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# SCIENCE

1 April 1988 $3.00
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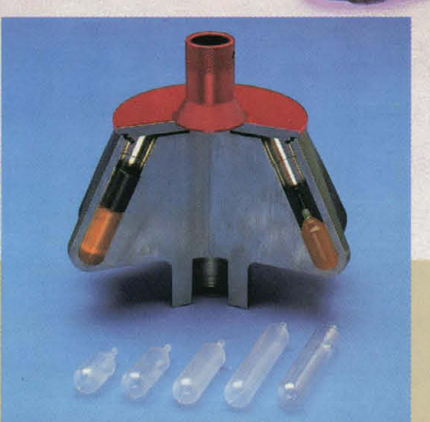

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COVER Pre-Pottery Neolithic B statuary from 'Ain Ghazal, Jordan. See page 35. [Conserved by Mrs. K. Tubb, Institute of Archaeology, University of London. Photo by Peter Dorrell and Stuart Laidlaw, courtesy of Institute of Archaeology, University of London]

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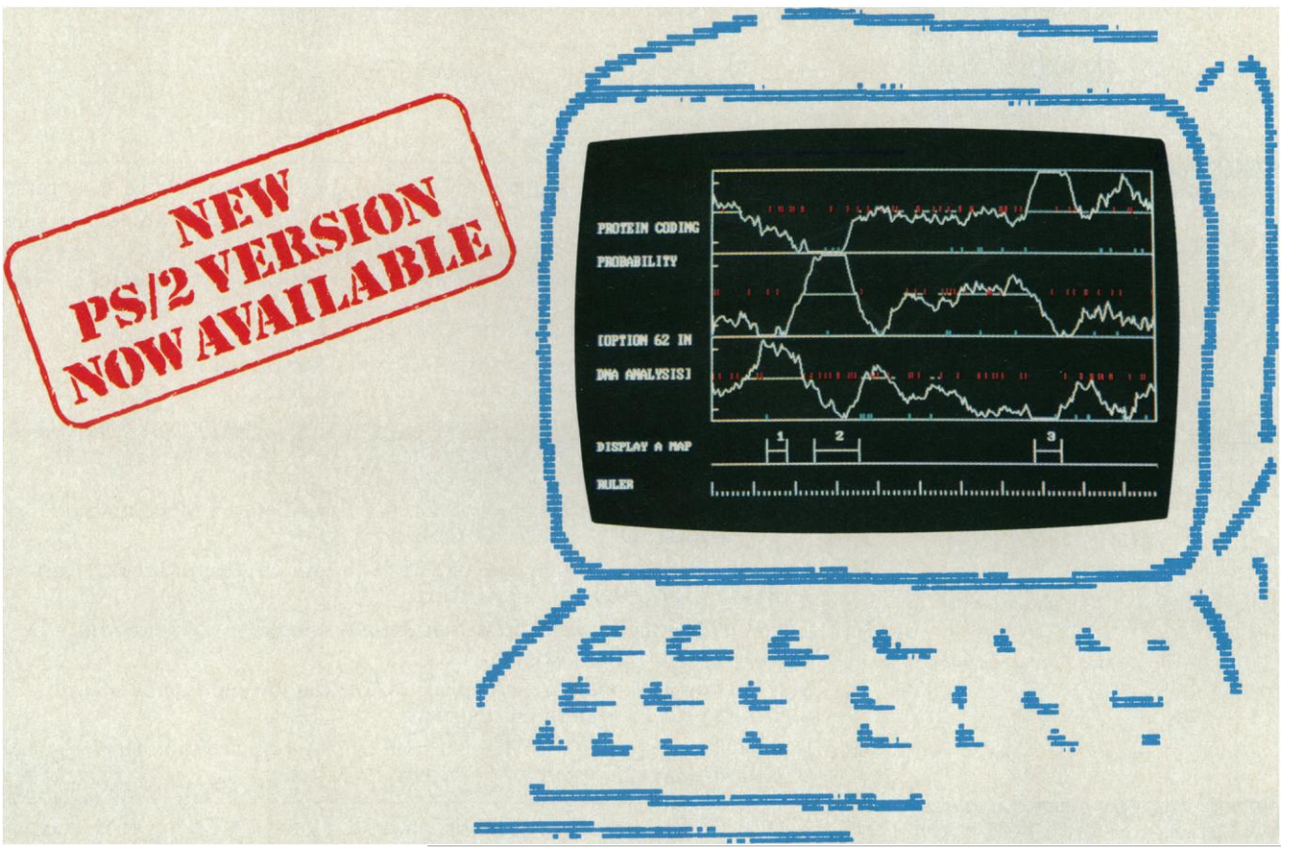


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# *This Week in* SCIENCE

## Spring of the gazelles

'AIN Ghazal, the "spring of the gazelles," was a Jordanian village that rode out one of the major stages in human cultural development—the shift that took place during the Neolithic period from the hunter-gatherer way of life to a life based on an economy centered on crop and animal domestication (page 35). The 30-acre archeologic site at 'Ain Ghazal was exposed in 1974 during road construction near Amman, but excavation only began there in 1982. The site is proving to be especially important for refining concepts about life in the late Neolithic. The large village was occupied more or less continuously for about 2000 years, starting around 7200 B.C. and ending around 5500 B.C. The earliest occupation appears to have been the most prosperous one: food sources included domesticated and wild animals and plants; architecture, art, and ritual behavior were elaborately developed (cover). Later, the diversity of foods narrowed, the land was depleted (overuse, an unstable landscape, and the region's marginal rainfall probably contributed to this), the standard of living declined, and the village became impoverished. Simmons *et al.* speculate that pastoralism may then have proved a more viable way of life (as it still is in parts of the Near East) and that the villagers wandered away from the settlement at 'Ain Ghazal, finally abandoning it altogether.

## Cell-cell adhesion molecules

CELL adhesion molecules are surface constituents that help cells recognize and interact with each other (page 53). Among the most abundant of these in the nervous system is the neural cell adhesion molecule (NCAM). After cells are brought together by NCAM, the large negatively charged polysialic acid (PSA) component (that may make up as much as a third of the molecule's mass) may regulate signal transmission. Rutishauser *et al.* propose that interactions between surface molecules in general may be regulated by NCAM. When the PSA content is high, cell-cell contact might be impeded sterically or electrostatically. In the extreme, a thin screen of PSA may form around the cell much as a protective or selective barrier forms around some bacteria and eggs. When PSA is limited, better membrane contact between cells may be established and cell-cell interactions facilitated; cells very early in development and cells in adult tissues have relatively low amounts of PSA. Thus the PSA content will determine whether NCAM has a positive or negative effect on cellular communications.

## Reverse transcriptase as immunogen

THE AIDS virus HIV-1 is hidden inside host cells; thus a successful defense against HIV-1 might be met by killer cells that can attack the sequestered virus in the harboring cell (page 64). Walker *et al.* found that people infected with HIV-1 have certain killer T cells that react against reverse transcriptase, an enzyme that signals the presence of this retrovirus. Virus-infected cells express reverse transcriptase in conjunction with major histocompatibility antigens. The killer cells, which have distinct antigens (CD3 and CD8) on their surfaces, must recognize reverse transcriptase in the context of their own major histocompatibility antigens. In most other viral systems, $CD3^+CD8^+$ cells have killer functions and facilitate recovery from viral infections. Although a protective or ameliorative effect of $CD3^+CD8^+$ killer cells in AIDS infections has not yet been established, it is possible that a vaccine containing reverse transcriptase might induce cells (and perhaps also antibodies) that would slow or halt the progression of the disease.

## Trigger of muscle contractions

TROPONIN C is a calcium-sensitive constituent of muscle; it is part of a complex of proteins that triggers the contractions of muscles during muscle activation (page 74). Babu *et al.* have found that there is an intrinsic difference in the activities of troponin C molecules taken from two different types of muscle, one (cardiac muscle) that is involved in sustained, regular pumping actions and the other (skeletal muscle) that makes fast-twitch responses. Segments of heart ventricle muscles were stripped of native troponin C and reloaded with either heart or skeletal troponin C. The response to calcium was greater for cardiac muscle than it was for skeletal muscle of the same length, and, as has been previously documented, the relation of length to calcium sensitivity was greater in heart than in skeletal troponin C. Troponin C may thus be the molecular factor in Starling's law of the heart, which states that the bigger the ventricle at the end of diastole the greater will be its contraction and its accompanying output of blood.

## Retinoblastoma origin

RETINOBLASTOMAS, which are tumors that grow inside the eye, were known to consist of cells of neuroectodermal origin, but exactly what cells they came from has been unclear (page 76). A study by Bogenmann *et al.* now establishes that retinoblastoma cells are derivatives of cells that normally give rise to retinal cones; earlier morphologic studies had ruled out an origin for retinoblastomas from fully differentiated cones. In the eye, the cone cells, along with rod cells, are responsible for color vision; they make photopigments and each has a distinctive form of the protein transducin. In experiments in culture, the retinoblastoma cells produced the photopigments and the transducin that are found in cones; they did not produce rhodopsin or the rod-specific form of transducin even though they carried the genes encoding these proteins. Besides being of value for clarifying many of the properties of retinoblastomas, this cell system may be useful for understanding how cone cells grow and how genes are expressed in them.

SCIENCE

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NUMBER 4848



# Research and Development in South Korea

The newly industrialized countries of east Asia are continuing to increase their favorable balance of trade with the United States. In 1987 it was $37.7 billion versus $30.3 billion in 1986. At one time, their exports were largely labor-intensive items, but increasingly they are competitive in high-technology products. This is especially true of South Korea, which has achieved a remarkable rate of industrialization.

At the conclusion of World War II, there were only 40 people trained in science and engineering in South Korea. The Korean War that ended in 1953 was devastating. Even with some recovery, the gross national product of Korea in 1962 was only $2.3 billion (1980 dollars), and the GNP per capita was $87. In 1986 the GNP was $94 billion. More than 40,000 professional people are now employed in research and development. Many electronic devices are being produced and exported, including computers and 256K random-access memory chips. Shipbuilding is sophisticated and computer-controlled. Steelmaking facilities are among the most modern and competitive in the world today. Seven nuclear power reactors are in operation, two are under construction, and two are being designed and will be built by a Korean company.

Key to the rapid progress and a continuing momentum has been future-oriented governmental policies that have been implemented by private initiative. Beginning in 1962, a national plan for development was formulated that emphasized import substitution and exports of labor-intensive products. In the plan, the need to increase national capabilities in science and engineering was also recognized. In 1964 and shortly thereafter, Donald Hornig, the then U.S. presidential science adviser, and the Battelle Memorial Institute were helpful, aiding in crystallizing a Korean view that, for a developing country, the choice of appropriate technology can be properly made only when the importing country itself has the capability to make relevant decisions and to negotiate with the transferring country.

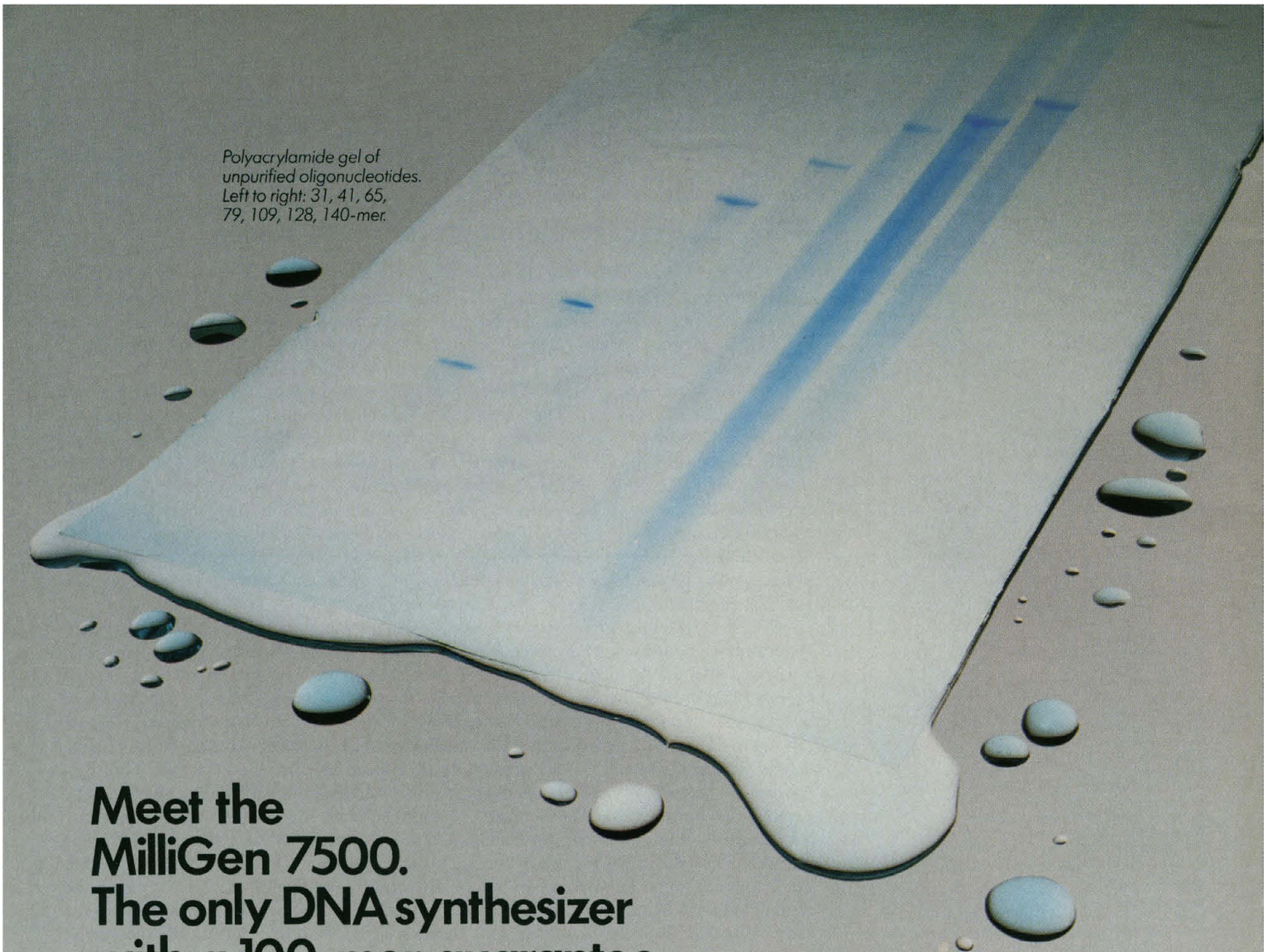
From the mid-1970s, the availability of trained scientists and engineers made feasible full-scale development of the heavy and chemical industries. Much of the technology that was employed came from foreign sources. But the pattern followed was to master the production process and then to move gradually into more sophisticated technology. In the early years, the Koreans were reluctant to enter joint ventures, but, as their expertise developed, participation increased greatly after 1980.

An extreme example of gradualism in taking on new technology is with respect to nuclear power reactors. The first three were obtained as turnkey products of foreign companies. However, Koreans were present in engineering studies and design work starting in 1970. Koreans participated actively in design and construction of the next six reactors, which again were the responsibility of foreign contractors. Simultaneously, Korea conducted intensive nuclear power engineering training programs. The Koreans have emphasized the need for safety and reliability in their nuclear power plants, but they feel sufficiently confident in their abilities that they will design and build two power reactors to be completed in 1996. At that time, 37 percent of the nation's electric power will come from nuclear energy.

In 1966, the then Korean President Park Chung Hee said, "In modern times development of science and technology is one of the most important factors in determining national power. Science and technology which are driving forces in the cultural development of mankind have greatly contributed toward rapid economic growth and human welfare."

Korean policy continues to take the Park statement as a given. A nationwide science movement has been launched to promote public understanding of science and technology. The country held its first "technology promotion meeting" in January 1982, presided over by the president of Korea. Cabinet ministers and representatives from relevant segments of the administrative, business, and academic sectors attended. These meetings have been held quarterly. With that kind of example, it is not surprising that young Koreans are knowledgeable about science. One recent study (see News & Comment, 11 March, p. 1237), showed that 10-year-old Koreans were tied for first place with Japanese children in knowledge of science, whereas 10-year-old U.S. children ranked 8 in a field of 15.

—PHILIP H. ABELSON



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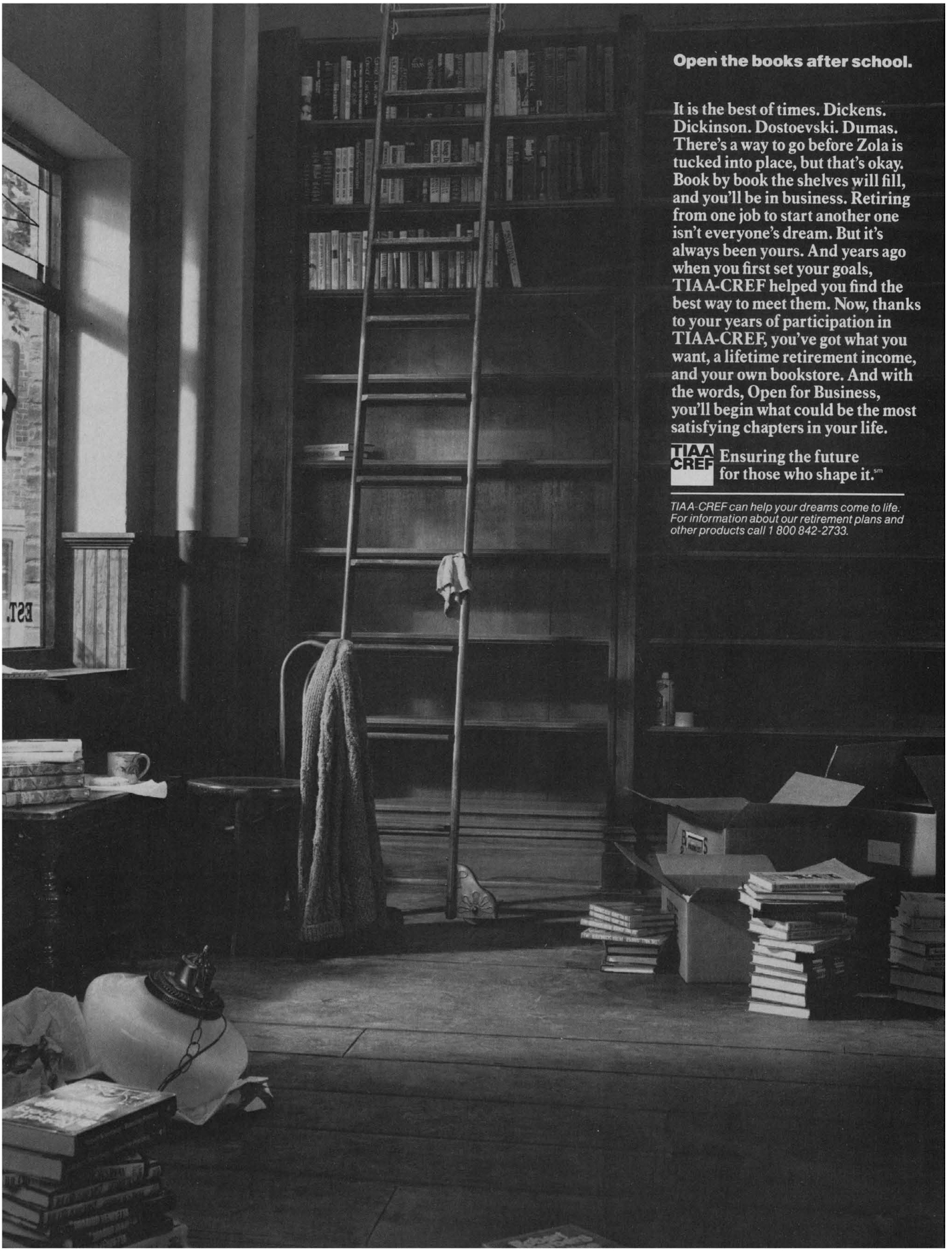

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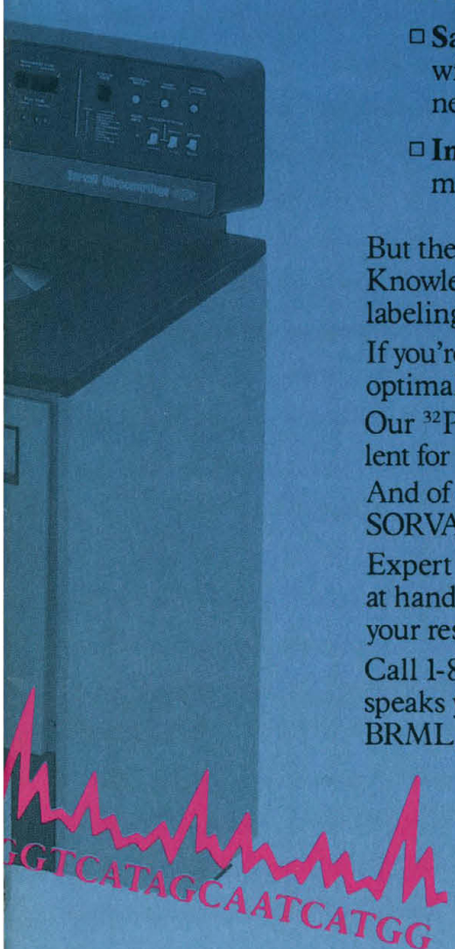


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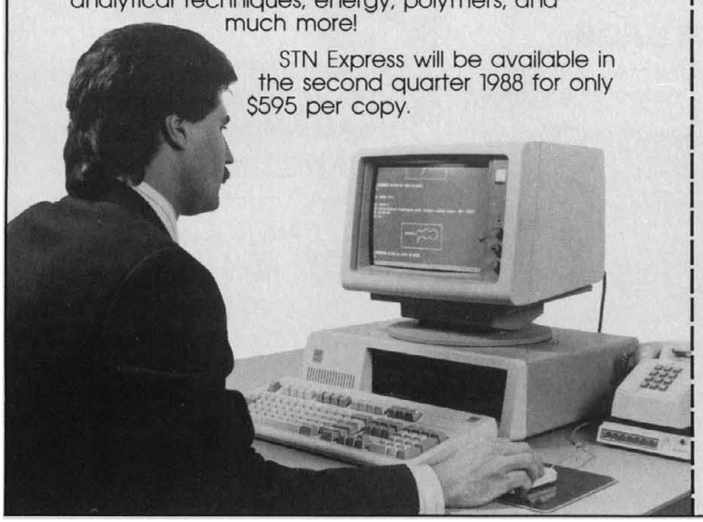

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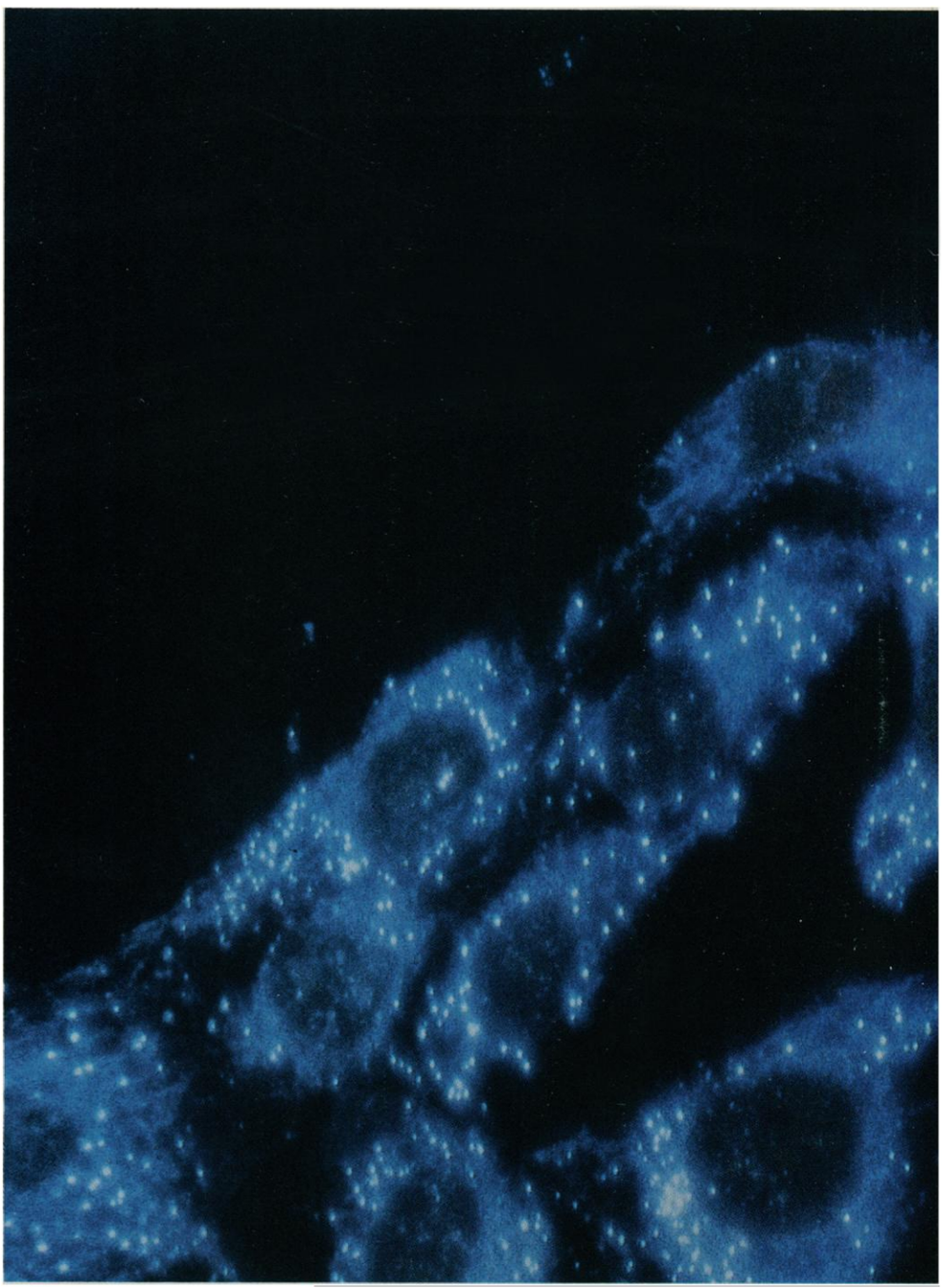

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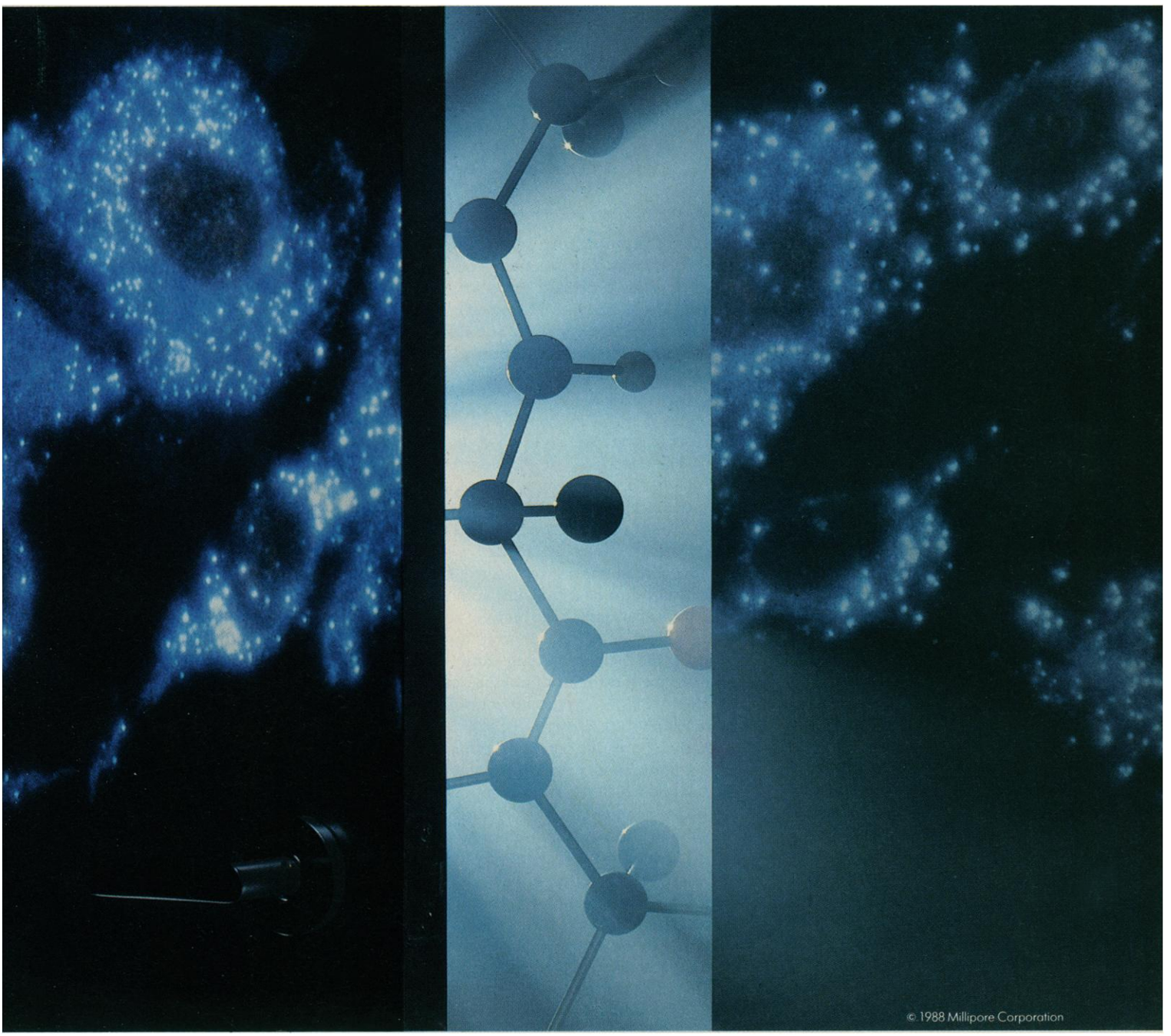


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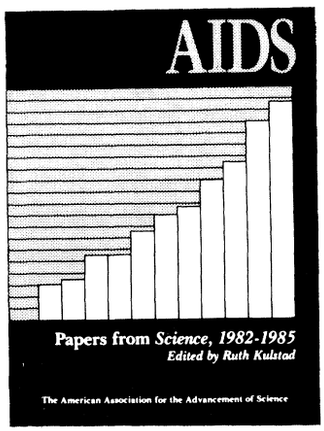


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