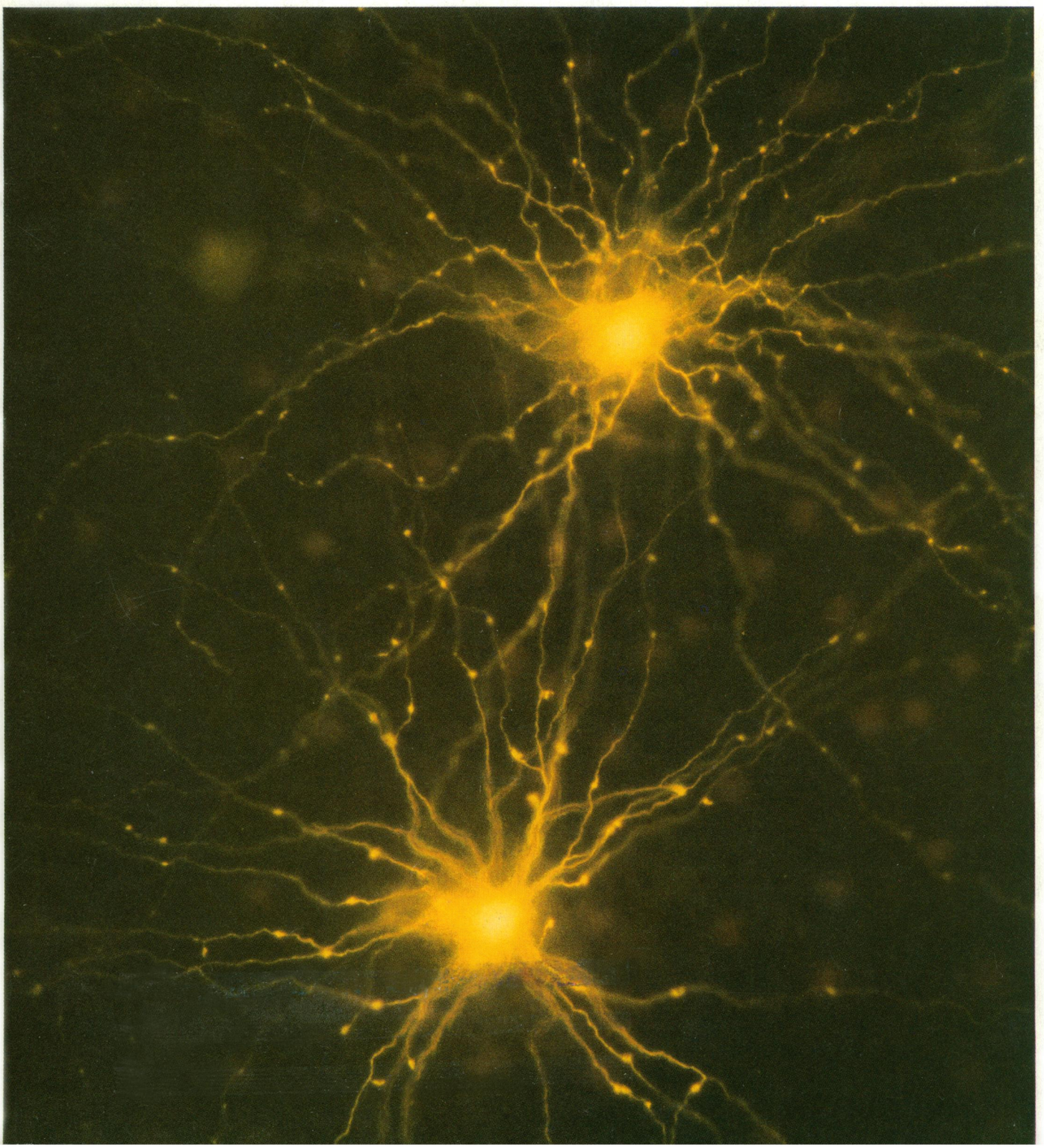
American Association for the Advancement of Science

SCIENCE

25 July 1986 $2.50
Vol. 233 ■ Pages 393–500



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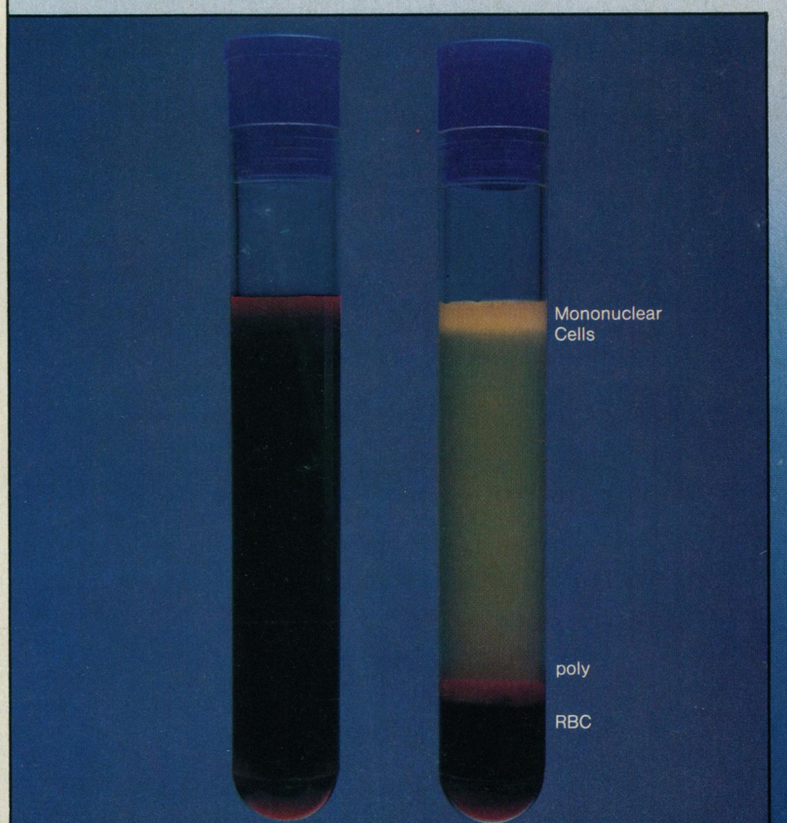

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SCIENCE

ISSN 0036-8075
25 JULY 1986
VOLUME 233
NUMBER 4762

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■ The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

COVER Iontophoretic injection of the fluorescent dye, Lucifer yellow, into retinal neurons labeled with a serotonin analog reveals their dendritic morphology. There are two types of serotonin-accumulating interneurons in the rabbit retina, termed S1 (lower) and S2 (upper) amacrine cells that can be distinguished by the extent and branching pattern of their processes. See page 444. [David I. Vaney, National Vision Research Institute of Australia, Carlton, Victoria 3053]

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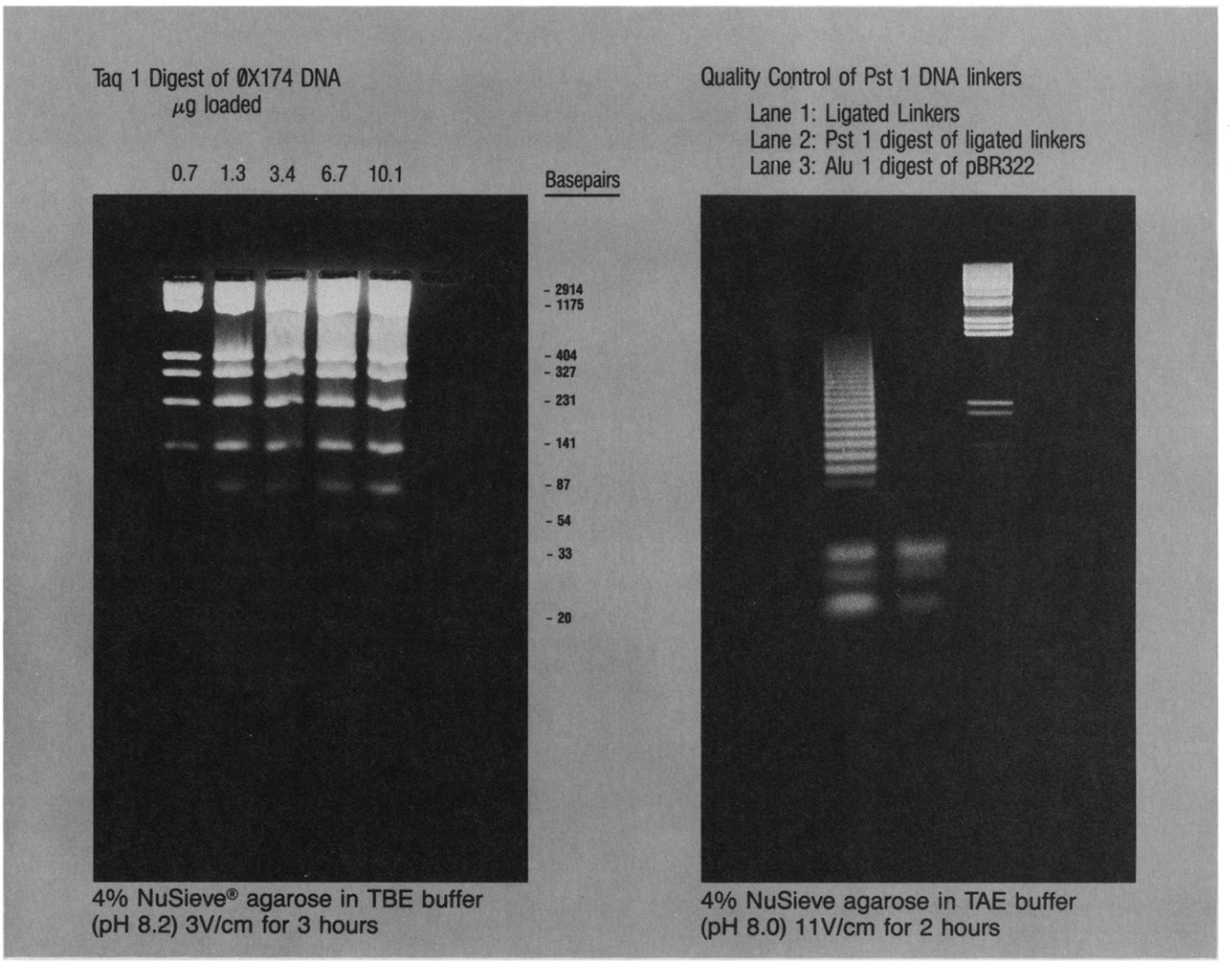

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This Week in
SCIENCE

Continental growth

ARE the continents growing (page 446)? Howell and Murray estimate that about 3 cubic kilometers of material are available for continental accretion annually, but 1.65 km^3 wear off the continents, leaving a net of 1.35 km^3 to contribute to continental growth. These figures are based on analyses of deep-sea core samples from around the world; determinations were made of how much of the sediment in ocean basins is biogenic, terrigenous, and volcanic and what contribution is made by porosity to the volume. Materials in the ocean basins can come from within the earth (appearing as volcanoes and seamounts), can erode off the edges of the continents, or can be transported from land out to sea by rivers. Once in the ocean basins, the sediments can ride on ocean plates and be accreted to continents or be subducted into the earth's mantle. It is considered likely that only a small percentage of the available material is subducted annually, but the actual subduction rate is not known. Continents fronting the Pacific have added new volume at rates consistent with the worldwide estimate of 1.35 km^3 per year throughout the past 200 million years since the supercontinent Pangaea began breaking up and the modern continental configuration began to take shape.

1985 Chilean earthquake

SINCE 1575, major earthquakes have rocked central Chile every 83 ± 9 years (page 449). In this series, an earthquake was expected around 1989 ± 9 and did occur in 1985. The magnitude of the 3 March earthquake was 7.8. It was preceded by hundreds of foreshocks beginning 21 February and by other premonitory signs such as the drying up of wells in a coastal community. The damage caused was heavy, a tsunami (a great sea wave) followed the earthquake indicating that vertical displacement of the sea floor had occurred, and there were numerous aftershocks. Although periodicity has characterized the great Chilean earthquakes (1575, 1647, 1730, 1822, 1906, and 1985), the lengths of the zones ruptured by these earthquakes appear to have varied by a factor of three. Available models do not account for this combination of periodic earthquakes with rupture zones of variable lengths. Comte *et al.* predict that the region south of the 1985 earthquake will be the next to rupture in a great earthquake because the centers of the earthquakes have consistently migrated southward.

Astrocytes and potassium

EXTRACELLULAR potassium levels in the brain may be regulated by astrocytes capable of shunting excess potassium away from neuronal cells (page 453). The astrocytes have a central cell body and radiating processes that end in bulbous enlargements called endfeet. Newman found that the potassium conductance (measured as depolarization when potassium was squirted onto the outer surface of the cell membrane) of fresh astrocytes from salamander optic nerves was ten times as high in the endfoot as in other parts of the astrocyte. Since potassium can enter the astrocyte at one place and exit at another, individual or coupled cells can help maintain electrical neutrality through the shunting of potassium ions. The high conductance of the endfeet suggests that these structures siphon excess potassium (generated by neuronal activity) away from active cells to the brain surface and capillaries, where free diffusion of ions to the large reservoirs of cerebrospinal fluid and blood can take place.

New vaccine technology

VIRAL envelopes secreted from cells infected with hepatitis B virus and used as a hepatitis B vaccine can be genetically engineered to carry foreign genes on their surfaces; thus they have the potential to be used in the production of vaccines for a range of other diseases (page 472). Delpeyroux *et al.* describe the insertion of a synthetic polio virus sequence into the gene for the major hepatitis surface antigen S. The polio antigen was expressed in biologically active form on the hepatitis envelopes: the engineered envelopes reacted with poliovirus-specific antibodies and also elicited poliovirus-neutralizing antibodies in mice and rabbits. Much of the immunogenicity of the hepatitis S antigen was lost, but the envelopes were assembled correctly and secreted from mammalian cells growing in culture. The secretion of engineered envelopes in large quantities should facilitate vaccine production; these are noninfectious envelopes that are of proven efficacy and safety.

Herbicide resistance

THERE is tremendous economic potential in herbicides that can kill weeds but not important agricultural products growing in the same field (page 478). Shah *et al.* describe a method for increasing the resistance of plants to the killing effects of the herbicide glyphosate. This herbicide inhibits activity of the enzyme EPSP synthase in plants, an enzyme that is important in a biochemical pathway for production of aromatic amino acids. The gene for EPSP synthase was isolated from a plant cell line that is tolerant to glyphosate and overproduces enzyme 15- to 20-fold. Twenty copies of the EPSP synthase gene were found per genome (a 20-fold amplification above normal). To this gene was attached a promoter that causes high level expression of foreign genes in plants; the engineered chimeric gene was introduced into petunia cells. Both transgenic calli and the plants derived from them showed tolerance to the herbicide; the tolerant plants grew to maturity despite being sprayed with herbicide at levels two to four times those required to kill 100% of wild-type plants. The herbicide tolerance of the plants apparently results from overproduction of the enzyme, the primary target of the herbicide.

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SCIENCE

25 JULY 1986
VOLUME 233
NUMBER 4762

Microbiological Resource Centers

The Microbiological Resource Centers (MIRCEN's) established in 1975 are carrying out highly cost-effective international programs. The MIRCEN's provide an infrastructure for a world network incorporating regional and interregional laboratories geared to the management, distribution, and use of microbial gene pools. The MIRCEN network supports workshops, training courses, and research projects. The centers reinforce conservation of microorganisms, emphasizing *Rhizobium* gene pools in developing countries with an agrarian base. The MIRCEN's have been active in fostering development of new and extensive technologies native to specific regions and have promoted the application of microbiology to strengthen world economies. They conduct programs throughout the world to investigate diverse capabilities of microorganisms for economic usefulness in helping the United States and developing nations meet both their present and future agriculture, chemical, energy, food, health, and waste-management needs. But despite a history of growing success, the U.S. share of support previously provided through U.S. membership in Unesco will be sharply reduced in the fiscal year 1987 budget.

The MIRCEN's working effectively on the rhizobia include Pôrto Alegre, Brazil; the University of Nairobi, Kenya; Bambey, Senegal; the NifTAL project at the College of Tropical Agriculture and Human Resources at the University of Hawaii; and the Nitrogen Fixation Laboratory at Beltsville, Maryland. A fermentation, food, and waste-recycling MIRCEN has been very active at the Thailand Institute of Scientific and Technological Research in Bangkok.

Several MIRCEN's are strongly biotechnology-oriented, including the Faculty of Agriculture in Cairo; Karolinska Institute in Sweden; the Central American Research Institute for Industry in Guatemala; the Tucumán MIRCEN in Argentina; Waterloo, Canada; Osaka, Japan; the Polytechnic of Central London, the University of Kent in the United Kingdom; and the University of Maryland, in marine biotechnology.

To optimize benefits of biological nitrogen fixation, the Nairobi *Rhizobium* MIRCEN is engaged in research on collection and preservation of cultures, isolation, selection, and testing of *Rhizobium* strains, and determination of parameters affecting survival of rhizobia in soil. They have evaluated locally available materials as carriers for inoculants and have quantified biological nitrogen fixation, using the nitrogen-15 technique. The University of Nairobi collection holds more than 200 bacterial cultures, and approximately 1984 requests for cultures have been met since 1975. More than 10,000 farmers have used the cultures. The Nairobi MIRCEN is clearly mission-oriented, like the others, delivering scientific knowledge needed for research and application. It represents an excellent example of successful technology transfer.

Overall, the network provides a knowledge base in microbiology and biotechnology that is needed throughout the world in both developed and developing countries to support the new biotechnology industries. The MIRCEN's offer a working network beneficial to the United States by providing access to unusual and important genetic material of potential application in industrial processes and to developing countries in providing applications of biotechnology appropriate to their needs, especially in enhancing their economy. The scope for the MIRCEN's includes soil fertility, rehabilitation of arid lands, bioconversion of waste, feed, fuel, and fodder, and production of microbial insecticides through biotechnology.

The amount of funding expected for the MIRCEN's from the fiscal year 1987 budget is only $20,000, to be awarded to the American Society for Microbiology for allocation to the MIRCEN's in accordance with an approved work plan. The funds available will assist with communication and research interaction among the centers. However, the allocation is tiny in comparison with the original budget submission of $175,000. Investment by the United States has already yielded significant return for this country by making available a source of genetic material for biotechnology applications. The MIRCEN's are a bargain: high productivity, low cost, and enormous potential. Here is where the United States may be penny-wise and pound-foolish in its foreign aid allocations.—RITA R. COLWELL, Vice President for Academic Affairs and Professor of Microbiology, University of Maryland, College Park, MD 20783.

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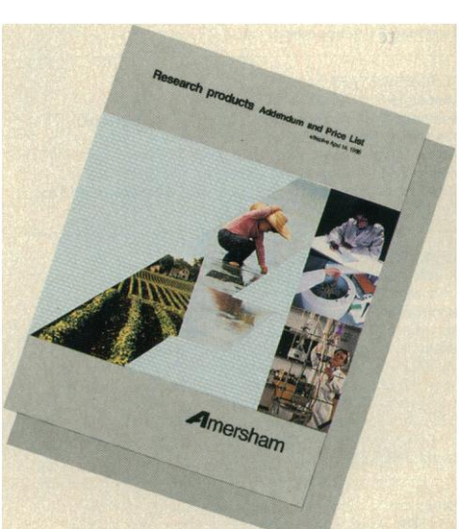

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The sensitive measure of complement activation

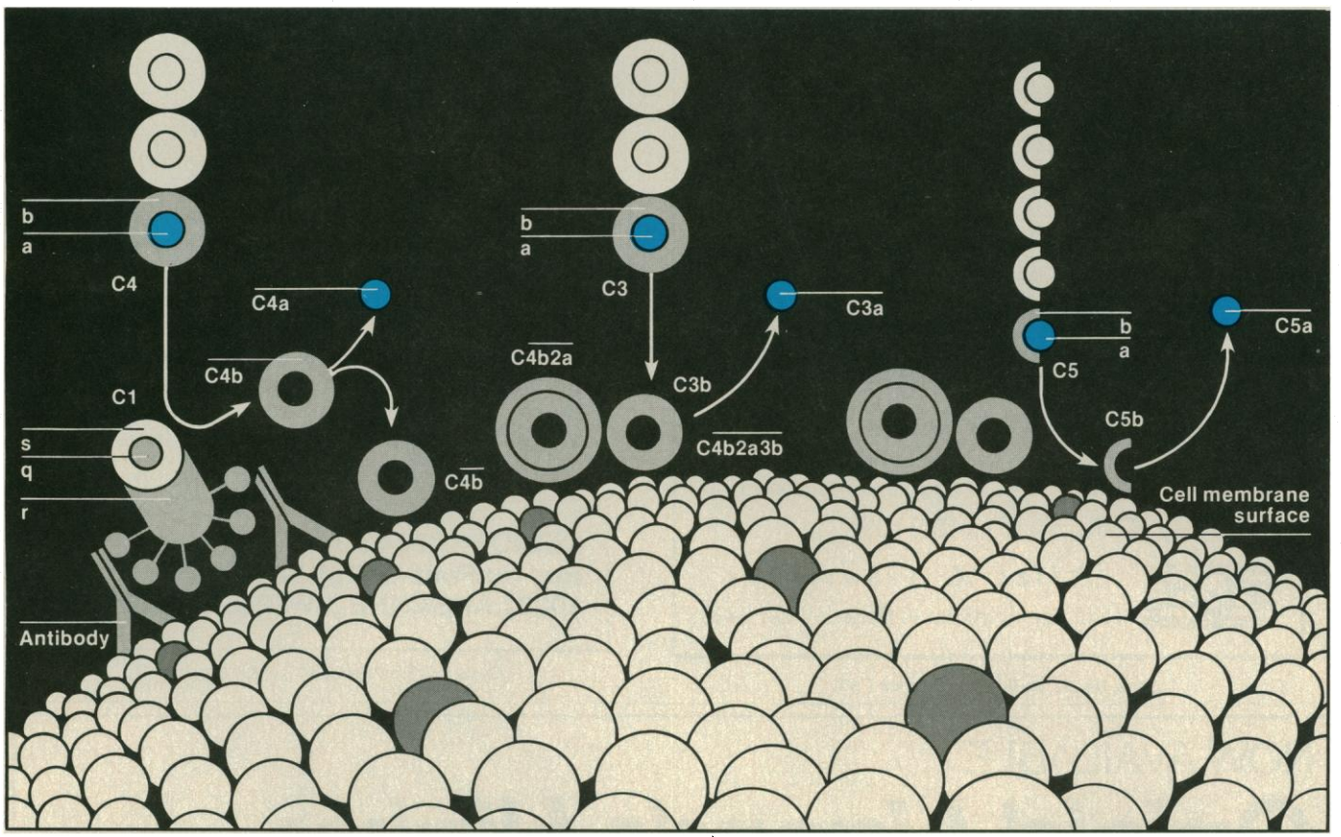

Illustration C3, C4, C5 activation in the classical complement cascade: Activated C1 (C1s), which binds to antigenic sites on the cell surface, cleaves C4 by limited protealysis to yield C4a which is released to the fluid phase and C4b which binds to the surface of the cell. C4b2a cleaves C3 to yield C3a and C3b. The latter binds to the cell surface. Complexes of C4b2a and C3b form a C5 convertase (C4b2a3b) that cleaves C5 to yield C5a, and C5b which binds to the cell surface.

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(1) Hugli, T E, and Chenoweth, D E, "Biologically Active Peptides of Complement: Techniques and Significance of C3a and C5a Measurement," *Laboratory and Research Methods in Biology and Medicine*, (ed. R M Nakamura, W R Dita, E S Tucker III: Alan R. Liss, Inc, 1980), pp.443-460.

(2) Gorski, J P, "Quantitation of Human Complement Fragment C4ai in Physiological Fluids by Competitive Inhibition Radioimmunoassay," *J. Immunol. Methods*, (47,1981), pp. 61-73.

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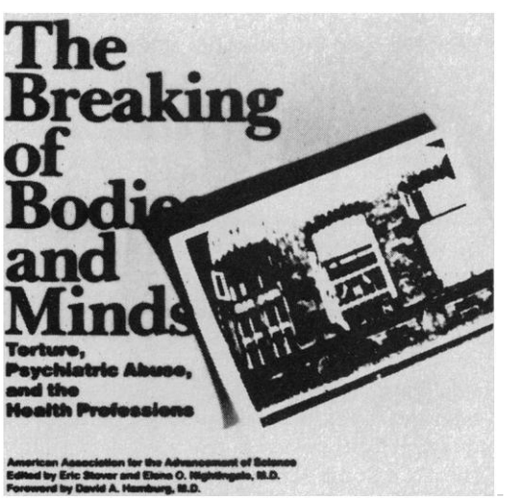
A documentation of systematic use and effects of physical and mental torture throughout the world

Edited by Eric Stover and Elena O. Nightingale

With a Foreword by David A. Hamburg



This eye-opening book brings together for the first time writings on the role of medical personnel in cases of torture and psychiatric abuse. Through analyses and case histories, psychiatrists and other health care professionals, political scientists, ethicists, and other writers discuss the systematic use and effects of physical and mental torture in the Soviet Union, Latin America, and other parts of the world.

The book also details the complicity of an alarming number of medical personnel in torture and psychiatric abuse and examines the ways in which governments use a medical rationale to seek legitimacy for human destruction. Finally, it describes efforts by medical and other associations both to combat offensive practices and treat victims.

Contents

The Breaking of Bodies and Minds is important reading for anyone concerned with the preservation of basic human rights.

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