as a mere applier of 'methods' for achieving ends determined by others, then he does his students two disservices. First, he invites them to become less than fully autonomous persons. . . Second, he robs them of the glimpse of the ideas that alone purchase for computer science a place in the university's curriculum at all" (p. 279). Weizenbaum makes a final strong statement of his position: "The computer is a powerful new metaphor for helping us to understand many aspects of the world, but. . . it enslaves the mind that has no other metaphors and few other resources to call on. . . The teacher must teach more than one metaphor, and he must teach more by the example of his conduct than by what he writes on the blackboard. He must teach the limitations of his tools as well as their power" (p. 277).

What should our reaction be to this book? Admittedly, it is often a polemical, biased, and emotional presentation. On the other hand, many excellent and telling substantive points are raised which merit a serious effort at understanding on their own terms and a reasoned reply based on such an understanding. The clear, well-presented chapters on the nature of computers, programs, theories and models, etc., written by a man who has "paid his dues" through many years of competent and creative computer science research, are in themselves rewarding features for any reader aside from the value judgments elsewhere in the book. Dismissing Weizenbaum's positions out of hand as "New Left" propaganda is not, in my opinion, a justifiable approach to the book's more controversial points. After all, the deeper issue is not the particular computer applications he personally objects to, but rather the fact that he challenges each of us to take up our own stand about how technology should or should not be used, and what kind of a world we want for ourselves and our children.

Several critiques have already been directed at Weizenbaum's book by members of the AI community. In the June 1976 issue of the *SIGART Newsletter* (a publication of the Special Interest Group on Artificial Intelligence in the Association for Computing Machinery), pp. 4-13, there is a highly interesting collection of reviews and a rebuttal by Weizenbaum, all originally available on the ARPANET on-line communications network linking many major research centers. The first review, by Benjamin Kuipers of the AI Lab at MIT, is entitled, "Reactions to Weizenbaum's Book." It sets a very balanced and restrained tone, and seems open-minded and even sympathetic to many of Weizenbaum's viewpoints. Kuipers clearly seems to understand and acknowledge Weizenbaum's frame of reference, and agrees on the importance of avoiding a narrowly instrumental approach to human reason and scientific undertakings. He claims, however, that AI researchers are already well aware of and engaged with these issues, and he is "puzzled by Weizenbaum's vehement attacks" on the AI community. He also accuses Weizenbaum of obscuring his valid points by "harsh and sometimes shrill accusations" and "personal attacks" (p. 4).

A very long review by John McCarthy of the Stanford University AI Labor, entitled "An Unreasonable Book," takes a much more impatient and hostile attitude (pp. 5-10). McCarthy characterizes the book as "moralistic," "incoherent," and self-contradictory on matters Weizenbaum has not thought through as carefully as he should have. In several places, he raises the interesting point that Weizenbaum's "moralistic" strictures may be twisted and exploited by "activist bureaucrats" or "public interest organizations" as an excuse to stifle scientific freedom or to redirect scientific endeavor. "I am frightened," says McCarthy, "by the book's arguments that certain research should not be done if it is based on or might result in an 'obscene' picture of the world and man. Worse yet, the book's notion of 'obscenity' is vague enough to admit arbitrary interpretations by activist bureaucrats" (p. 5).

It seems to me, in reading McCarthy's comments, that science itself represents an ultimate value source for him, like a religion. He appears to accept it as such unquestioningly, to the point where he is completely unable or unwilling to entertain the suggestion that any other value source might take precedence over science. In support of his overriding respect for science, he presents an uncompromisingly absolute (and emotional!) statement by Andrew D. White, first president of Cornell University: "'In all modern history, interference with science in the supposed interest of religion . . . has resulted in the direst evils both to religion and science, and invariably; and, on the other hand, all untrammelled scientific investigation . . . has invariably resulted in the highest good both of religion and of science'" (p. 9). For McCarthy, evidently, "scientific freedom" is an unquestioned value in itself, which must be preserved as our first priority, and at any cost.

McCarthy takes issue in his review with almost every point that Weizenbaum made; in my opinion, however, he does not come to grips directly with Weizenbaum's essential arguments. He dismisses them *in toto*, much as many AI workers dismissed Dreyfus' earlier work. His approach is purely pragmatist: anything is moral so long as it "works." "Using computer programs as psychotherapists. . . would be moral if it would cure people" (p. 7).

Weizenbaum's response to McCarthy forms the third and final portion of the presentation in the *SIGART Newsletter* (pp. 10-13). He reiterates the main arguments of the book, and defends himself against some of McCarthy's more barbed attacks. He provides a direct rejoinder, for example, to McCarthy's pragmatic justification for computer psychotherapy; this reply can serve to bring into focus the basic gulf between the two viewpoints. "Prefrontal lobotomy 'cures' certain mental disorders. But at what price to the patient, and, I would add, to the surgeon as well? I believe that machine-administered psychotherapy would induce an image of what it means to be human that would be prohibitively costly to human culture."

In closing, I would like to single out three points that seemed most important to me in Weizenbaum's book. These are, at least in part, highly relevant to many of our concerns as employees of a large government organization that uses computers.

- *A solid theory base is crucially important.* The lesson of DENDRAL and MYCIN, pointed out by Weizenbaum, has been presented by others also: the cooperation of one or more specialists who are highly skilled and gifted in the problem area, and, can transfer their knowledge into the program's knowledge base, is a vital prerequisite for a successful application. This means that the problem, the data, the habits of working of human problem-solvers, the function of the automated process within a larger context, etc., must all be intensively studied and deeply understood. Then a model must be developed which is sufficiently detailed and representative of all aspects of the problem situation to satisfy the needs of those who will use the program. And, ultimately, this means more emphasis on learning about the problem, the data, and the man-machine interfaces and less emphasis on instruments and techniques as such: more on the "what" and "why," and less on the "how."

- *Control over the technology or program is essential.* Someone, or some small group of people, must maintain a grasp on how the program or device performs. Someone must be watching to see that the data and the problem situation do not drift away from the program's model. Someone must be able to detect malfunctions and correct them, not with a "patch," but by amending the model and, if necessary, also the theory beneath the model. We must even be willing to junk the model altogether if it breaks down, and build another. All of this, again, forces us to direct constant attention to the problem, the data, and the human users who must work with the program.

• *Human goals have overriding importance.* We cannot take our values and goals for granted, as if they were somehow part of the package containing our current scientific theories and the state of the art in some technology. We must find a way to choose where to put our effort, which programs to write, which techniques to use, which problems to solve -- a way that does not simply reflect the monetary or political pragmatism of the moment. I am doubtful about the reality of "pure research"; most research gets done because of passing fashions, interests, and demands; simply because a given field is active and "paying off" at the moment; or, even worse, just to get another paper into the literature. I agree with Weizenbaum in wishing that basic human considerations could have a larger part in the motivation of those choices that will, inevitably, be made. Weizenbaum does not tell us how to make better choices, but he has had the courage to tell us how he himself has chosen what he will and will not do with computers.

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Winograd, T., *Procedures as a Representation for Data in a Computer Program for Understanding Natural Language.* PhD Dissertation submitted to the Department of Mathematics, MIT, August 24, 1970.

From Weizenbaum's Preface:

Briefly summarized, I composed a computer program with which one could "converse" in English (by means of a typewriter). . . I chose the name ELIZA for the language analysis program because, like the Eliza of *Pygmalion* fame, it could be taught to "speak" increasingly well. . .

For my first experiment, I gave ELIZA a script designed to permit it to play -- I should really say parody -- the role of a Rogerian psychotherapist engaged in an initial interview with a patient. . . DOCTOR, as ELIZA playing psychiatrist came to be known, soon became famous around the Massachusetts Institute of Technology. . . (and) at other institutions in the United States. The program became nationally known and even, in certain circles, a national plaything.

The shocks I experienced, as DOCTOR became widely known and "played," were due principally to three distinct events:

1. A number of practicing psychiatrists seriously believed the DOCTOR computer program to have the potential of growing into a nearly completely automatic form of psychotherapy. . .

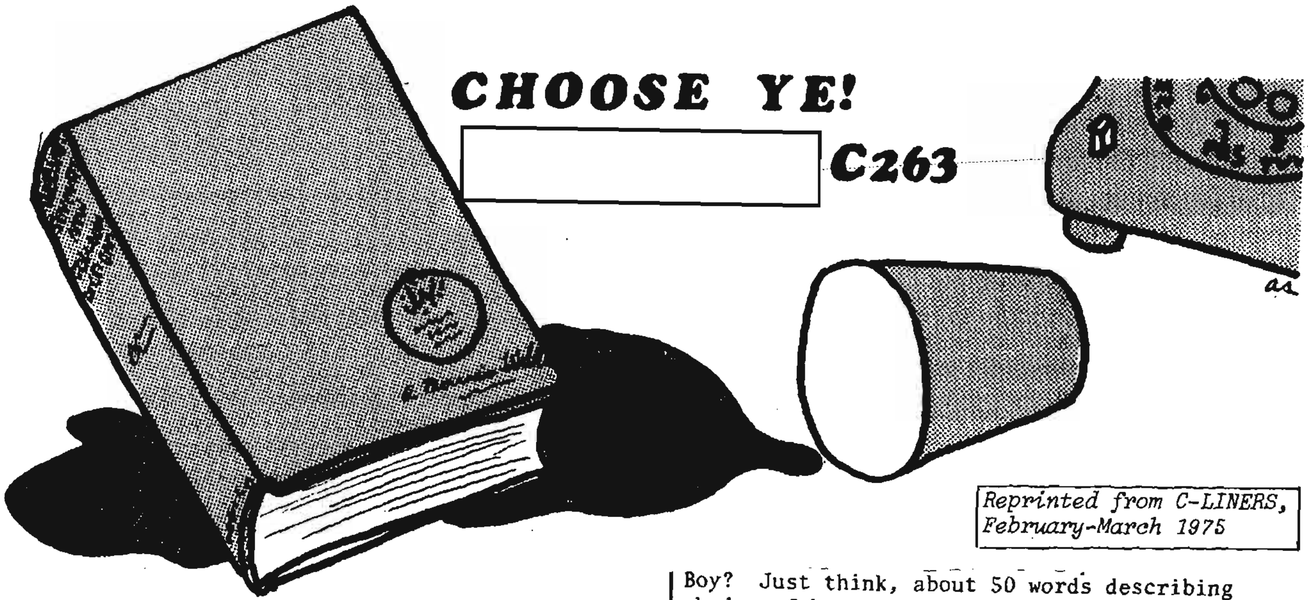
2. I was startled to see how quickly and how very deeply people conversing with DOCTOR became emotionally involved with the computer. . . My secretary, who had watched me work on the program for many months and therefore surely knew it to be merely a computer program, started conversing with it. After only a few interchanges with it, she asked me to leave the room . . .

3. Another widespread, and to me surprising, reaction to the ELIZA program was the spread of a belief that it demonstrated a general solution to the problem of computer understanding of natural language. In my paper, I had tried to say that no general solution to the problem was possible, *i.e.*, that language is understood only in contextual frameworks. . .

CHOOSE YE!

C263

P.L. 86-36



Reprinted from C-LINERS, February-March 1975

"This technique will eschew the obfuscation prevailing in the system." When I first read this line, it was Monday morning, and I hadn't had my first coffee. In my excitement fumbling for the phone under emergency conditions, I spilled my coffee. It ran under my Webster on the desk. Still grappling for the phone, I pulled the dictionary deeper into the coffee. In spite of all this, my only thought was to make my call and get rid of the "obfuscation in the system."

The clue was right on my desk. The dictionary was now coffee-soaked. It was as though Old Noah was deliberately maneuvering his book into a position which would prevent my using the phone. But I still didn't catch on.

Wouldn't you know it? The line is busy. Perhaps a fast rereading of the memo would help me to better understand the problem. Yes, this guy was in real trouble. Not only was he plagued by "obfuscation," but he also had a "plethora of common recordings." I wonder why he didn't call me instead of writing a memo. Perhaps he also had a Webster on his desk.

Now this has gone far enough and I apologize to my readers, but I cannot exonerate Webster for his part in this fiasco of communications. In his desire to record our language, Webster unwittingly gave us an overabundance of choices of words. One might say that we have the Midas touch in our lexicon. We, like the king, may starve to death unless we discipline ourselves in the art of choosing.

Further compounding the problems are the many thesauruses lying around unguarded like Pandora's boxes, just waiting for the unwitting to lift the cover. Now, I did it: 300 words to replace "use," but only 50 to replace "possibility," but each, you must remember, is just a shade different from the others. Leonardo would certainly have stopped with finger paints if someone had told him that there are over a hundred shades of brown. Then, what about Gainsborough's Blue Boy? Just think, about 50 words describing shades of blue.

At this point I am about to be accused of, among other things, being against mother love, apple pie, and hot dogs, but really I'm not. I love Mom.

Who except the one trained in chromatography can distinguish between ochre and saffron, both shades of yellow? Possibly he's the same person who can distinguish between "use" and "utilize," or "possible" and "feasible."

Even the job titles of our duties give credence to this attempt to cushion the impact of our communication. What does a "coordinator" do? What is a "focal point"? In the latter title I envision many inputs being channeled through a small opening, sometimes called a lens, sometimes a bottleneck, and emerging inverted, completely reversed, at some secondary destination. Is a focal point a passive position in which the only requirement is to sharpen up the image of a previous input, as does a lens, or can it take independent action and contribute to the output? My apologies to all who must bear up under this label.

It is all too easy to poke fun at ourselves, but it takes a little more thought to find solutions. So, then, why do we choose words for a particular job anyway? There are many reasons: you may or may not agree. One textbook says that we write to direct, inform, or persuade. I have observed that we also write to impress, confuse, stall, or even retaliate. Then there is the neutrality syndrome. Some writing is done, of all things, to communicate. Perhaps you could make a few additions to my list.

If, upon weighing a particular reason for writing, the decision is "to communicate," I believe that there is but one rule in picking the best word: pick the shortest and most common word. Risk being called a square. Make the decision now. Decide whether you would rather "eschew the obfuscation" or "avoid the confusion."

Solution to NSA-crostic No. 7 (CRYPTOLOG, April 1977), by L. R. Chauvenet, P12.

[redacted] "[The Thrusts and Boggles of] Outrageous Escalation", *NSA Technical Journal,* Vol. XIII, Spring 1968, No. 2:

"Not everything has to be *per se* in order to be real; reasonable deals were rarely mentioned but the old *quid pro quo* was much in evidence; but the true winner in the foreign competition was *vis-a-vis* . . . a beguiling Frenchy sound. . ."

(UNCLASSIFIED)

Letter

To the Editor, CRYPTOLOG:

I must confess that I thoroughly enjoyed -- even found hilarious -- the article in CRYPTOLOG entitled "A Medal for Horatius" (January-February 1977). I see the "colonels' club" was active in those days too! Having had a similar experience in the not too distant past -- trying to justify the awarding of a Legion of Merit decoration to one of my military subordinates, over the objections of various but nameless peoples and boards -- I found it gratifying to realize that inanity can also be humorous. Thanks for the laugh.

[redacted] B311

P.S. Thanks to Regular Army channels, the award finally came through.

(UNCLASSIFIED)

DID YOU GET YOUR INDEX?

The cumulative index (1974 through 1976) of CRYPTOLOG articles and authors' names was distributed in February according to a special distribution list. If you requested a copy but did not receive one, or if you did not request a copy originally but would like to have one anyway, please write to: CRYPTOLOG, P1, or telephone the editor on 5236s.

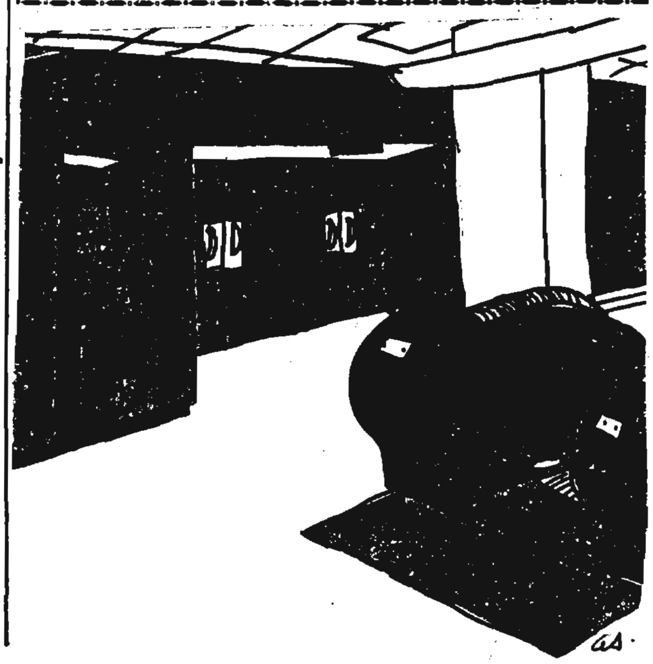
(UNCLASSIFIED)

ANNOUNCEMENT:

P.L. 86-36

With this issue, [redacted] ends her tour as Cryptanalysis Editor of CRYPTOLOG. Betty has been a member of the Board of Editors since even before the first issue of CRYPTOLOG appeared in August 1974. In addition to contributing articles of her own ("What Should You Expect?, or, The Analysis of Cryptanalysts," August 1974; "Secrets of the Altars -- The Moustier Cryptogram," September 1974; "An October Overlap," October 1975; and "Twenty Years of Transposition," August 1975), Betty has been of invaluable aid in encouraging cryptanalysts, young and old, to write articles for CRYPTOLOG. In her current assignment, however, Betty has fewer opportunities to sniff out good articles, and therefore has asked to give this important job to someone else who has more such opportunities. [redacted] G42, has graciously agreed to become Betty's successor as Cryptanalysis Editor and promises to beat the bushes for good articles in that field. So, Betty, thanks for doing a wonderful job all these years, and, Alice, now it's your turn -- so, go get 'em!

William Lutwiniak,
Publisher



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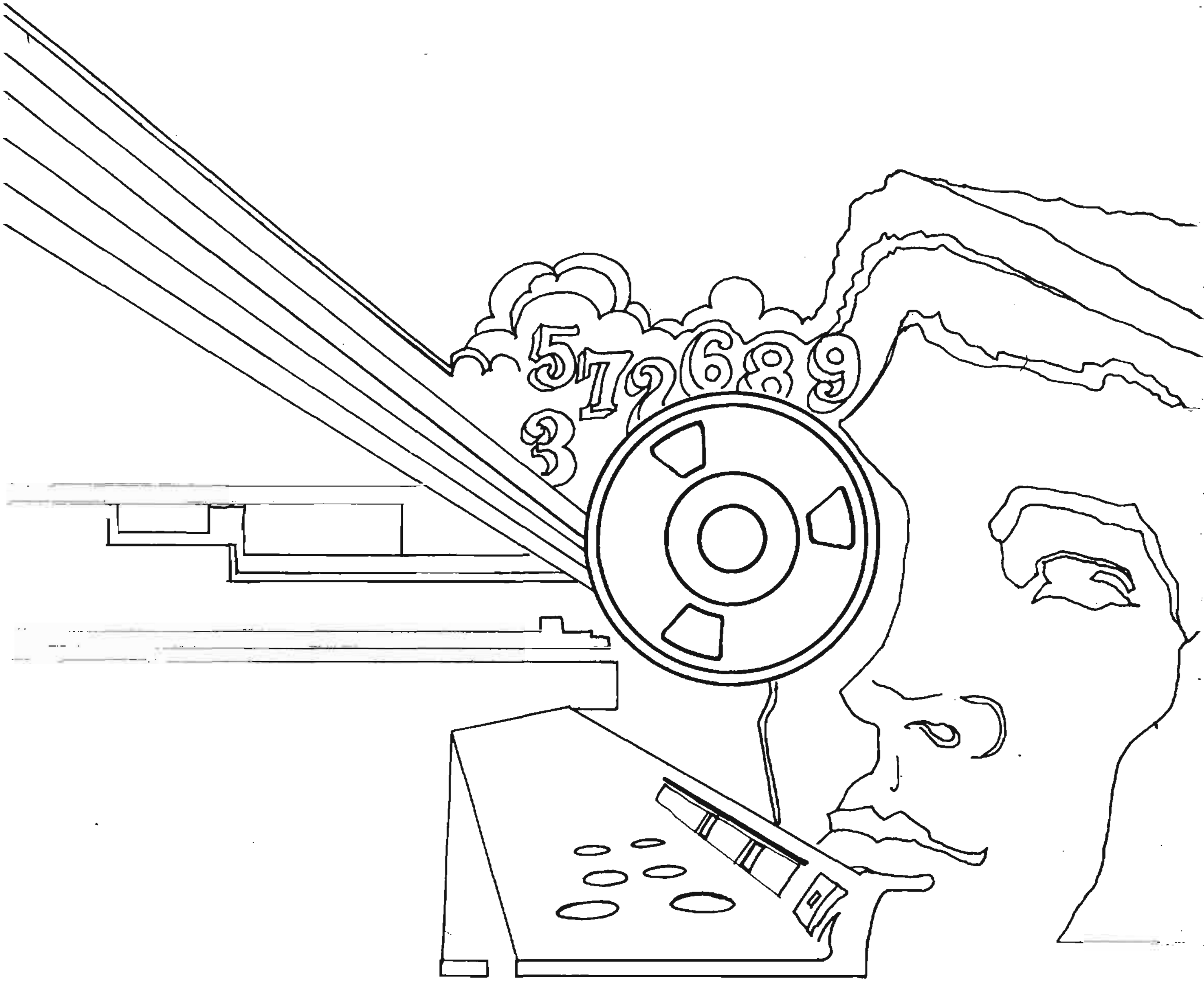

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