Letters

Who Gets the Word?

I am surprised that scientists and the representatives of scientific organizations have not publicly protested the newly instituted system in the Department of Health, Education, and Welfare of releasing information concerning scientific grants and contracts through the offices of congressmen. In my opinion, several dangers are inherent in this system.

First, the scientist's earliest knowledge of the success of his application is less likely to come through the regular channels of the agency awarding the grant than from a local reporter who wants "background information," or even from a neighbor who reads all the minor notices and promptly asks, "What are you going to do with all of that money?" After all, everybody *knows* what happens to government funds for swamp drainage, steam control, and highways. The reporter wants to *know* also what the results of the scientist's study are going to be—and if the scientist isn't willing to stick his neck out now, then early next month. The statements that emerge can be devastating.

Second, the announcements in the newspapers are often inadequate and misleading. No distinction is made between a grant of $20,000 for each of 10 years and a grant of $200,000 for 1 year; each is "a $200,000 grant." The headlines can be a source of amusement. (After a headline like "Ten Tons of Topaz-Tinted Fruit Flies Subject of Research Grant," the scientist can expect biological contributions in the mail for months.)

Third, the suspicion arises that the congressman helped to obtain the grant. This leads to the additional suspicion that scientific projects are being furthered with the aid of politicians. This, in turn, leads to suspicions that are even more unsettling.

Lastly, the official announcement of the grant award may be greatly delayed, and the project—the original object of all this attention—is off to a slow start, although with its future conclusions already printed and the lab chockful of equipment salesmen.

Apparently this situation is due to the efforts of the Department of Health, Education, and Welfare to pacify congressmen. Such a policy may only increase their curiosity about why the gesture was made in the first place.

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Automated Decision Making: A Threat, or a Promise?

Apparently Cowan ["Decision theory in law, science, and technology," *Science* **140**, 1065 (1963)] believes he has discovered something important in his generalization that the focus of scientific inquiry is shifting and that today the scientist *"is being recognized as a decision maker"* (his emphasis). Has this ever been doubted among wise men during the past 400 years? Did we really need game theory or computers to make us aware of this? What Cowan seems unable to state clearly is that vast amounts of quite subtle decision making, requiring comparison, inference, judgment, and so on, are at bottom quite banal and trivial and that mankind will gladly hand over such operations to machines, while retaining for itself increasingly more challenging and creative levels of decision making about how decisions are to be fed into machines. That this is bound to transform legal processes as well as other human disciplines is neither to be wondered at nor feared. It has long been the impression of many of us that at least 90 percent of what is traditionally considered the "creative" employments of physicians, judges, lawyers, editors, is no less sheer hackwork than the physical exertions of day laborers. Why not let it go with shouts of hurrah rather than with dire forebodings?

This brings us to what was doubtlessly intended to be the core of Cowan's discussion, that is, his justification of why there is no cause for the legal community to get "so aroused at the extravagant claims of computer enthusiasts." On the one hand he claims too much for the computers, and on the other he claims too little. His ambiguous stance is neatly conveyed in his observations concerning the United States Supreme Court. He agrees that there is merit in scientific studies of legal decision making and speaks of the motives behind them as "unimpeachable." Later appears this sentence: "But we are hardly prepared to turn that august body [the Supreme Court] into a group of experimental subjects to test the results of factor analysis!" This evades the crucial point. No responsible scientist would suggest that we do violence to any social body or grouping—be it very august or very humble—by transforming it into experimental subjects for test purposes. But it may very well happen that we will one day achieve, with the help of computers, a legal and social system in which something called a supreme court is no longer needed. Why is the United States Supreme Court any more hallowed than scores of sanhedrins, general courts, and privy councils which have long since passed into oblivion even without the aid of computers?

Cowan's excessive claims for the computers have to do with his concept of "brain power." Here his tendency to make facile dichotomies (thinking and feeling, arts and sciences, man and nature) leads him into the trap of thinking that the automation of all muscle processes is good but that the automation of "brain power" is a "much more serious matter." We are told that "man willingly substitutes mechanical energy for muscle power wherever he can," but this of course is only superficially true. No man who likes to garden or play golf, or who enjoys indulging in sexual intercourse, for example, is going to deprive himself of utilizing certain kinds of muscle power no matter what the automation experts may yet have up their sleeves. Cowan correctly points out that high-speed computers have relieved man of staggering amounts of mental calculations, but he tries to save his case by referring to this as "finger work." It can be predicted that for generations to come school children will continue to get some pleasure out of that homey brain-power function known as "mental arith-

metic" no matter how sophisticated the computers become, just as amateur pianists will continue to play the piano even after we have come up with a machine that can play more exquisitely than a Rubinstein or a Richter. In the last analysis, science enables us to find a way to coexist, not to compete, with the machine. (One recalls the 19th century prediction that photography would transform all artists into has-beens.)

In common parlance it is of course frequently convenient to make a fairly rigid distinction between brain and brawn, but this will not do in scientific discourse. The concepts of "physicality" and "mentality" simply fall apart when we have to deal with such important phenomena as human creativity or sexual love. Where does the genius of a great sculptor reside, in his fingers, his eyes, his brain, or his "soul"? Do great athletes, who tend not to be intellectuals, nevertheless have a certain formidable kind of "brain power"? The simple automation of brain processes is no more a "serious matter" (in the sense of being a threat or an imponderable challenge) to the intellectual pursuits of man than is the invention of space flight a serious matter to the distance runner.

I know less than I should about computer theory and technique, but I know enough about human psychology and physiology to recognize that Cowan leads us down a primrose path of intellectual extravagances when he suggests that computers pose some unheard-of challenges to the human species and that they expose potential activities "infinitely greater than either the telescope or the microscope, or of any other instrument in the history of science." Much or even unprecedentedly greater, yes. But infinitely? No. The realm of man's potential conquests is truly astounding, but it is not infinite. If science has taught us anything, it is that we are creatures of finite potentialities. Cowan is a poor stylist when he makes statements such as this: "The telescope literally remade the whole universe." It is not given to man, or a contrivance of man, to remake the universe either literally or figuratively. It would be more correct to say that the telescope (and the microscope) caused man to begin a radical reassessment of his own role in the universe, compelling him to see what a humble and finite creature he truly was, and not merely in the theological sense. This was Newton's great insight, for he did not see himself as one who had helped remake the world in Cowan's sense but, as Newton himself expressed it in the well-known statement made shortly before his death in 1727, "like a boy playing on the seashore, and diverting myself in now and then finding . a smoother pebble or prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me."

But let us, for the sake of the argument, stretch the limits of potentiality to the utmost. Let us assume one of the ultimate fantasies, that science one day succeeds in conquering death, in making man immortal. Will this mean that man will then confront still another "infinite" series of potentialities? Not at all. One of the chief meanings of death, at least in the consciousness of man, is that it causes him to think profoundly about the meaning of life. But the need to think deeply on the meaning of life would exist even without death, for every man must daily reaffirm in some dimension of his being, no matter how unconscious, the decision to go on living, and immediately thereafter the decisions about how to live. For all we know, the "suicide rate" might rise under conditions of immortality. Surely immortality would compel man to struggle with problems fully as awesome as those presented by mortality. Since man is ultimately limited not only by time, but also by space and how much can be crowded into his sensory apparatus, why must we assume that an infinity of time necessarily permits an infinity of potentialities? Man's potentialities are wonderfully malleable and expandable, but being a creature of flesh and blood man remains man. Incidentally, this was one of the brilliant insights of the nonscientific Greeks who gave their gods the gift of immortality while not depriving them of the passions of men.

Computers may indeed make for far-reaching revolutions in the practice of law, medicine, and science, and perhaps even more rapidly than Cowan suspects once we have solved certain terribly urgent problems in the socio-economic sphere of man's relationships. But since man is composed of man-like traits and not merely of the atomic stuff of which computers are made, neither his peculiar brand of creativity nor his special blend of physicality and mentality will ever permit him to surrender all brain processes to computers. On the other hand, I do strongly suspect, Cowan's protests notwithstanding, that the practice of law as we know it today will at some future time all but wither and disappear, and that this discipline will become as vital to the higher pursuits of man as blacksmithing is to atomic technology. "The law" will survive, but I suspect that lawyers, at least as we know them today, are doomed. In any event, may the computers flourish and multiply and revolutionize the world.

As for Cowan's conclusions, they are commonplace and unilluminating. They boil down to the following: (i) science is without a coherent theory of individual or collective human behavior (which no one denies), and (ii) factor analysis is "important" but not scientific (a questionable assertion which does not follow from the discussion). The last paragraph contains a somewhat slighting reference to enthusiasts of "one world, one law." Apparently Cowan does not believe that the pursuit of this end, surely one of the soundest humanistic ideals embraced by great philosophers and law-givers, is worth the "bother." Despite my criticisms of Cowan's paper, it is clear that he is a man of good will, and it is thus painful to see him end his discussion on this futile note. No matter what we may think of computers or law or the destined role of science, certainly the quicker we can bring mankind together under "one world, one law" the better for all of us.

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Consanguineous Marriage

Exception must be taken to the implication in one sentence of Lloyd Cabot Briggs's review of *Nomades et Nomadisme au Sahara* [*Science* **141**, 1266 (1963)]: "And once again there is an echo of the antiquated belief that consanguineous marriage is biologically dangerous." The idea (or "belief") is ancient but not antiquated. The matter has been under study at least since 1858, when Bemiss reported on a survey done at the request of the American Medical Association. More sophisticated studies have been done in the last 15 years. All show a direct relation between the closeness of relationship of parents and the risk of illness and premature death in the offspring. I suggest that the reviewer also review Curt Stern's *Principles of Human Genetics* (Freeman, San Francisco, ed. 2, 1960), especially chapter 19. Also useful is