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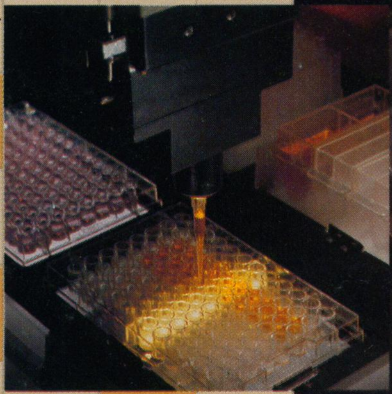

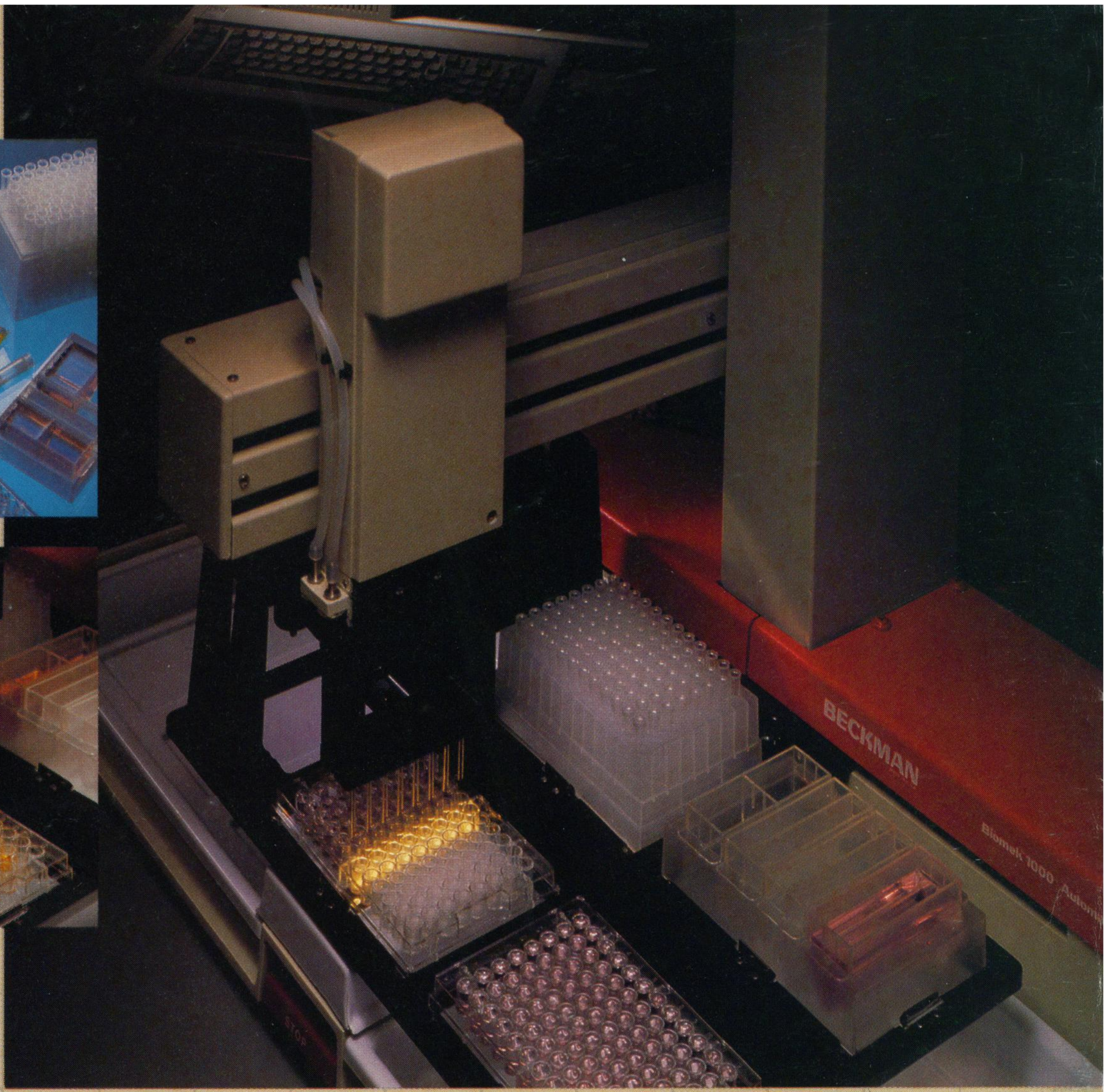

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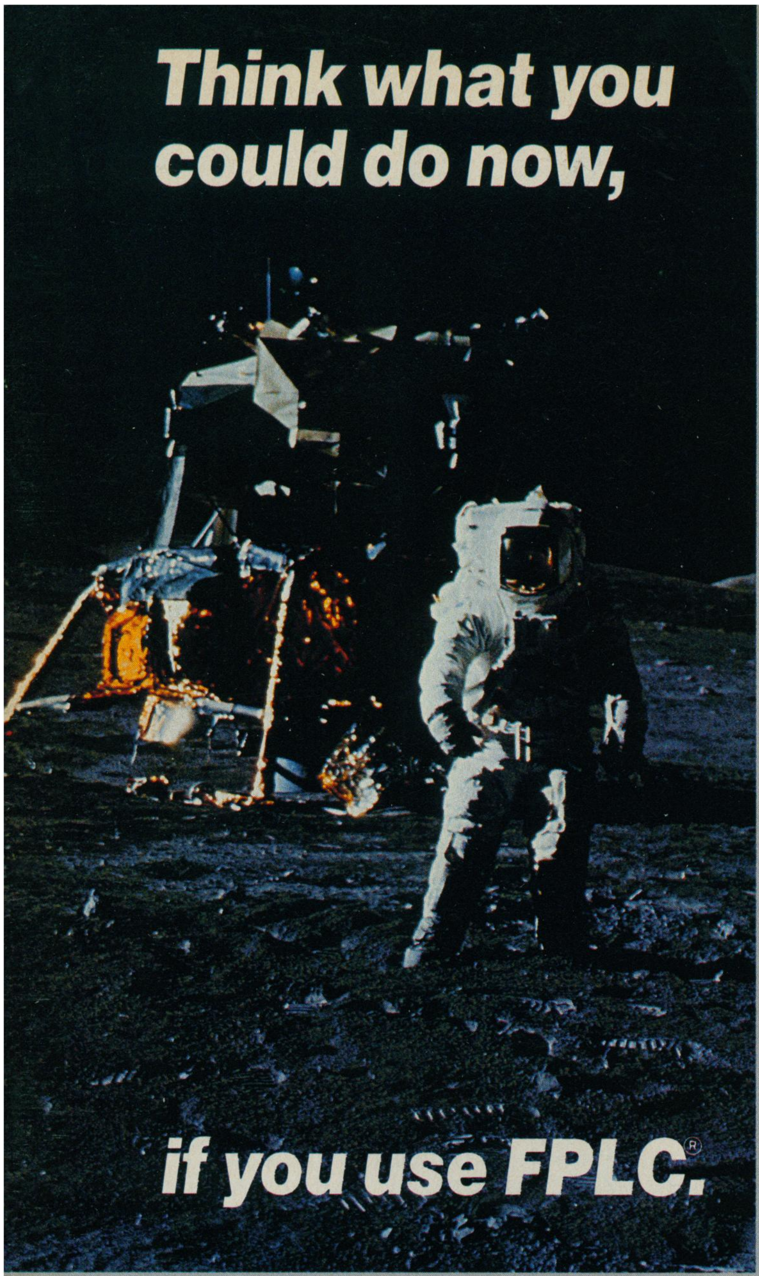

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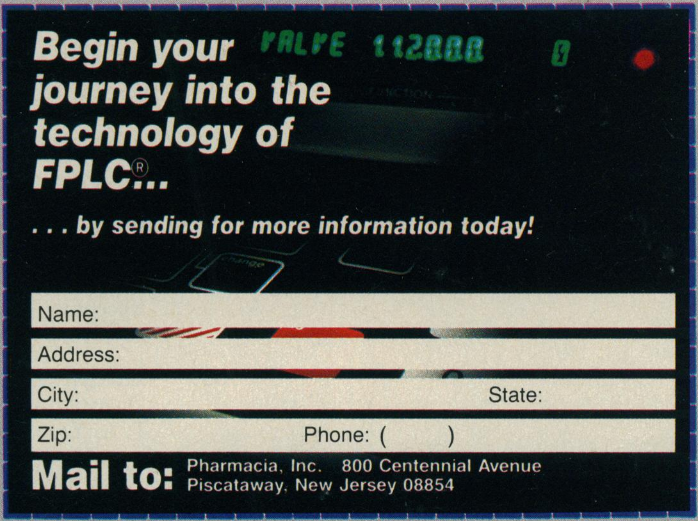

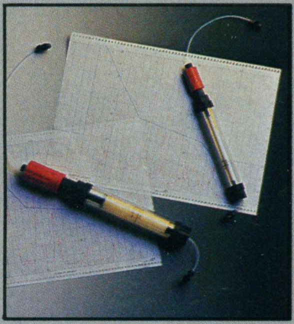

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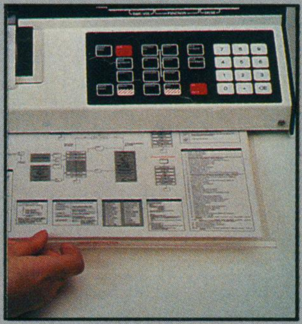

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COVER Experimental watershed no. 5 in the Hubbard Brook Experimental Forest, in central New Hampshire. This watershed was commercially whole-tree harvested in 1983. Experimental watershed no. 6, the location of a continuous 25-year record of precipitation and stream water chemistry, is to the immediate left of watershed no 5. Massive disturbances, such as whole-tree harvesting, set in motion a series of biogeochemical responses that shape both the long- and short-term behavior of the recovering landscape. See page 867. [Ashton Hallett]

Reports

Products & Materials

Book Reviews

Repository of Human DNA Probes and Libraries

National Laboratory Gene Library Project

In 1983, members of the human genetics community petitioned the National Institutes of Health to develop a reliable and efficient means for researchers to exchange cloned human DNA. To fulfill these needs, a repository of human cloned DNA segments has been established at the American Type Culture Collection (ATCC) in Rockville, Maryland, under contract from the National Institute of Child Health and Human Development (NICHD) and the Division of Research Resources (DRR). Drs. Victor McKusick and Mark Skolnick are serving as advisors to the repository in addition to a panel of geneticists assembled by the NIH. ATCC will collect well-characterized probes from investigators, expand and verify the probes, and store multiple samples that will be distributed to other investigators. Active solicitation and acceptance of important probes has begun.

In order to accelerate the rate of probe production for gene mapping and genetic disease diagnosis, the Office of Health and Environmental Research of the U.S. Department of Energy is funding a collaborative project between Lawrence Livermore National Laboratory and Los Alamos National Laboratory to construct 2 complete sets of chromosome-specific libraries of all 24 different human chromosomal types. The National Laboratory Gene Library Project involves purifying chromosomes isolated from cultured human cells or human chromosome-containing hybrid cells by flow sorting. Once enough chromosomes of a given type are sorted, the DNA is extracted and purified. In phase I of the project, the purified DNA is digested to completion with *Eco*RI (Los Alamos) or *Hin*d III (Livermore). The digested DNA is next inserted into a bacteriophage lambda vector, Charon 21A. The recombinant molecules are packaged *in vitro* into infectious phage particles and the resultant chromosome-specific library is amplified in an E. *coli* host as infectious phage. The use of two restriction enzymes allows the construction of two distinct libraries for each chromosome. The average length of the human DNA inserts in Charon 21A (accepts 0-9 kb) is about 4 kilobases. Since complete digestion by either restriction enzyme will yield some fragments larger than 9 kb which are not clonable, the construction of 2 libraries means that a sequence missing from one will probably exist in the other.

In phase II, chromosome-specific libraries will be constructed by partially digesting the sorted chromosomal DNA with a restriction enzyme to an average size in the 20-40 kb range. Lambda vectors or cosmids will be selected for library construction which accept inserts in this range. Thus, many complete genes with their flanking sequences will be contained in single clones of the Phase II libraries.

The phase I libraries are of particular value to researchers involved in chromosome mapping and the study and diagnosis of genetic disease, linkage, and pedigree analysis. The phase II libraries, containing larger cloned inserts, should be of special interest to molecular biologists studying gene structure and regulation.

The human chromosome-specific libraries developed at the Los Alamos and Lawrence Livermore National Laboratories are available from the repository through funding by the NIH Division of Research Resources. The availability of these libraries will greatly increase the rate at which important probes are produced. The phase II libraries will be placed in the repository as they are constructed.

Human Chromosome—Specific Libraries

CH	ATCC #	National Lab ID Code	Rest Enz	CH Equiv
1	57738	LA01NS01	*Eco* RI	31.0
2	57716	LA02NS01	*Eco* RI	1.8
3	57717	LA03NS01	*Eco* RI	.8
4	57700	LLO4NS01	*Hind* III	.8
4	57718	LA04NS02	*Eco* RI	3.4
4	57719	LA04NS01	*Eco* RI	2.3
5	57720	LA05NS01	*Eco* RI	43.0
6	57701	LL06NS01	*Hind* III	20.0
6	57721	LA06NS01	*Eco* RI	2.4
7	57722	LA07NS01	*Eco* RI	9.2
8	57702	LL08NS02	*Hind* III	20.0
8	57723	LA08NS04	*Eco* RI	1.5
9	57703	LL09NS01	*Hind* III	13.0
9	57724	LA09NS01	*Eco* RI	7.0
10	57725	LA10NS01	*Eco* RI	18.0
10	57736	LL10NS01	*Hind* III	9.6
11	57704	LL11NS01	*Hind* III	4.9
11	57726	LA11NS02	*Eco* RI	2.8
12	57727	LA12NS01	*Eco* RI	27.3
13	57705	LL13NS01	*Hind* III	1.3
13	57728	LA13NS03	*Eco* RI	4.2
14	57706	LL14NS01	*Hind* III	135.0
14	57739	LA14NS01	*Eco* RI	36.0
14/15	57707	LL99NS01	*Hind* III	30.0
15	57729	LA15NS02	*Eco* RI	20.4
15	57737	LL15NS01	*Hind* III	4.4
15	57740	LA15NS03	*Eco* RI	4.0
16	57708	LL16NS02	*Hind* III	20.0
16	57730	LA16NS02	*Eco* RI	2.0
17	57709	LL17NS01	*Hind* III	1.3
17	57741	LA17NS03	*Eco* RI	7.9
18	57710	LL18NS01	*Hind* III	72.0
18	57742	LA18NS04	*Eco* RI	19.0
19	57711	LL19NS01	*Hind* III	30.0
19	57731	LA19NS03	*Eco* RI	10.5
20	57712	LL20NS01	*Hind* III	20.0
20	57732	LA20NS01	*Eco* RI	1.4
21	57713	LL21NS02	*Hind* III	20.0
21	57743	LA21NS01	*Eco* RI	137.0
22	57714	LL22NS01	*Hind* III	13.0
22	57733	LA22NS03	*Eco* RI	11.0
X	57734	LA0XNS01	*Eco* RI	8.2
Y	57715	LL0YNS01	*Hind* III	27.0
Y	57735	LA0YNS01	*Eco* RI	11.5

1. National Lab ID Code Prefix: LA designates a library constructed at the Los Alamos National Laboratory and deposited by Dr. Larry L. Deaven. LL designates a library constructed at the Lawrence Livermore National Laboratory and deposited by Dr. Marvin Van Dilla.
2. The average size of the human DNA inserts in the libraries is 4 kb.

For more information, contact ATCC at the address below.

American Type Culture Collection

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This Week in SCIENCE

Complex systems

LIVING systems are not simple nor do they function perfectly (page 849). Dumont and Robertson suggest that the existence of any trait (neuronal circuitry is the example) depends only in part on its having been adaptive during evolution; nonadaptive constraints—developmental, historical, architectural—are also important. Selection acts on behaviors, not circuitry, and the process of natural selection does not take the "long view." Instead, a trait may persist in some cases as long as it works well enough not to be selected against (ancient thermoregulators became feathers for flight); in other cases, a trait may simply never have been subjected to the selection process. Scrutinized through this evolutionary approach, a circuit (or other system) that does not satisfy the law of parsimony can be understood as one having both crucial functional components and residual elements of the system from which it evolved.

Protein kinase C

PROTEIN kinase C (PKC) is a widely distributed enzyme that appears to be important in transmitting signals for diverse cells; it responds to growth factors, hormones, and other external agents by catalyzing the phosphorylation of proteins and in this way influences cell growth, differentiation, and a variety of other cellular responses. PKC is activated by calcium and diacylglycerol (a lipid by-product produced in the membrane); tumor promoters such as phorbol esters can cause diacylglycerol-like effects and permanent activation of PKC. Parker *et al.* determined the complete amino acid sequence of bovine PKC and identified discrete domains of the protein where the various activities of the molecule—calcium binding, phospholipid binding, catalytic activity, membrane interactions—are thought to reside (page 853). Coussens *et al.* found that there are families of PKC genes, rather than a single gene, and suggest that this may account for the diverse responses obtained when PKC is activated (page 859). The structural work may clarify which sites on PKC bind tumor promoters (from this information, antagonists might be designed) and will help in determining how PKC's of both normal and tumor cells are activated and produce their effects.

C_4 photosynthesis

A physiologic pathway for converting sunlight to energy, used by contemporary grasses including lovegrasses, Bermuda grass, buffalo grass, zoysia, and others, had developed at least 5 to 7 million years ago (page 876). Distinctive Kranz-type anatomy characteristic of plants that engage in C_4 photosynthesis was found in a leaf fragment collected by Thomasson *et al.* at a site in Kansas; a late Miocene date was assigned on the basis of the site's mammalian specimens. Anatomic peculiarities (observed through the scanning electron microscope) plant the fossil fragment squarely in the contemporary subfamily Chloridoideae, which includes many tropical and subtropical grasses; the C_4 pathway functions efficiently because of the ambient high temperatures and intense light in which such grasses grow. Many details of the process of C_4 photosynthesis have been known for some time, but little has been understood about its phylogenetic history because of the paucity of fossil specimens.

Placers of cosmic dust

IN the melt zone of Greenland's ice cap, natural processes have concentrated cosmic spheres (the melted pieces of comets and asteroids) and unmelted extraterrestrial particles into the largest known accumulations of cosmic dust on the earth (page 869). Approximately 10^4 tons of cosmic dust fall to the earth each year. Particles landing in the melt zone get buried in the ice, are carried toward coastal regions by glaciers, and then are liberated into flowing streams during the summer melt. Each year lakes form at the same places (because of topographic constraints), and the particles sink and concentrate in local basins. Aerial photographs showing dark patches in the lakes were the first clues that deposits (called placers) of cosmic spheres might be found. Maurette *et al.* mined the patches with plastic tubing connected to a water pump and examined the grains by scanning electron microscopy (to study physical characteristics) and with an electron microprobe (to determine elemental compositions). The Greenland specimens are similar to, although younger than, particles found on the ocean floor; probably because they have been in cold storage, the Greenland specimens are well preserved and show fewer signs of chemical weathering. The placers are rich, accessible deposits from which cosmic dust can be collected and studied.

B19 parvovirus

THE B19 parvovirus that causes a number of diseases—erythema infectiosum (fifth disease) of children, an adult polyarthralgia syndrome, transient aplastic crises in hemolytic disease, and possibly some cases of abnormal fluid accumulation in fetal tissue (hydrops fetalis)—has been propagated in cells growing in culture; this makes possible studies of the molecular biology, mode of replication, and other features of the virus (page 883). Ozawa *et al.* report that viral growth and replication occur most favorably in fresh bone marrow cells from patients with hemolytic anemias when cells are supplemented with erythropoietin, the erythroid cell hormone. Viral replication takes place in nuclei of immature cells in the erythroid (red blood cell) lineage; various intermediate forms of viral DNA are detectable. Prevention of B19 infections may be possible as more is learned about the virus and its properties; the extraordinary specificity of the virus for erythroid progenitor cells suggests that it may have a use in gene therapy in hematopoietic diseases.

SCIENCE

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Scientists' Roles in AIDS Control

Experts now project that by 1991 as many as 54,000 Americans will be dying each year from AIDS. Given the extent of infection by the virus in the present population (conservatively, 1 million people), the fact that transmission of the virus is invisible and usually unwitting, and the likelihood that developing a vaccine is at best a number of years away, the United States—and other societies—are still near the onset of an agonizing episode that will have far-reaching personal, social, economic, and political ramifications.

It is obvious to all that we must plan for the serious dislocations that will surely come. We do in principle know what must be done to stop the spread of infection. Epidemiologists tell us, for example, that of the projected 54,000 who will, statistically speaking, die in 1991, some substantial share are not currently infected with the virus: perhaps 13,000 individuals could be saved in 1991 by preventing transmission of the disease to them.

In recent months, officials at the Public Health Service (PHS) have acknowledged that, in the absence of a vaccine and effective treatment, our most powerful tools in the next few years will be information, education, and prevention campaigns. To some scientists these terms may sound abstract, even vacuous—but not to public health professionals or social scientists. These endeavors have specific procedural meaning, and they save lives. Social scientists have a crucial role, both in preparing for societal stresses of major proportions and in devising effective means for intervention and prevention of illness. They know how to elicit reliable reports of personal behavior, knowledge, and attitudes; how to reach special cultural groups; how social networks, peer interactions, and voluntary associations function within the general society; how political processes work at the local level; and how to effect attitude change. They have studied risk-seeking and addictive patterns and the basis for cooperative rather than selfish behavior.

There is, in addition, a long-established tradition of cooperation between social scientists and public health workers—in improving diet, preventing infection, and introducing healthful practices on a significant scale. There is a similarly recognized partnership between social science and experimental medicine—in the design of trials, assessment of outcomes, evaluation of illness-correlated factors, and reinforcement of new behavior.

There has been a marked reluctance by the federal government—reflecting a natural distaste for sex, drugs, and disease—to launch serious programs of prevention or even to conduct strategic research. But officials of the PHS are now seeking a trebling of the administration's 1987 budget for AIDS education and risk reduction. It is a courageous move; all concerned scientists should support it.

Coordinated intervention projects on a demonstration basis must be undertaken in communities across the country, without delay. However, as demands on public health professionals and social scientists increase, it will be essential to have designed already ways to evaluate what is done in the field. An effort by the National Research Council or similar organization will be needed for sound scientific evaluation of health promotion and disease prevention projects funded by government or by private groups.

It is also important that a program of directed applied research be started, covering, for example, how to reach particular segments of the population, how to protect the medical care system from intolerable strain, and how to deal with persons who may be infectious for the rest of their lives. The National Institutes of Health's system of investigator-initiated research proposals is not efficient for this purpose; a central coordinating mechanism is needed. It is also crucial, however, that NIH and other agencies fund longer range basic research. Ironically, the AIDS crisis may stimulate work on fundamental research topics where little is known: the malleability of sexual behavior in adult life, psychobiological aspects of risk-seeking, or community organization and cultural change as a response to external threat.

As citizens, social scientists should advocate and participate in knowledge-based action in their own locales. No university town or rural area will prove an Isle of the Blest, safe from threat. As professional scientists, they should insist on proper funding levels for both directed and fundamental research. Finally, they should move to participate as consultants, partners, and leaders in the enormous effort that lies ahead.—DAVID JENNESS, *Executive Director, Consortium of Social Science Associations, Washington, DC 20036*

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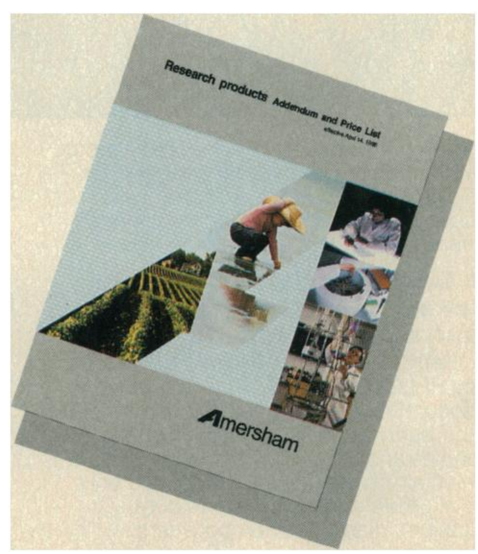

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for aspects of complex chemical systems. In addition, symbiotic relationships (H. F. Schaefer, Letters, 13 June) between theory and experiment and hybrids (E. Wasserman, Letters, 13 June) of the two may become more significant.

E. WASSERMAN
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REFERENCES

1. C. F. Bender and H. F. Schaefer, *J. Am. Chem. Soc.* **92**, 4984 (1970).
2. E. Wasserman, W. A. Yager, V. J. Kuck, *Chem. Phys. Lett.* 7, 409 (1970); E. Wasserman, V. J. Kuck, R. S. Hutton, W. A. Yager, *J. Am. Chem. Soc.* **92**, 7491 (1970).
3. J. F. Harrison and R. C. Liedtke, *J. Chem. Phys.* **58**, 3106 (1973).
4. D. R. McLaughlin, C. F. Bender, H. F. Schaefer, *Theor. Chim. Acta* **25**, 352 (1972).
5. P. R. Bunker, T. J. Sears, A. R. W. McKellar, K. M. Evenson, F. J. Lovas, *J. Chem. Phys.* **79**, 1211 (1983); A. R. W. McKellar, C. Yamada, E. Hirota, *ibid.*, p. 1220; P. R. Bunker and P. Jensen, *ibid.*, p. 1224.

Mental Illness

While I agree that it is important to give mental illness "its research due," the allegation in Constance Holden's article (News & Comment, 30 May, p. 1084) that "there are no well-developed scales to measure attitudes toward mental illness" is incorrect. Several psychometrically adequate scales have been available for more than 20 years. The best known, the Opinions about Mental Illness Scale (*1*) has been used in hundreds of studies. In addition, the Attitudes Toward Disabled Persons Scale (*2*) has been adapted to measure attitudes toward mentally ill persons.

H. E. YUKER
Center for the Study of Attitudes Toward Persons with Disabilities, Hofstra University, Hempstead, NY 11550

REFERENCES

1. J. Cohen and E. L. Struening, *J. Abnorm. Soc. Psychol.* **64**, 349 (1962).
2. H. E. Yuker, J. R. Block, J. H. Young, *The Measurement of Attitudes toward Disabled Persons* (Human Resources Center, Albertson, NY, 1966).

Erratum: The time in the cover legend (8 Aug., p. 605) was mistakenly noted as 6:26 a.m. It should have read 6:16 a.m.

Erratum: The time of impact of a meteorite at Lake Acraman is estimated to have been around 600 million years ago, when materials were being deposited in the Bunyeroo Formation, not 1 billion years ago as stated in "Meteorite scenario pieced together" (This Week in Science, 11 July, p. 139).

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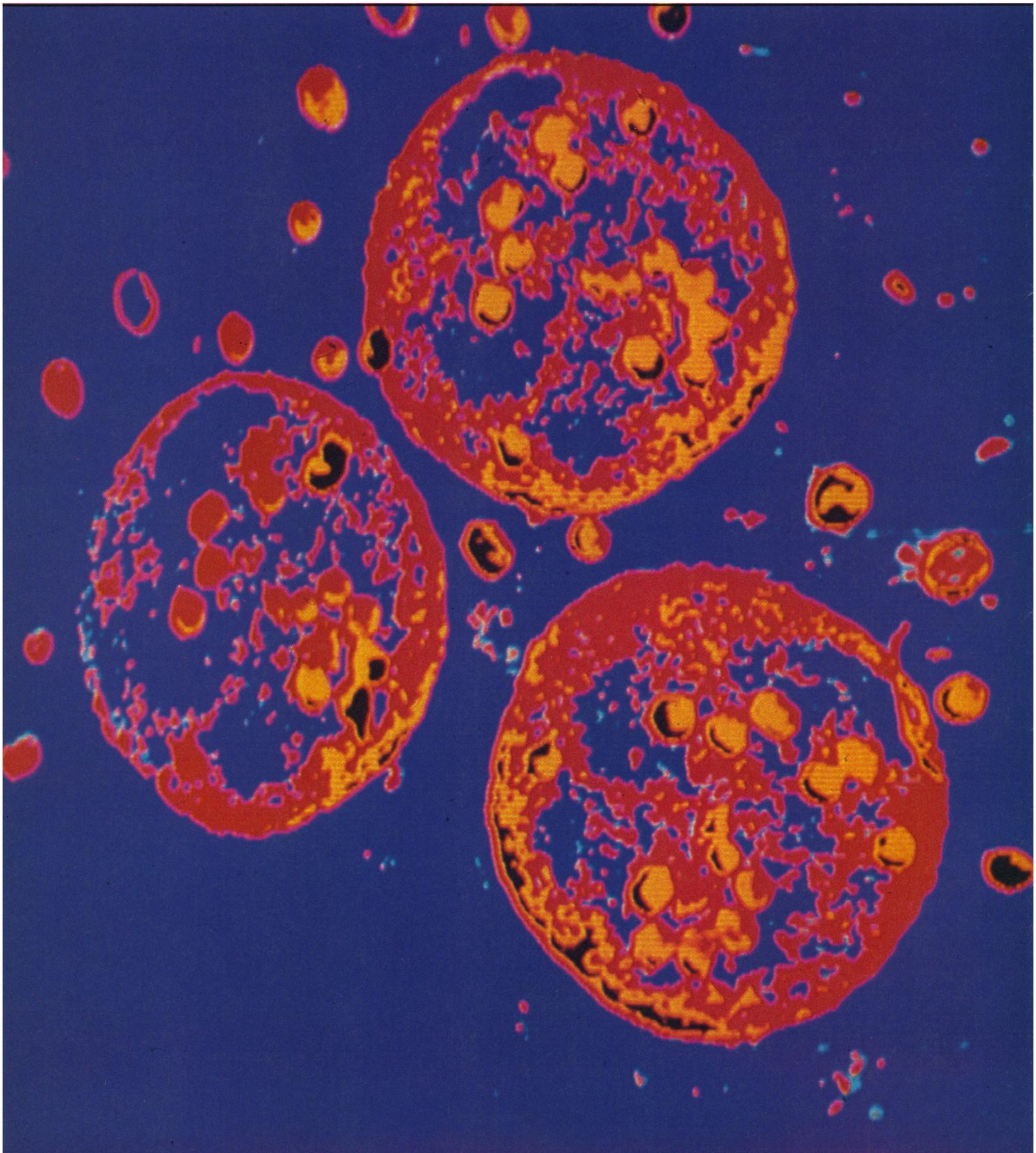

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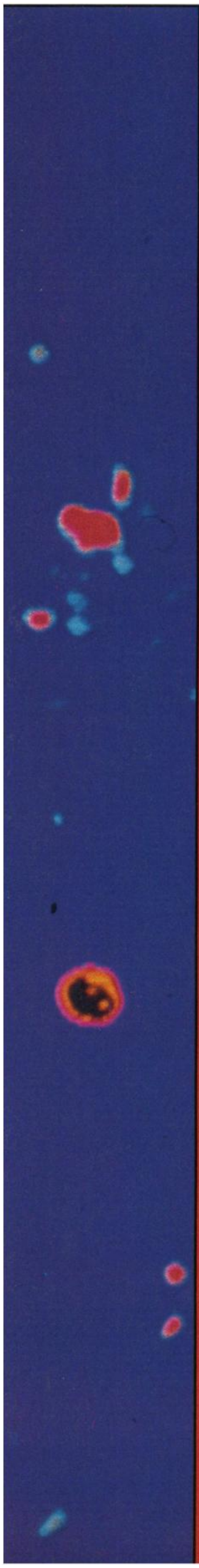

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