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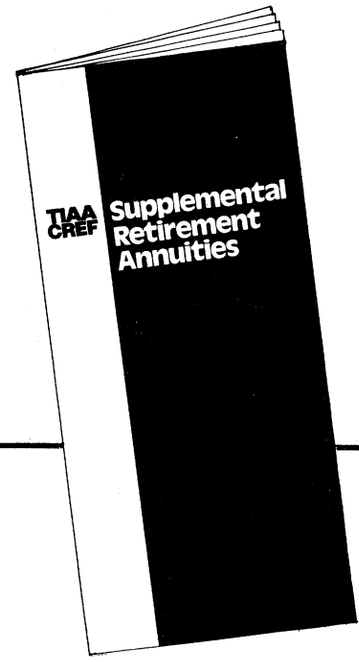

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COVER

Preserved cell wall structures are apparent in a cross section of silicified wood (approximately 90 percent silicon dioxide) 200 million years old from the Petrified Forest National Park, Arizona. Phenolic and alkyl-substituted aromatic compounds extracted from these fossil woods attest to the stability of lignin-derived materials in the environment (about × 325). See page 1054. [Anne C. Sigleo, University of Maryland, College Park]

LETTERS

Cloning and Maternal Inheritance

In response to Paul R. Gross's illuminating discussion of maternal inheritance and the cloning hysteria (Letters, 14 Apr., p. 126), Mitchel Sayare (Letters, 5 May, p. 486) contends that a literal replica of an individual would result " . . . if the donor of the somatic nucleus were the same person as the source of the ovum." On a date so close to Mother's Day, the facts must be set straight. A truly identical copy of the donor of a nucleus would need to have developed under the influence of egg cytoplasm identical to that which influenced the donor's development. Therefore, the production of exact copies is not limited to persons capable of oogenesis, but to those with living mothers. Since the size of a woman's oocyte pool declines progressively from a maximum attained before birth, and since human oocytes apparently undergo senescence, as indicated by the increase in chromosomal nondisjunction with age, the candidates for exact duplication may be further restricted to those with young mothers, a category which presumably excludes millionaires in their 60's.

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Mitchel Sayare seems to be accusing me of having overlooked those members of the human race who are capable of oogenesis. I hate to respond, for fear of spoiling the fun of cloning stories, and because a more detailed exposition leads away from my original point. These days, however, no man should take a charge of sexism lying down.

"What if the donor of the somatic nucleus," Sayare asks, "were the same person as the source of the ovum? Here, the 'maternal' messenger RNA would be transcribed from a nucleus virtually identical with the one to be inserted."

True, but beside the point. At issue is the genotype of the oocyte that gives rise to the somatic nucleus donor. That genotype can never have been the same as the donor's, which arises after fertilization. It must have been the genotype of her *mother*, 46,XX before reduction and 23,X afterward.

I put this argument in another way, in case it isn't clear. If you want to make an exact copy of yourself, you had best try by joining one of your body-cell nuclei with an ovulated, enucleate secondary oocyte taken from your mother. Since you are already taking the trouble, you might as well arrange for her to serve as the implant recipient. If she is then the same age and in the same shape as she was when you were yourself implanting, there is a good chance of seeing yourself emerge some 38 weeks later.

Therein my reluctance to pursue this further: I find it hard to imagine such vanity. I fear, also, the wrath of my classicist colleagues. They have never taken kindly to my amateur exegesis of *Oedipus Rex*. They surely won't take *this* lying down.

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Language, Projection, and Computer Therapy

Constance Holden (News and Comment, 7 Oct. 1977, p. 32) reported a symposium honoring Carl Rogers on his 75th birthday. Coincidentally, she cited material from a computer program fashioned by Weizenbaum (*1*) to provide Rogerian therapy to clients answering questionnaires translated into the machine. Her comments elicited a series of letters from Weizenbaum (28 Oct. 1977, p. 354), Palmén (3 Mar., p. 934), and Schmidt (31 Mar., p. 1390) dealing with various aspects of "real" and "mechanized" therapy.

Arguments in this correspondence pivot on different interpretations of what cognitive and affective signals are required for therapeutic change and what signals pass from programmer, through machine, to client. Schmidt (quoting from Holden who cites Rogers) takes the view that the computer cannot provide "authentic 'unconditional positive regard' " for the client and therefore cannot replace a therapist. Palmén, by contrast, points out that a love letter, even though sent through the mail or processed by a computer, is none the less an influential affective link between two persons. Palmén's position may be reinforced by considering the play *Hamlet* stored in a computer and subsequently drawn from that source. Shakespeare and the printout reader are in a genuine affective link. The reader's insights and emotional reactions are a function of life experiences shared with the playwright, including a set of common linguistic associations of awesome subtlety and complexity. It appears that language acts as an affective link whether or not accompanied by feedback devices, facial expressions, voice tone, and other such cues which contribute to empathic reactions in a live therapeutic session.

The main reason language has this capacity lies in the reader's ability to assign significance to symbols. This talent must be taken into account to understand the scope of the interface between man and machine. In clinical terms I refer to projection, transference, and cathexis; in experimental terms—cognitive and affective association bonds. These processes operate in political, religious, economic, and scientific domains to produce familiar results. A wooden cross may have profound influence on the feelings and behaviors of a devout Christian; a $20 bill has purchasing power because we all agree with the Secretary of the Treasury that it has purchasing power; soldiers die to defend their flag because they have been persuaded that foreign soldiers will destroy them to defend foreign flags; mathematicians let X equal all prime numbers from zero to infinity (or anything else) to facilitate investigating the world of logic.

Thus, linked with a reasonable amount of religious ferver, political propaganda, money sense, and mathematical logic, computers may come to dominate the therapeutic scene. My comment is not facetious, no more than was Shakespeare when he anticipated our correspondence with the remark: "There is nothing either good or bad, but thinking makes it so" (*2*).

DAVID NICHOLS

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References

1. J. Weizenbaum, *Computer Power and Human Reason: From Judgement to Calculation* (Freeman, San Francisco, 1976).
2. *Hamlet*, act II, scene ii, line 259.

Equine VD: Isolating the Agent

In the News and Comment section of the 14 April issue of *Science*, it is stated (p. 181) that the causative agent of the current outbreak of equine venereal disease in Kentucky is an organism that "like the human gonococcus, is anaerobic . . ." and therefore did not grow under the aerobic conditions used for initial isolation. Although the gonococcus grows under conditions of reduced oxygen tension, it is by no means considered an anaerobic organism. Any attempt to isolate an unknown causative agent of equine venereal disease should certainly have included anaerobe culturing quite early in the diagnostic scheme.

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Technology in Response to Local Needs

Before the period when President Johnson talked of the Great Society, federally sponsored research and development was concerned primarily with problem areas external to society, specifically those of defense posture and the space program. Since then the scope of federal R & D has broadened to include domestic problems such as urban economic development, transportation, and energy conservation. Several editorials in *Science* have illuminated aspects of this situation.*

Effective R & D, or technical assistance and technology transfer, on domestic problems is peculiarly difficult because the users are generally varied and dispersed. For example, in the area of energy conservation the clients include consumers, builders, heating and cooling contractors, architects, and utilities. This is typical of domestic problem areas; we must reach the grass roots. Yet the federal R & D community is not responsive to local needs. Rather, it is focused where the money is, in Washington, D.C. This incongruous situation is a major obstacle to progress. What is needed is a structure that integrates the R & D community with problems and people at the local level. The major difficulty in designing an appropriate delivery system is that of providing a technology extension service which achieves intimate contact with millions of local businesses and thousands of state and local government agencies. If a delivery system is designed from scratch, the costs are formidable and the problem of achieving the required rapport between the system and the people to be served may be insurmountable. Both issues indicate that organizations which are already an integral part of the community should be used to provide the technology extension service.

A set of institutions that have become strong and well supported at the community level and are committed to community service are the 1200 community colleges located across the country and serving a major share of the people. It is recommended that the community colleges—which have the required geographic distribution, service orientation, constituency, and value system—should have a prominent role in a national R & D delivery system.

Universities, research institutes, and government laboratories would operate in concert with the colleges by conducting research that is responsive to local needs and by obtaining from the R & D community results and products that can be moved into the economic stream. Substantial costs would be involved in establishing such a delivery network; however, they would be a small fraction (perhaps 1 percent) of the cost of the current R & D enterprise. Also, the additional resources brought to bear are large enough to have a major impact. In terms of dollars, the operating budgets of the community colleges total over $5 billion per year, and the enrollment is more than 4 million students, with the majority in vocational and continuing educational programs.

A pilot program has been in operation in Michigan with support from the Economic Development Administration of the Department of Commerce. The program stresses cooperation with the activities and resources of the (agricultural) Cooperative Extension Service and other public and private assistance programs. The performance and institutional motivations thus far demonstrated are encouraging. Energy is a national problem area in which the community colleges could be very helpful in disseminating information and techniques. This is especially true of the effort to attain better conservation of energy in home heating and cooling. It is also likely that expanding applications of solar energy such as water heating and use of biomass would be facilitated if the community colleges were broadly involved.—WILLIAM M. BROWN, *President, Environmental Research Institute of Michigan, Ann Arbor 48107, and* EDMUND J. GLEAZER, JR., *President, American Association of Community and Junior Colleges, Washington, D.C. 20036*

*R. L. Bisplinghoff, *Science* **190**, 1045 (1975); J. G. Horsfall, *ibid.* **193**, 637 (1976).

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