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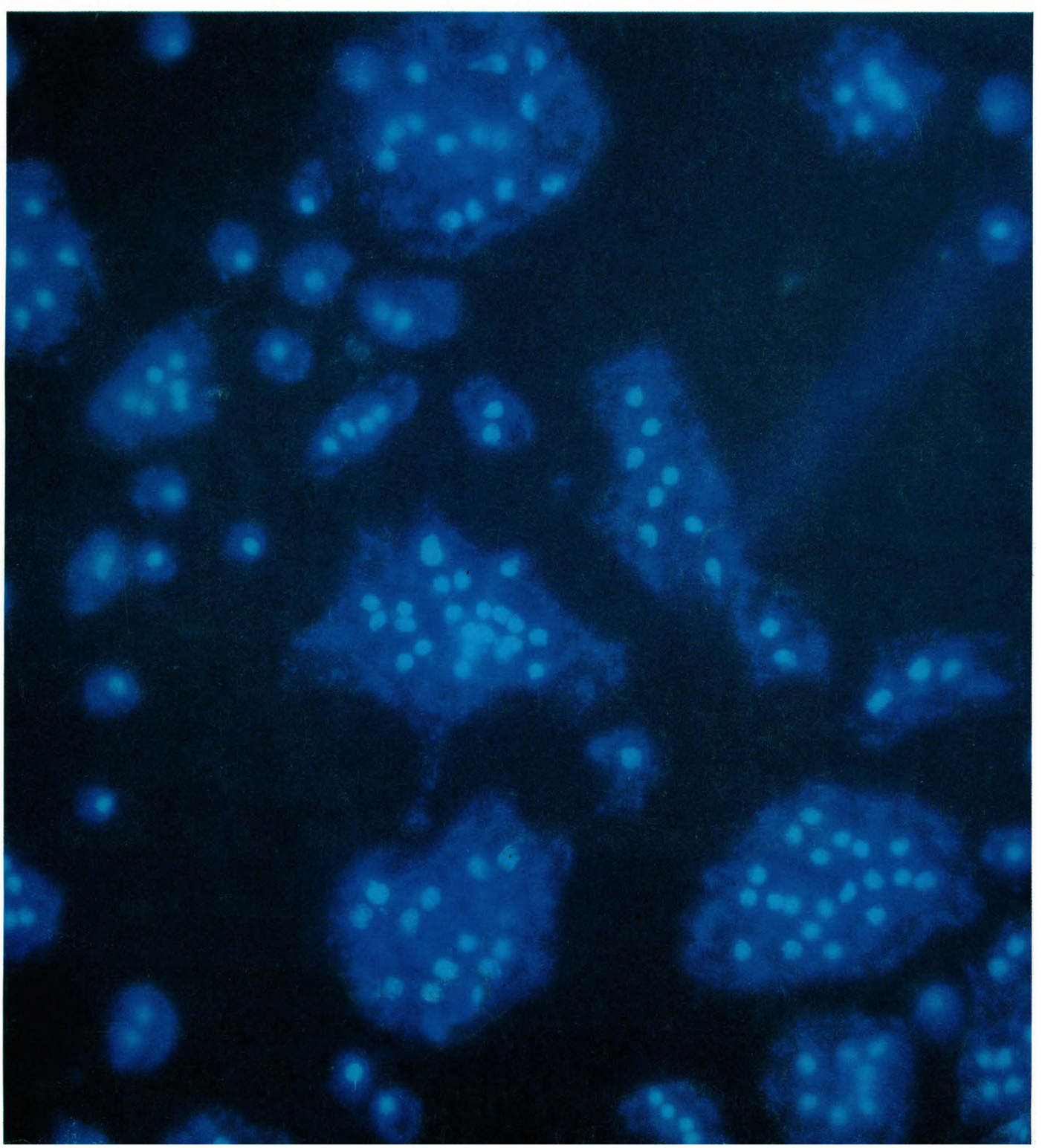

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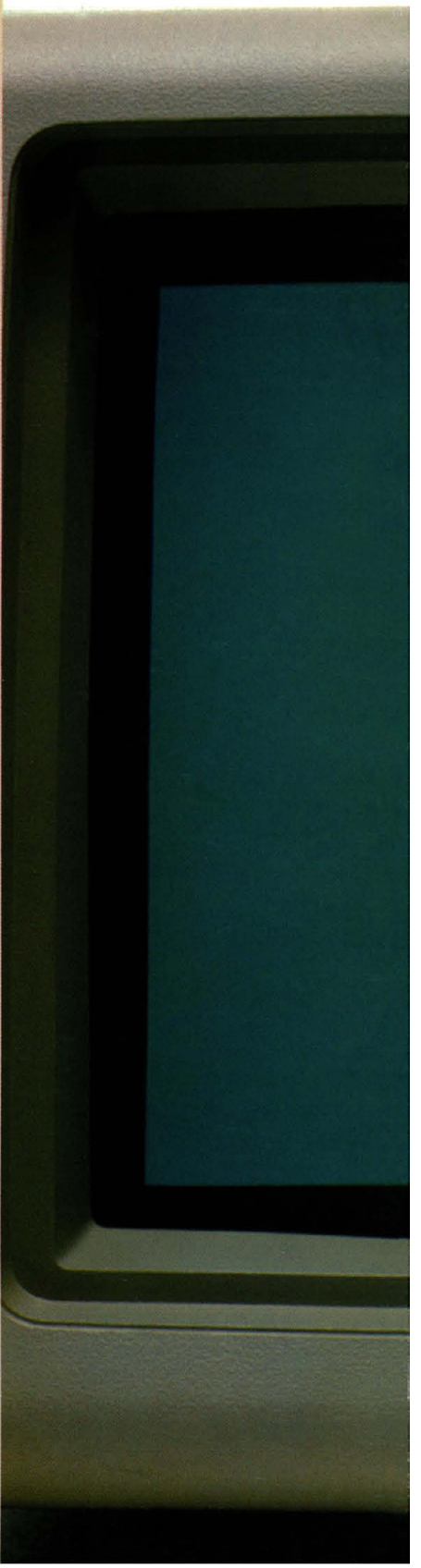

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COVER Multinucleated cells of *Dictyostelium discoideum* cells that arise when cytokinesis is impaired by the lack of myosin heavy chain protein. The bright spots are nuclei fluorescently stained with the DNA binding dye Hoechst 33258 after fixation of the cells. The phenotype was produced by transforming cells with a vector that encodes myosin heavy chain antisense RNA. See pages 1081 and 1086. [D. A. Knecht and W. F. Loomis, University of California San Diego, La Jolla, CA 92093]

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Telltale trails of foraging snails

SNAILS that forage in Israel's Negev Desert Highlands, a hilly limestone rock desert, are the major agents of soil formation (page 1098). Two species of *Euchondrus* snails eat endolithic lichens that live below the surface of the limestone rocks; coincidentally, the snails break up, ingest, and process rock and generate dust. Shachak *et al.* videotaped snails eating lichens and limestone rocks. A groove of white dust (limestone stripped of lichens) and white fecal material consisting largely of limestone dust were left in the rock. Based on the amount of dust generated on a small scale, the annual dust production by snails throughout the desert was calculated; huge quantities of rock would be weathered by snails, and the amount of dust generated would equal or exceed the amount brought to and deposited in the Negev by winds from the Arabian and Sinai peninsulas. These snails are consumers whose major impact on the ecosystem occurs not directly through consumption of biologic matter but through rock weathering and soil formation.

Gene for neurofibromatosis

ONE of the most common autosomal dominant conditions of humans (affecting 1 person in 2500), von Recklinghausen neurofibromatosis (NF), is caused by mutations at a genetic locus on chromosome 17 (page 1100). Through linkage analyses of 128 individuals in 15 families in Utah, 6 of which provided information for 3 generations, Barker *et al.* identified a region near the centromere of chromosome 17 as the probable location for the NF genetic defect(s). Precise localization of the position of the causative gene(s) will be determined as closer flanking markers are defined and the order of the closest markers is established. NF manifests as changes in the central nervous system, bones, skin, and eyes; many soft tumors develop on the skin and in the eyes and these are typically associated with pigment cells. Although the pleiomorphic signs of the disease suggest the possibility of genetic heterogeneity, little heterogeneity was found among the patients.

Regeneration of nervous tissues

HUMAN amnion membrane matrices can promote the regeneration of neurons both in vitro and in vivo (page 1106). Davis *et al.* collected and prepared membrane matrices from full-term placentas; the matrices had an intact basement membrane on one side and a stromal surface on the other. The layers contained various growth-promoting proteins (laminin, collagen) and proteoglycans and lacked cells. Neurons could attach to either side of the matrix, but elongation of axons occurred only when attachment was on the basement membrane side. Rolled matrices with the basement membrane exposed on the surface were implanted into rat brains in cavities that had been created by aspiration of axons connecting the septum to the hippocampus; these axons cannot normally regenerate spontaneously, but, with time, axons could extend through the implant to reestablish the neurologic link between septum and hippocampus. It was not necessary to use immunosuppressive agents to maintain the integrity of the matrix. Similar matrices might be implanted into human brains to promote neuronal regeneration in adults who have brain lesions that produce degenerative neurologic diseases.

Brain development

EACH hemisphere—right and left—of the human brain develops steadily at its own pace; each also undergoes spurts of growth at specific times in development (page 1110). The developmental independence of the two hemispheres is not surprising, because each has been associated, at least in adults, with control of different cognitive processes. Thatcher *et al.* measured the electroencephalographic (EEG) coherence and phase characteristics of the cerebral hemispheres of 577 "normal" children and young adults. These subjects had normal mental and physical development, no head injuries, no disorders of consciousness, no obvious mental disorders, and they ranged in age from 2 months to early adulthood. The EEG recordings provide details of electric discharges occurring within the cortex of the brain over both short and long distances. Five major developmental spurts were documented from birth to adulthood; some were exclusive to one hemisphere while others occurred bilaterally. A direct association of leaps in cognitive development with the neurophysiologic changes occurring in distinct anatomic regions remains to be established; however, the EEG spurt periods do overlap with stages of human development that were defined by Piaget in classic behavioral studies.

Trojan horse tires

TIRES are imported into North America from around the world for recapping and reselling and along with them have come *Aedes albopictus* mosquitoes that had used the stagnant water in the tires as a breeding ground (page 1114). Hawley *et al.* traced the source of these mosquitoes by comparing several of their physiologic characteristics with those of mosquitoes of the same species isolated from various countries around the world. Both with regard to the cold-hardiness of the eggs and their sensitivity to light exposures, this strain most closely resembles strains from temperate not tropical zones of northern Asia. *Aedes albopictus* mosquitoes are aggressive biters and can be vectors for many dangerous viruses including the dengue virus, encephalitis viruses, and yellow fever viruses. The mosquitoes are becoming increasingly abundant in southern and midwestern states in the United States (and in Brazil) and may be capable of establishing themselves in more northerly states. Thus, the possibility exists that dengue, a serious disease formerly only a problem in southern regions, might spread northward.

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The Challenge to U.S. Competitiveness

If the Soviet launch of Sputnik was a technological shock, and the oil crisis of 1973 an oil shock, then what is happening to us today can only be called a competitiveness shock. Although the competitive challenge is understood in some parts of industry and government, it is not widely understood for its significance and its threat to the national economic well-being and our standard of living.

One of our tasks is to meet the challenge of the globalization of the world economy. Industries and individual companies in the United States or in other countries ignore at their economic peril the need to operate in a global economy. The challenge is across the board—in market access, low-cost production, quality products, research and development, innovation, marketing, and education. The competition is for market share not only abroad but also in the United States. Access to global markets is critical to economic success. Although it is essential that products be competitive in cost, quality, and performance, in many cases economic and political necessity dictates that the products and institutions that produce them have an indigenous component.

A phenomenon, the long-term consequences of which are poorly understood, is that product design, engineering, and software development increasingly are likely to be done overseas. The implications for maintaining the essential U.S. engineering capability are worrisome because of the implied erosion of the U.S. base in knowledge and know-how. Whether automobiles or refrigerators, computers or microchips, nuclear power or energy transmission systems, the likelihood is increasing that the systems are assembled from components designed, engineered, manufactured, and shipped from all parts of the world.

Increasingly, excellence in research and engineering is to be found throughout the world, and the level of innovation is rising abroad. Witness the increase in the number of patents granted to foreign companies and individuals in the past year. More than 43 percent of the patents granted in the United States went to foreign entities.

It is time that our national policy recognizes the key role of engineering research and engineering application, alongside of scientific discovery, in meeting the global competitive challenge before us. This means allocating funds to, and creating programs for, engineering activity to an extent far greater than exists today. There must be a realization that engineering and technology are different from science and equally important. It also means encouraging private investment in engineering research and its application.

The absence of attention to excellence in manufacturing has been at the heart of some of our problems in industrial competitiveness. Until recently we have failed to treat the manufacturing process as a system; we have failed to provide adequate manufacturing education in our engineering and business schools; we have failed in many cases to provide the incentives of prestige and compensation to manufacturing engineering; and we have failed to make the capital investments in new manufacturing technology.

We are assured, however, by some economists and others that we need not worry about manufacturing moving offshore, since all we are witnessing is a natural, though painful, transition to a service economy in the United States. Although it is true that services increasingly are sources of employment and wealth generation, we face the dilemma that a thriving service economy is directly dependent on a vigorous manufacturing base. We need to recognize that the problems of manufacturing productivity and quality require a system approach. We need to examine manufacturing from the design phase to the producibility of the product to its marketing, and distribution. Only when this view is adopted throughout industry and academia will our manufacturing sector regain competitiveness.—ROBERT M. WHITE,* *President, National Academy of Engineering, Washington, DC 20418*

*Adapted from "Taking technological stock," Report of the President at the NAE 22nd Annual Meeting (National Academy of Engineering, Washington, DC, 1986).

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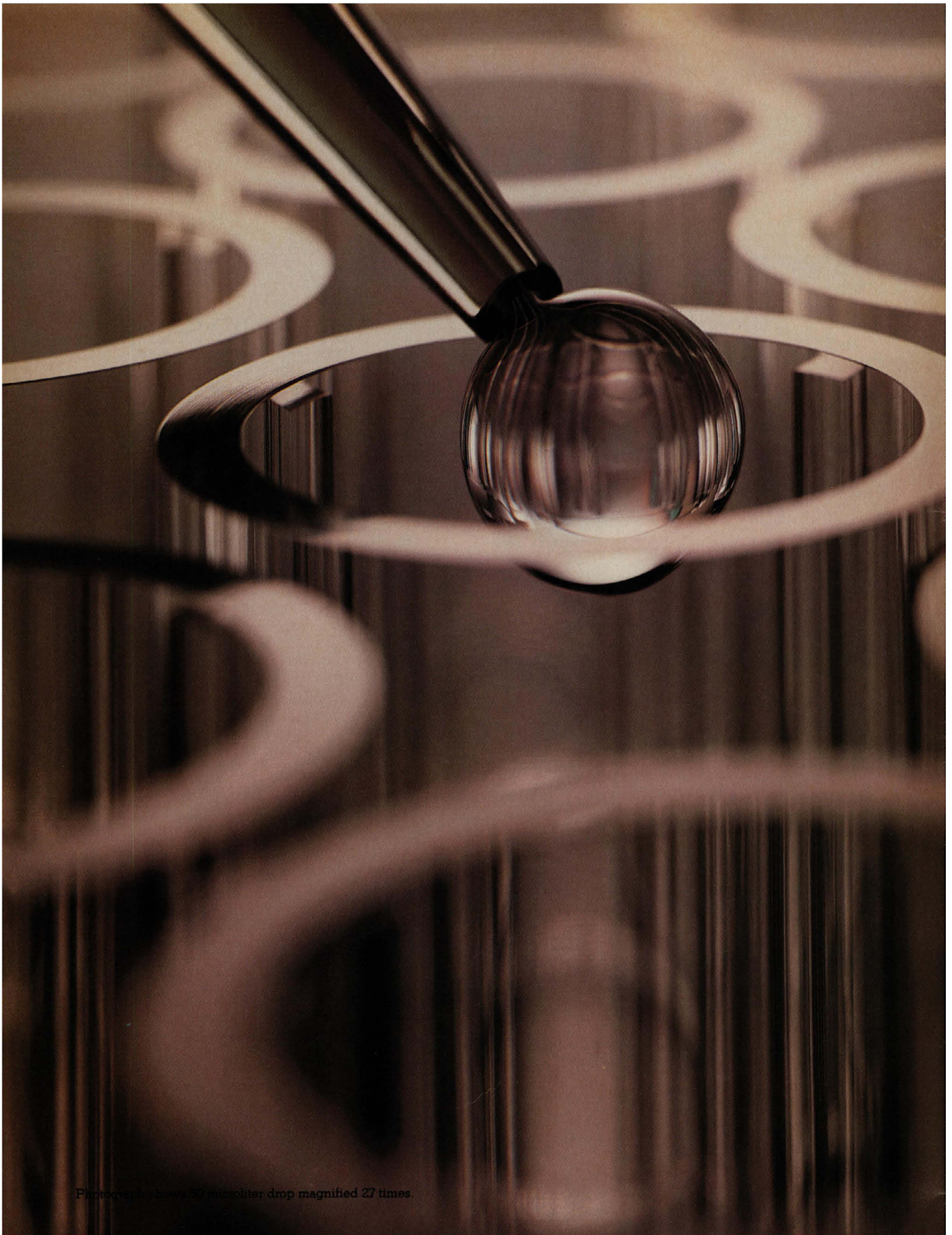
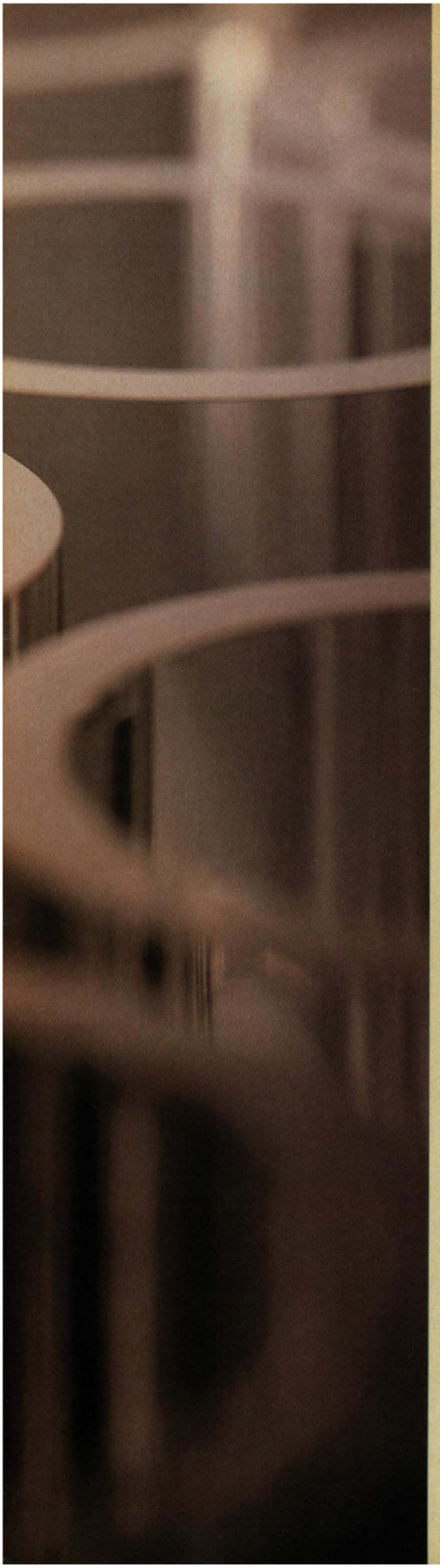


Photograph shows 50 microliter drop magnified 27 times.



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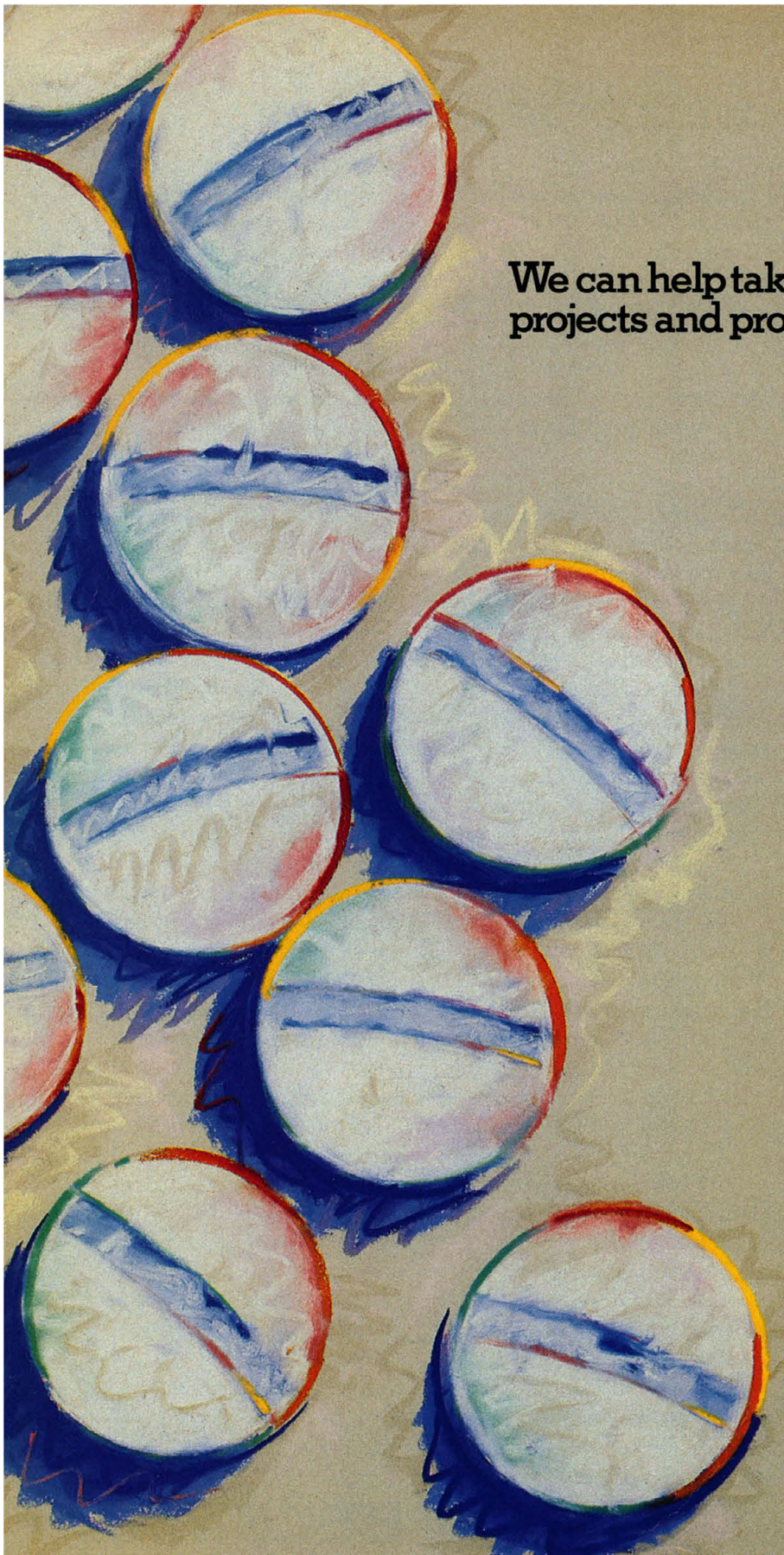

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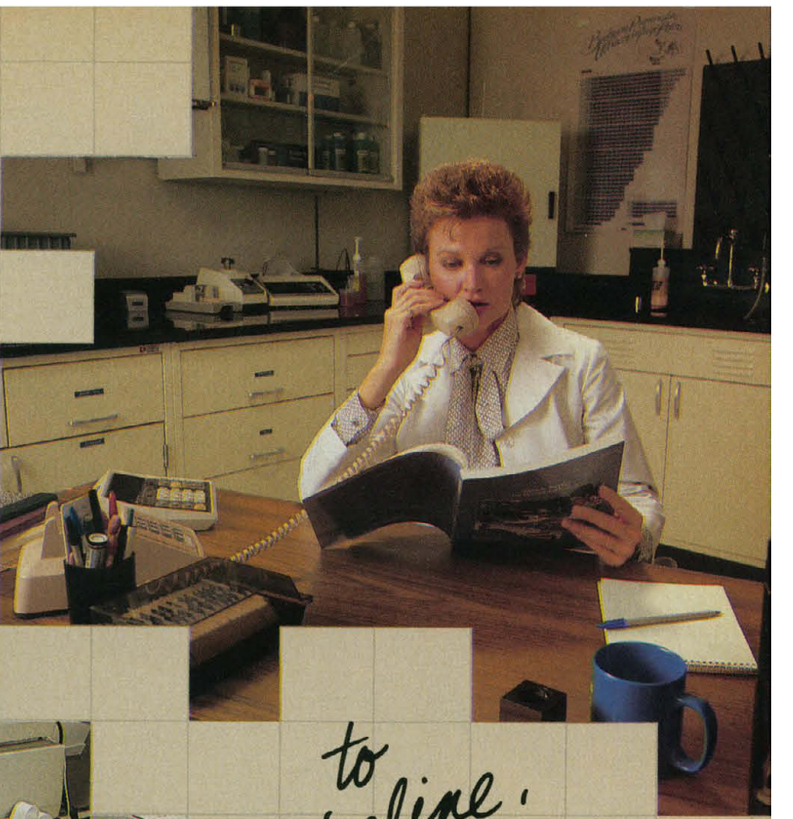

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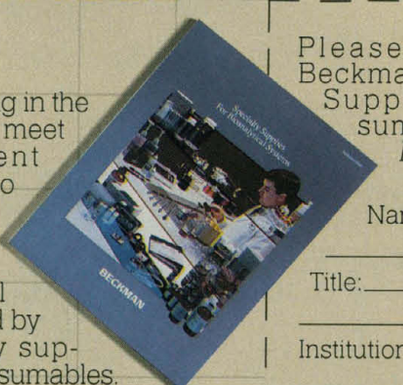

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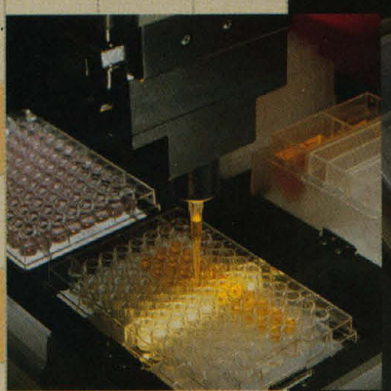

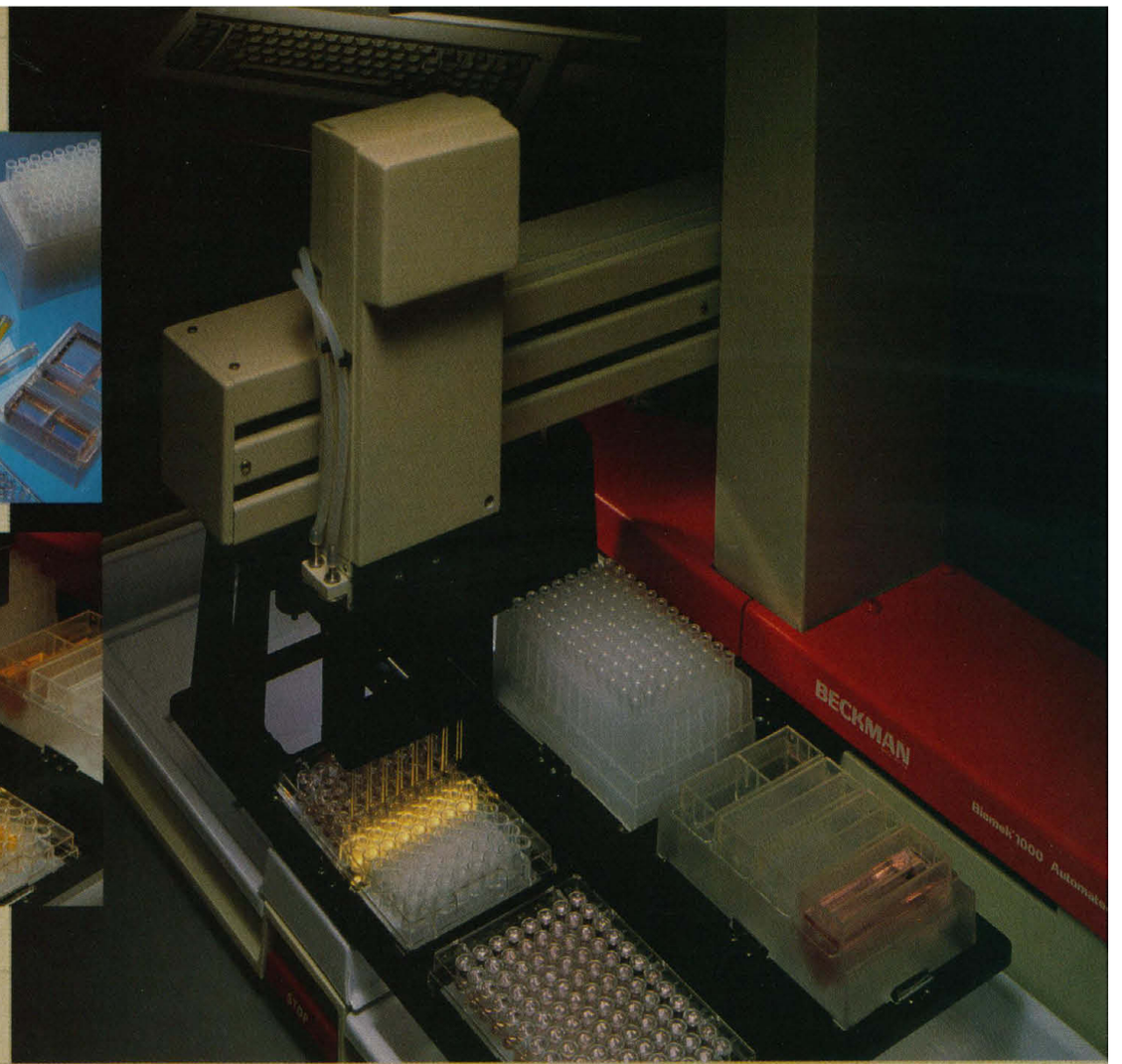

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