Letters

Legislating Biological Concepts

The heart transplants have stimulated a blizzard of legislative proposals, as well as authoritative pronouncements by nonparticipants, and have made biological ethics—whatever that is—the fashion of the season. The specter of scientific and political regulation of biological research is alarming. As individuals we know so little, and our ignorance as committee members is even greater. It is disquieting to see that such committees lump biological concepts together with practical social aspects of surgery. Even well-meaning committees cannot legislate creativeness, and hence *any* action is apt to be a limiting one, for one reason or another.

The culture of human cells is another area in which a collision course between the will to know and the fear of knowing may take place. Are human cells really people? We have established more than 100 cell lines from the peripheral blood of our colleagues and of strangers. These seemingly normal human lymphoblasts apparently have an infinite life in culture and can be preserved for years in cell banks. Practical problems include identification schemes for these cell lines. Serial numbers offer the advantages of "anonymity," but name or code words are more convenient and less subject to error. Even if both name and initials are replaced with a designation like "RPMI #5278," most workers identify the culture with the donor, epecially if the cells are peculiar. The acute disappointment of a young colleague when *his* cell line was discontinued provided a sharp reminder of the emotional and "ethical" aspects of this research.

Future complications may be limitless. The cell physiologists have developed lovely methods for growing mature plants from certain kinds of cultured cells. If one merely ignores a few theoretical and practical problems, it is easy to imagine biopsying a favorite movie star and setting out to grow a thousand of them in the laboratory. A special committee should handle this matter.

The dangers of mandating committees, whatever their distinguished sponsorship, are very real. The knowledge of the informed and the uninformed is really not very different in an evolutionary sense. A deliberate attempt to guide future research on the basis of present knowledge is quite different from facing the social implications of organ transplantations. The first order of business of any such committee or commission should be to limit discussion to immediate social problems rather than to construct fables as a result of fear of future knowledge.

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Computerized Conditioning Device

Since I have frequently heard complaints about the lack of equipment in the laboratories of the "developing countries," I want to describe briefly the automatic conditioning apparatus we have been using successfully for many years in training all sorts of small animals (rats, fish, salamanders, and others). It makes use of a computer whose existence is being more and more neglected, especially in those labs which are able to employ more expensive programming systems. It is a high-breed multichannel digital-analogical computer —not merely a digital computer coupled to the output of an analogical, or vice versa. It is actually composed of 10^{10} operational amplifiers coupled by digital transmitting lines. It requires a very low power supply (about 20 watts for the computing system and 100 watts with all the accessory machinery). Moreover, it does not require any electricity. It can be run on a number of different fuels like animal or vegetable protein, starch, sugar, or even plain ethyl alcohol (not recommended for prolonged operation). It does not have punch-card or magnetic tape inputs, and does not require the use of Fortramm or any other computer language. It can be programmed by either typed, legibly handwritten, or spoken instructions in basic Spanish (we had a notice about other sophisticated models that can be programmed in English or even more exotic languages).

We have coupled this computing device to a homemade wooden shuttle box or a glass aquarium, and, after the programmer has fed in the proper instructions, it can perform a large number of tasks that no other machine that we know of, not even the most expensive, is able to do. For instance, besides giving the reinforcements at approximately random intervals (for which it must be coupled to another automatic device called a chronometer), it can automatically increase the delay between the start of the conditional stimulus and the application of the unconditional shock at the first sign of a classical conditional response so that it will further develop into an instrumental avoidance; it can recognize and automatically preclude the formation of avoiding responses other than the desired one (like jumping to the ceiling of the box and hanging there, or stepping on two bars of the same polarity); by a very simple correcting procedure (pushing the rat down or aside, whichever applies, with a wooden stick), it can stop reinforcing an animal at the first signs of fatigue or overtraining (usually identified by an increased latency or even a lack of response to the shock) and automatically change it for the next animal; it can record all the events happening during the experimental session directly in printed basic Spanish; it can report either by sound or by printing when an animal reaches criterium, so the programming may be modified at that time. It has been performing these, and many other tasks too long to enumerate, for up to 6 hours daily, without any overheating or overloading of its memory, at a ridiculously low machine-time fee, and without any need for repair or part replacements for many years. The upper limit of performance of this machine is determined exclusively by the ability of the programmer, and not by the circuits themselves.

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