LETTERS

DNA Database

In July 1980, the National Institute of General Medical Sciences (NIGMS) of the National Institutes of Health sponsored a meeting of scientists to evaluate the need for a nucleic acid sequence data bank. As a result of that meeting steps were taken to set up such a resource in this country with the expectation that this bank would collaborate with similar banks in other countries and that data from the bank would be available internationally.

With the cooperation of the National Institute of Allergy and Infectious Diseases, the National Cancer Institute, the Division of Research Resources, the National Science Foundation, the Department of Energy, and the Department of Defense, the NIGMS has completed arrangements for the establishment of this resource, and effective 1 October 1982 the Genetic Sequence Data Bank (GenBank) will be available to the public. The bank will be a repository for all published nucleic acid sequences greater than 50 base pairs in length, cataloged and annotated for sites of biological interest. Distribution is primarily off-line by means of computer-readable magnetic tapes and a yearly hard copy edition, but limited on-line access is also available. Data bank management and distribution is under the direction of Howard Bilofsky at Bolt Beranek and Newman Inc. of Cambridge, Massachusetts. Data collection, verification, and annotation will be performed at Los Alamos National Laboratory under the direction of Walter Goad. For information write GenBank, c/o Computer Systems Division, Bolt Beranek and Newman, Inc., 10 Moulton Street, Cambridge, Massachusetts 02238.

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Roger Lewin, in his article "Long-awaited decision on DNA database" (Research News, 27 Aug., p. 817), discusses the award of a contract to Bolt Beranek and Newman with Los Alamos National Laboratory as subcontractor for the construction of a national DNA database. I should like to make an addition to the history of work at Los Alamos on biological sequences. It would seem from the article that Los Alamos started work on the subject in 1979.

Los Alamos' participation in the analysis of biological sequences was started at least a decade before. S. M. Ulam in the late 1960's often gave talks at Los Alamos on the mathematics of sequence comparison. In the early 1970's Temple F. Smith and I did extensive work at Los Alamos on the mathematics of sequences and its application to biology. Myron Stein did the computer programming. Michael Waterman joined our group at Los Alamos in 1974. Smith and Waterman have continued since to work on many aspects of biological sequences, much of the work being done at Los Alamos in groups T-7 and S-1. It was Smith who brought to the attention of many, including Los Alamos, the need for such a database.

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Elephant Grass

Eliot Marshall's quotes (News and Comment, 2 July, p. 32) from the Soviet paper suggesting that elephant grass has provided a breeding ground for toxin-producing *Fusarium* in Southeast Asia can be supplemented with background information about this highly desirable species, which presumably is *Pennisetum purpureum*. It is not a malignant weed, but rather an esteemed livestock feed, widely grown throughout the tropics and subtropics, where it is used for cutting daily as fresh feed, for grazing, sometimes for silage and is often included in rotation with food crops for soil improvement. Elephant grass yields more biomass per unit area of land than any other herbaceous species used for livestock feed production. Plants develop long roots (but not rhizomes), which is an advantage because they penetrate deeply into the soil, giving them access to more nutrients and water. The floral structure is simple and not polyspermous.

It is unlikely that a sufficient amount of seeds could be assembled to permit aerial seeding, since there is no commercial seed production of this species. The grass is established vegetatively by transplanting stem sections, similar to the method used for sugarcane.

With regard to the grass providing a "good breeding ground" for new fungi (in this case *Fusarium*), there is no report (to my knowledge) that any *Fusarium* species has developed a host-parasite relationship with elephant grass.

As for its practical value, without elephant grass there would be less meat, milk, butter, cheese, wool, and leather for human use. In addition, many wild animals would go hungry, including elephants that inhabit areas where elephant grass grows.

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The Inevitability of Cancer

I am concerned about the title of Thomas H. Maugh II's article " 'Cancer is not inevitable' " (Research News, 2 July, p. 36). All evidence now available indicates that cancer *is* inevitable in most people and that cancer *is* a part of the human estate. For example, as many as 80 to 90 percent of men who live long enough develop cancer of the prostate (*1*). Further, the incidence of cancer at all organ sites apparently increases with age (*2*). The most reasonable conclusion to be drawn from this evidence is that most people will develop cancer if they live long enough.

The cancer problem, then—at least the part addressed by the National Research Council in their report (*3*)—is the precocious development of (epithelial) cancer, which can be accelerated by malnutrition and exposure to genetic insults such as electromagnetic radiation or alkylating agents. It would be in the public's interest if this distinction were drawn.

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References and Notes

1. F. K. Mostofi and J. E. Leestma, in *Pathology*, W. A. D. Anderson, Ed. (Mosby, St. Louis, ed. 6, 1971), vol. 1, chap. 22, p. 850.
2. J. Cairns, *Cancer: Science and Society* (Freeman, San Francisco, 1978), pp. 36–40.
3. *Diet, Nutrition, and Cancer* (National Academy Press, Washington, D.C., 1982).

Empiricism or Diversity?

Wassily Leontief (Letters, 9 July, p. 104) argues that more empiricism would be healthy for a dismal economic discipline that has grown obese staring at its theoretical navel. The proposed cure, however, may lead to an alternative disorder.

Academicians in any area are faced with the problem of developing systematizations of knowledge that are more powerful than common sense. Perhaps for historically accidental reasons economics went theoretical, while academic psychology took a strongly empirical

route. In neither case has a scientific system been achieved that is comparable in power to the parsimonious systems of physics and chemistry. For a couple of decades, academic psychology has been edging away from the empirical compulsiveness that marked the peak of behaviorism; with Leontief's help, the dialectical pendulum of economics is now set to swing in the opposite direction. In my opinion, such swings can be expected merely to yield newly worded variations of old ideas, to which elaborate empirical decorations are added when this is in fashion.

The complex subject matter of the social sciences strains the attention spans of social scientists, who sometimes cope by grasping at local disciplinary orthodoxies. As Leontief observes, the power structures of intellectual establishments reinforce this tendency. The solution is not to encourage swings toward empiricism or theory but somehow to encourage greater diversity of theories. This, rather than data, might be the more important set of contributions from the adjoining disciplines that Leontief lists. Indeed, it is a question of multiple balances rather than of either-or. "Too much" diversity will lead to the Babel of conversations that scientifically disciplined minds strive to avoid, but too little diversity has led to present states of near sterility in other areas as well as in economics.

We should explicitly acknowledge that important sources of theory are philosophical reflections carried out by intelligent people in many disciplines and professional areas; one's informal observations may sometimes be even more useful than those that are conditioned by the expectations of a formal theory in one's own field.

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Rabies Treatment

T. L. Lentz *et al.* (Reports, 8 Jan., p. 182) provide evidence to suggest that acetylcholine receptors may serve as receptors for rabies virus. In *Sushruta Samhita*, the ancient Indian classic on the science of life, there is a fascinating account of *Datura* as a prophylaxis for rabies (*1*). *Datura* is to be given by mouth immediately after a dog bite in a dosage sufficient to produce dilation of the pupils and symptoms of mild delirium, which pass in a day or two, when the next oral dose is given to produce similar symptoms. Several such doses are recommended. The treatment is to be started as early as possible because, once the clinical symptoms of rabies become manifest, the disease is fatal.

The active principles of *Datura stramonium*, like *Atropa belladona*, are atropine and related alkaloids that predominantly block the muscarine actions of acetylcholine. In view of Lentz's findings, *Datura* for rabies may represent the first documented example of prophylaxis by receptor blockage.

Because clinical rabies is fatal and antirabic vaccine is routinely administered to victims of bites from rabic dogs, it is not possible to conduct a controlled clinical trial to assess the efficacy of *Datura* prophylaxis. However, it would be interesting to compare the effectiveness of antirabic vaccine with acetylcholine inhibitors, such as atropine, in experimental animals.

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Reference

1. *Sushruta Samhita* (circa 300 B.C.), Kalpa Sthanam, chap. 7, stanzas 49–59.

Index Medicus: Essential Tool

In his letter (13 Aug., p. 586) responding to Philip H. Abelson's editorial (28 May, p. 937), Robert S. Willard advocates charging foreign users fees based on full cost recovery for National Library of Medicine products and databases. In the case of Canadian subscribers to *Index Medicus*, most of which are health science libraries, Sherrington (*1*) estimates that the extra cost involved would be $250,000 per year. As I pointed out in response (*2*), it is impossible in the present financial climate to stretch library budgets to maintain the collection standards of former, more affluent, times. In the case of my own library, and probably of most health science libraries, whether Canadian or in other countries, *Index Medicus* is regarded as an essential tool. If its price is drastically increased, librarians will be forced to cancel subscriptions to other abstracting and indexing tools in order to free the additional funding needed for *Index Medicus*. Therefore, full cost recovery of *Index Medicus* and its associated databases might well be the death knell for some private sector indexes, rather than their salvation.

Foreign users have, for many years, contributed to the production of *Index Medicus* and its databases through international quid pro quo agreements. The value of the goodwill generated through this cooperation cannot be overemphasized; nor can the convenience of having one international tool of excellent quality, rather than a plethora of potentially less comprehensive national indexes.

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References

1. A. Sherrington, *Can. Med. Assoc. J.* **126**, 459 (1982).
2. A. D. Nevill, *ibid.*, p. 1266.

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Engineering Programs in Arizona

Colin Norman's article "Electronics firms plug into the universities" (News and Comment, 6 Aug., p. 511) is a valuable description of the importance of university/industrial ties. These surely represent major elements of the solution to the ever-present need for modern academic and research facilities at our universities. In referring to an Arizona State University engineering program, however, Norman states that "last year the center was one of only two items in the state budget to receive an increase in funds. The other was the prison system." As a matter of fact, the state legislature authorized a major increase in the funding of the Microelectronics Laboratory of the University of Arizona, already one of the leading such facilities in the country. The University of Arizona was also allocated 30 new faculty positions, the largest segment of which went to the College of Engineering.

It is fair to say that the established, nationally ranked programs in engineering at the University of Arizona are still improving and that both we and Arizona State University are benefiting from forward-looking actions of both industry and government in the state.

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Erratum. In the report by N. Yamamoto *et al.*, "Transformation of human leukocytes by cocultivation with an adult T cell leukemia virus producer cell line" (20 Aug., p. 737), the column headings in Table 1, on page 738, under "Cells with markers (%)," should have read: Leu 1, Leu 2a, Leu 3a, Leu 4, and Ia (not immunoglobulin A).