

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 non-scientific 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

Newton Morton's paper "Morbidity of children from consanguineous marriages" in Steinberg's *Progress in Medical Genetics* (Grune and Stratton, New York, 1961).

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Mea culpa. Dr. McKusick is quite right, of course. What I meant and should have said was, "... that consanguineous marriage is *always* biologically dangerous." What I was really shooting at was the popular belief, common among the scientifically unsophisticated, that consanguineous unions *inevitably* produce feeble-minded or physically deformed offspring or descendants, by some mysterious and essentially nongenetic process. I have had my nose rubbed in this belief so often and so hard during my years of work abroad that I have perhaps become overly sensitized to it. I fully realize that ill effects do result from such marriages, in varying degrees according to the deleterious gene loads of the partners, and obviously I should have made this clear or not brought up the subject. And I am grateful to Dr. McKusick for calling it to my attention.

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Noise

Where are the acoustical engineers of the country? We know that this large and able group of highly trained scientists is deep in research and practical technology. Perhaps they are busy designing auditoriums or suppressing the sonic boom as the jets break the sound barrier, or controlling the noise of a submarine. They must be hard at work on some important project, but unfortunately they are not very effective in helping the tired businessman relax in a quiet office, hotel, or home.

The fault may not lie entirely with the acoustical engineer. It may be that he has the know-how but that he is over-ruled by the building and equipment industry. It would seem, at least from the layman's point of view, that most research and technology in these industries are directed toward cheaper construction to offset rising labor costs, provided showy exteriors and interior decoration remain to dazzle the casual observer.

The tired businessman, or victim, purchases what looks to be a beautiful ranch-type rambler home in which to relax after a tough day in a noisy office. The noise continues throughout the night. The heating system roars intermittently with ventilating fans or noisy circulating pumps. He becomes thirsty and draws a drink of water from the bathroom tap, awakening everyone in the house as the water rushes through paper-thin copper tubing. If a toilet is flushed, there is no more sleep for anyone. Such noises did not occur with the old-fashioned red brass or heavy copper plumbing now considered antiquated. Flexible, thin-wall noisy piping is used because it costs less and repairs can be made by snaking new lines through the walls. Even for drain lines, thinner-walled pipe, of smaller diameter, is being used, giving rise to noisy surges and other hydrodynamical phenomena if several toilets are flushed simultaneously. The British are far ahead of us in the design of noiseless plumbing, accessories, valves, and so on.

To reduce cost, interior and exterior walls are made thinner each year, with inadequate insulation against heat and cold and, of course, no attention to noise. One finds that a central air conditioner installed to offset heat input through the thin walls is so noisy that it must be shut off at night, regardless of the location of the compressor. Anyone who uses, instead, one of the so-called "quiet" window air conditioners finds the noise just as disturbing, and there are complaints from nearby homes. If the compressor and cooling tower of a central system are located outside the house, sooner or later there are visits from unfriendly neighbors or the police.

Some manufacturers and builders of equipment are installing cooking stoves, ovens, and broilers with no ventilating fan whatever. Perhaps they are noise-conscious, but do not be misled by the claims that when the door of the broiler is opened a crack there are no fumes. It is going to be interesting to see what grease deposits accumulate on the interior walls of the large apartment houses now being constructed with no provision for ventilation, to say nothing of the odors as one enters the building. Here, certainly, ventilating fans are needed, regardless of noise. Fortunately they need not be operated at night. Of course, some of the odor and fume problems can be solved by use of the so-called electronic devices that add

toxic ozone to air circulated by the fan. The home-owner may choose between smell and headache-plus-noise.

The noise problem is even worse in the modern hotel or motor inn. If one enjoys music he will hear plenty from radios and television sets several doors down the hall, all simultaneous and in chorus. Conversation in the adjoining room is quite audible through the thin partitions. To the layman it seems astonishing that all the motels or hotels in a chain of motels or hotels are based on the same design, regardless of location. For example, in a resort area at a high elevation, all the windows may be sealed, as they would be in a humid, hot climate, making it impossible to enjoy the cool evening breeze.

Moreover, if the hotels should make a survey they would be surprised at the number of people who avoid some of the modern buildings because the heating system in winter and the cooling system in summer are so noisy that sleep is impossible. Often there is no way to cut off this circulation.

A proposal to run a railroad track or even a speed highway through a restricted residential section will arouse the populace to fury. Yet we tolerate without complaint major air routes a few hundred yards over our homes.

If one desires quiet in his home he must avoid the sales pitch of the modern building contractor. He had better purchase a house at least 60 years old. This will of course require remodeling of bathroom and kitchen, but with the help of a good acoustical engineer the buyer stands a fair chance of minimizing noise, and the purchase price plus the cost of improvements will be no more than the inflated costs of flimsy modern construction.

Mental diseases are said to be the greatest affliction of all illnesses. These certainly are not improved by living in a miniature boiler factory. It may cost a little more to design homes and public buildings properly, making use of the information developed by the acoustical engineering profession.

Eventually the problem will be solved. The Federal Housing Authority is promoting noise insulation, based on the work of the National Bureau of Standards. However, by the time the building industry and the architects are educated to the requirements, most of us will be immune to noise, buried under six feet of sod.

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