the caveats so fully spelled out on earlier occasions (I). Besides, to have discussed at all adequately the prospective benefits, risks, and quandaries of possible eugenic programs would have required another occasion. Even more recently, in an address entitled "What man can be," I tried especially to emphasize the grave difficulties in the realm of value judgments which the new biological reproductive possibilities might bring about, and concluded:

I have asked many questions which cannot at present be answered. I have predicted a future in which many cherished values of our society and many ethical standards may be questioned or superseded. It is not sufficient to have a few scientists raise such issues. Only a prolonged and profound attention by many of the wisest men of our time, men of philosophy and religion, students of society and government, and representatives of the common interests of men throughout the world, together with scientists, may achieve a wise and sober solution of the crisis evoked in our world by scientific discoveries and their applications (2).

Let me suggest that there are rather better ways to judge a man's opinions than by reading his countenance or observing his gestures.

There is a more important point raised by the objections of Kass. He has ignored altogether the possibility that the introduction of eugenic measures through prenatal adoption will proceed on a voluntary basis. The experimental approaches used by R. G. Edwards in England are based on the voluntary consent and participation of women whose oviducts are blocked but who, together with their husbands, deeply desire to have children. My own files contain many letters from women who have indicated their hopes to have a child by such a method, whether because they are sterile or because of knowledge that in their families there are hereditary factors that might inflict a lifelong burden upon a child of their own. I think it quite clear that if such practices are introduced in countries of the Western World it will occur first through voluntary action. That is why genetic counseling must be greatly improved and rendered far more accessible to those who need it. The idea that, in the conceit of their ignorance, boards of experts will decide who may reproduce and who may not, is as repugnant to me as to Kass. Nevertheless, under a Nazi type of dictatorship, it might become a reality with which the world would need to reckon. The biological developments indeed make the "brave new world" credible.

In the matter of the right of every child to be born "with a sound physical and mental constitution, based on a sound genotype . . . the inalienable right to a sound heritage," I shall not retreat. Incumbent on every prospective parent is the duty of ascertaining whatever is possible regarding the probabilities that his or her child will be mentally and physically sound. Since detection of heterozygous carriers is now possible for about 60 recessive genetic defects, and since chromosome defects, such as the extra chromosomes that produce mongolism (Down's syndrome) or a variety of serious sex deviations from the norm, such as the XXY condition, are detectable by amniocentesis, the way lies open to voluntary constraint in reproduction and to voluntary induced abortion in those states where the law permits. I, for one, regard the New York abortion law as more significant in opening up the possibility of voluntary eugenic practice than in protecting the life of the mother in a few cases or in disposing of unwanted children in lieu of contraception.

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References

Restoring Bacterial Toxigenicity

The report by M. W. Eklund et al. (30 Apr., p. 480) on the restoration of toxigenicity by phage infection to nontoxic strains of Clostridium botulinum brings to mind a paper published 78 years ago on a closely related subject. Francesco Sanfelice's name is best known for his isolation of the pathogenic fungus Cryptococcus neoformans; however, in 1893 (I) he reported studies on anaerobic bacteria, including Clostridium tetani and related organisms that he regarded as indistinguishable except for their having lost the ability to produce toxin. In support of this evolutionary view, he studied the effect of culturing the nontoxic strains in sterile filtrates of the toxic bacteria. His crude assay methods
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were far from compelling, but they did indeed point to a toxic conversion quite analogous to that described in the recent report. Neither bacteriophages, nor their fascinating attributes of transduction or lysogenic conversion had yet been discovered; nor had toxins been purified. He may be forgiven for the naive speculation that the toxin itself was the active agent.

As far as I am aware, Sanfelice’s experiment was never subjected to further verification, and it thus played no part in the further history of bacterial genetics. However, it was conceptually similar to the pneumococcus transformation, reported by Griffith 35 years later (a latent period familiar to geneticists). It is now a reasonable surmise that his observations were correct.

**Joshua Lederberg**

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Reference


**Nomenclative Etiquette**

Plumb suggests (Letters, 19 Feb.) the suppression of the term centigrade so that “at some time in the future, degrees Celsius will be a natural expression.” Why? Degrees centigrade is already a “natural expression” which furthermore describes the system as one of 100 degrees between reference points. Not so long ago, a perfectly understandable unit like cycles per second was changed to hertz, and spectrosopists are now forced to use nanometers when everyone has always understood millimicrons. Furthermore, I challenge anyone to demonstrate how “torr” is any more understandable than “mm-Hg.” All this useless arbitrary pedantry torr my heart out. It hertz so much it gave me a fever, which steadfastly, I shall always measure in degrees centigrade.

**Barry M. Austern**

Environmental Protection Agency, Water Quality Office, Ohio Basin Region, Cincinnati 45226

It is not hard to understand why the medical people are switching to centigrade degrees rather than to Celsius. For centuries the doctors suffered under eponymous names: Prowazek-Greiff bodies (trachoma bodies), the Achard-Castaigne test (methylene blue),

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Peer Review System

One of this country's most successful collaborative operations which links the entire health-oriented scientific community to the federal government, namely the National Institutes of Health (NIH) and National Science Foundation's system of research grant evaluation by peer review, is now undergoing serious attacks and is in danger of dissolution.

Opponents of the peer review system argue that the larger, better staffed and equipped universities and research institutions are more successful in the competition than are the smaller less distinguished ones, and that there is considerable geographic imbalance in distribution of research funds. This is not a valid argument against the present national competitive system if our goal remains high-quality scientific achievement, since much of the most imaginative and high-quality research is coming from the established institutions. It is an argument, however, for providing institutional funds for universities in less populated areas so that they may attract high-quality teaching faculty and build their resources. Grants of this nature have been provided in the recent past by the National Science Foundation, and it is to be hoped that this type of support will be continued, but not substituted for the present system.

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Opponents also argue that the study sections do not concern themselves with "relevance" but recommend support purely on the basis of scientific merit. The corollary argument is that basic research has no goal and is "undirected." An imaginative, well-designed research project always has a significant goal, and usually in the long run becomes more obviously relevant. Clearly defined and biologically significant goals and the asking of important and pointed questions are prime criteria in the present evaluation system. It is a mistake to give priority to a project of third-rate scientific merit aimed directly at a difficult problem of human disease over a high-quality proposal directed toward an understanding of a basic biochemical mechanism. This country can well afford the modest investment in the latter but can ill afford the entrenchment of mediocre investigators in a socially "relevant" area. The argument for quality in science, both basic and applied, must outweigh all others if we are ever to answer our more difficult "relevant" medical problems.

Perhaps the greatest threat to the present system of standing committees for grant review at the national level is the growth of NIH center grants and contracts which are not now reviewed by study sections. Despite sincere assurances from responsible senior officials that the individual project grant and the study section systems are not under attack, they will attenuate spontaneously because it is much easier and safer for individual investigators to come in under the large umbrella. Applications for research grants and fellowships will automatically fall off, and diminishing demand will be used to justify a diminishing program.

If we must live with center grants and contracts, they should be reviewed rigorously by the regular standing study sections and advisory panels composed of working scientists, using the same criteria of merit as are applied to individual applicants. Multidisciplinary applications can be reviewed piecemeal and in toto by appropriate study sections and pruned accordingly. One wonders whether the current complaint of "bureaucratic interference" leveled at the NIH is not simply part of the effort to bypass the present system of quality control.

**JEROME GROSS**

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nisms (3). In the nonceccetomized, germfree rat, this advantage appears to be negated by the enlargement of the cecum.

Because they provide a picture of functional and cellular decline that is unadulterated by invading bacteria, germfree rodents are eminent models in the study of healing wounds and kidney pathology. On the other hand, they make it possible to obtain an even clearer picture of the effect of associated microbes on such functions. The posttraumatic, ischemic kidney appears to have retained its function much better in germfree rats than in conventional rats. It appeared possible, however, to obtain a comparable improvement in kidney function by orally treating conventional rats with a mixture of nonabsorbable antibiotics. These rats, although harboring an adjusted intestinal microflora, also showed other characteristics of germfree rats—such as cecal enlargement and more liquid cecal contents, with elevated colloid osmotic value—indicating reduction or absence of at least some functional aspects of the conventional microflora.

Association of the originally germfree animal with selected pathogens has done much to clarify the etiology of infectious disease. The oral administration of virulent cultures of Pasteurella haemolytica to gnotobiotic lambs has resulted in the production of fibrinous pleuritis and pneumonia. This syndrome is similar to cases of neonatal lamb pneumonia that occur in nature. Establishing a tracheostomy and occluding the anterior portion of the trachea prior to the oral inoculation demonstrated that the infection of the lung developed after intestinal invasion and subsequent bacteremia. Monoassociation with Bacillus cereus prior to administration of Pasteurella haemolytica prevented pneumonia.

It was also shown, however, that germfree mice could harbor large populations of Shigella and Salmonella species as monoassociates without any apparent ill effect. A similar observation had been made earlier in the case of monoassociation of rats with Salmonella typhimurium. It thus appears that a symbiosis between the host and its associated pathogen is possible without loss of pathogenicity when the reisolated bacteria are retested in a previously unchallenged susceptible host.

Germfree mice have been shown to harbor leukemia and mammary tumor viruses that are probably responsible...