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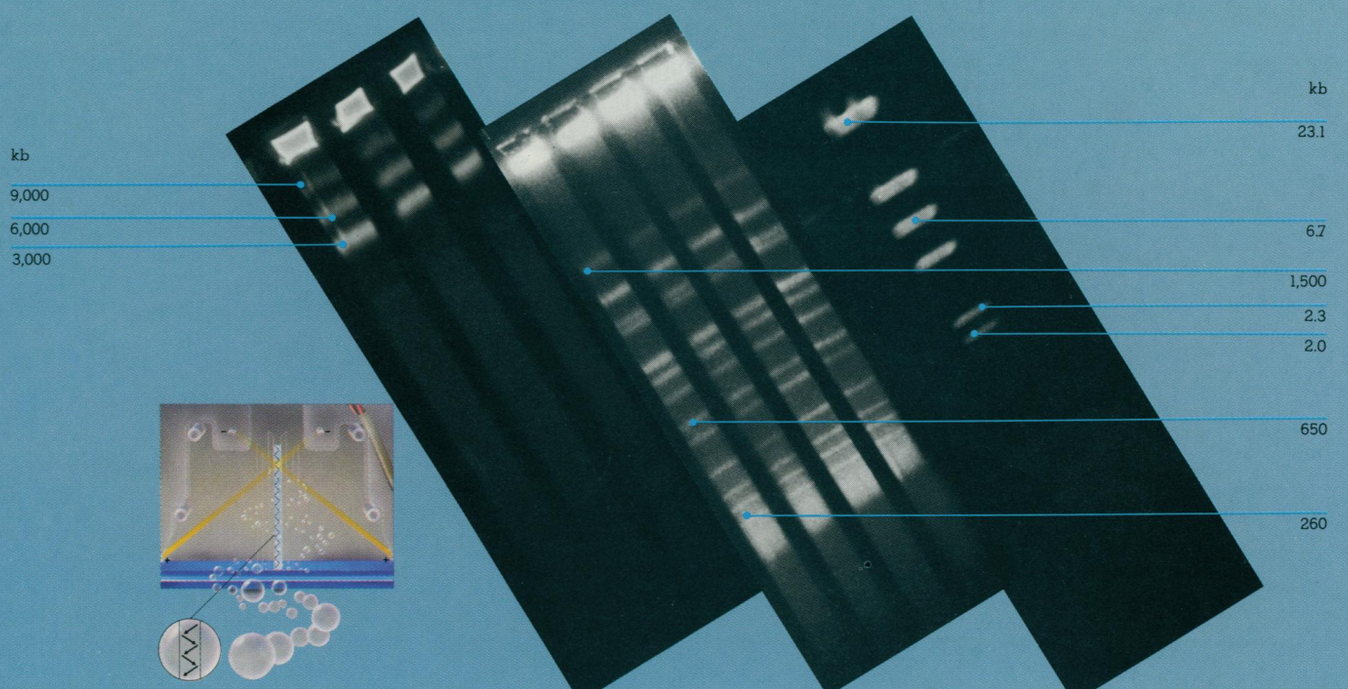

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Fig. 1. 9000 kb separation achieved using GeneLine with whole chromosomes of Schizosaccharomyces pombe.

Fig. 2. High-resolution lanes produced using GeneLine with whole chromosomes of the yeast Saccharomyces cerevisiae.

Fig. 3. Separation down to 2 kb using GeneLine with a HindIII *digest of lambda phage DNA.*

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COVER The 10-meter optical reflector at the Smithsonian Institution's Whipple Observatory in the Santa Rita mountains in southern Arizona. Built in 1968, it is still the largest instrument designed exclusively for use in very high energy gamma-ray astronomy. See page 1528. [Gary Ladd, Whipple Observatory, Amado, AZ 85645]

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Flexibility of transfer RNA molecules

ACCURATE expression of a gene depends on the proper translation of information encoded in the corresponding messenger RNA molecule (page 1545). Transfer RNA molecules read successive triplets (comprising a reading frame) in the messenger, generally with high accuracy. Typically, transfer RNA molecules have seven nucleotides in their anticodon loop, three of which line up with nucleotides in the message. However, under certain circumstances, transfer RNA molecules may have an extra nucleotide in the anticodon loop, and these can compensate for mistakes in the message by reading genes that have an extra nucleotide in the messenger sequence. Curran and Yarus studied a series of mutant transfer RNA molecules, assessing the effects caused by additional nucleotides in the anticodon loop. In a molecular model, structure was tied to the functioning of transfer RNA molecules; the model accounts for both the high level of reading accuracy that is normally accomplished and the role played by certain transfer RNA molecules in suppressing genetic mutations that otherwise would have the effect of causing shifts in the reading frame.

Formative years for stars

EVIDENCE in support of the theory that star formation occurs through inside-out gravitational collapse of a molecular cloud has come from observations of one of the most spectacular star-forming regions of the Milky Way galaxy, region W49A (page 1550). The model envisions the collapse beginning in the interior of such a cloud and then extending outward at increasingly large radii from the core. Welch *et al.* have now mapped portions of region W49A using radio interferometers at the Hat Creek Observatory in California and the Very Large Array in New Mexico. Out from the core of region W49A there is a ring of compact, discrete, ionized clumps of gas; in each clump there is at least one star and the ring itself consists of a dense warm rotating disk of molecular gas. Strong magnetic fields have played an important part in the formation of this cluster of massive stars, with the outward propagation of the collapse proceeding at the speed of magnetic Alfvén waves.

Hide-and seek-skills in children

EARLY in a child's development, between the ages of 2 1/2 and 3, an abrupt developmental milestone has been identified: children can develop the ability to solve problems with symbols (page 1556). A group of 3-year-olds who were shown a model of a room and the location of a model toy hidden in it were able to find a real toy straightaway in a real room; the younger children did not succeed immediately. Both groups had equally good memories of where the toy had been hidden in the model; it was only in their abilities to use this memory to find the toy that they so dramatically differed. DeLoache suggests that the 3-year-olds are able to think of the model both as a symbol for the room and as a structure itself, whereas the younger children may see the model only as a thing, not as a symbol as well. The younger children readily found the hidden toy when its location was shown to them first in a photograph, a more familiar symbolic medium for them.

Infection and tumor growth

CAN an infection affect the development of a tumor (page 1573)? Using mouse fibrosarcoma cells that had been induced to ingest the yeast *Candida albicans*, Ginsburg *et al.* show that when yeast-containing cells are injected into mice, tumors develop earlier, grow faster, invade surrounding tissues more quickly, and metastasize to the lungs sooner than do tumors induced by cells that lack yeast particles, even when both types of tumors are growing in the same animal. The yeast-containing tumors elicit larger initial local inflammatory reactions in the host, but histologic differences between the yeast-containing and the yeast-free tumors are not apparent. This animal model facilitates the study of a phenomenon—the infectious component to the etiology of certain cancers—that appears to have important physiologic consequences and that has so far eluded in vitro analysis: tumor cells that have ingested yeast or microbial particles continue to grow normally in tissue culture medium.

Hypercalcemia in malignancy

PATIENTS with malignancies frequently develop high concentrations of calcium in their blood (pages 1566 and 1568). More than 40 years ago it was suggested the secretion of parathyroid hormone by certain tumors caused this malignancy-associated hypercalcemia. However, a protein secreted from tumors has recently been shown to have significant sequence homology with a portion of the parathyroid hormone molecule but to be a distinct substance; reports by Horiuchi *et al.* and Kemp *et al.* show that the amino-terminal portion of the tumor product can induce hypercalcemia and related biochemical abnormalities in several experimental systems. In vivo and in vitro, synthetic peptides based on the amino-terminal 34 amino acids of the substance induced effects similar to those induced by parathyroid hormone, including altered calcium and vitamin D metabolism, increased kidney and bone-cell secretion of cyclic adenosine monophosphate, and fluxes in phosphorus levels. The synthetic peptides reacted with parathyroid hormone receptors and, like parathyroid hormone, their effects on bone, kidney, and (indirectly) gut resulted in decreased calcium excretion. The possibility is raised by these findings that antagonists of parathyroid hormone or the tumor-secreted analog will have uses in the treatment of malignancies.

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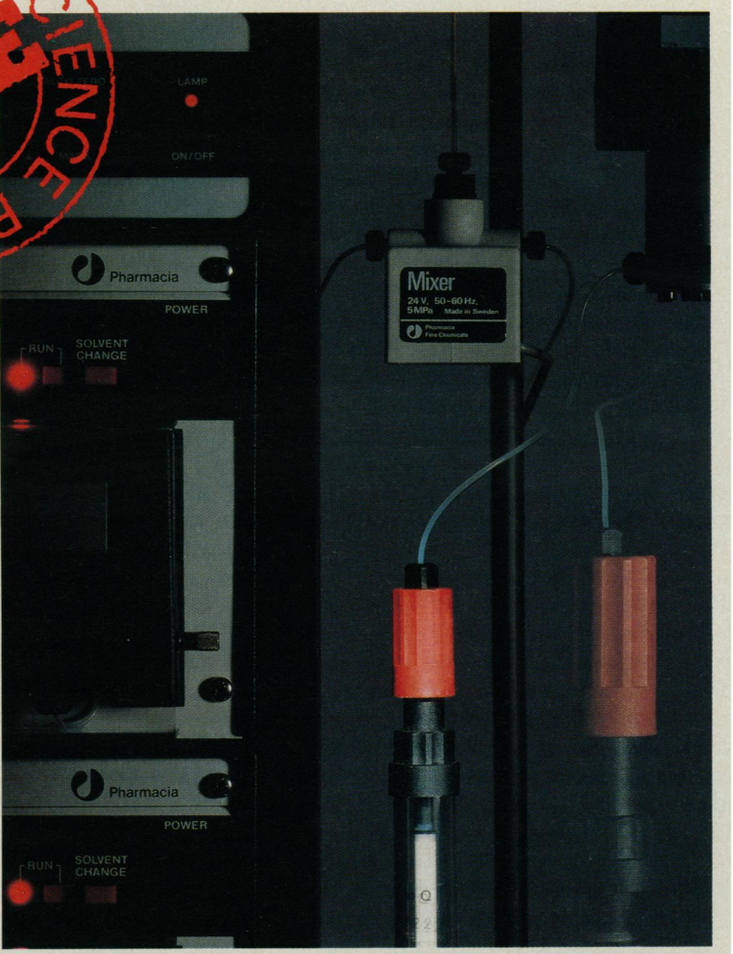

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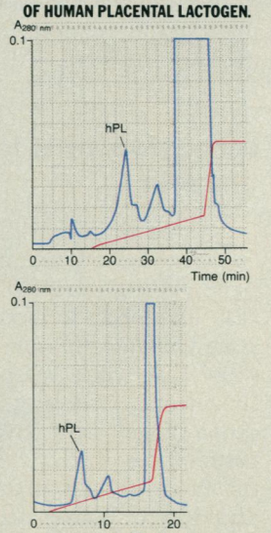

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SCIENCE

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University-Based Public Service

As the public universities have grown and matured, the triumvirate of their mission—teaching, research, and public service—has become generally accepted, at least in rhetoric. In this process, two clearly identifiable tendencies have occurred. First, teaching has become narrowly defined, referring only to that which occurs in a classroom or laboratory setting. Second, the research mission of the university has become omnipotent. In the academic life of public institutions today, research represents the ultimate exercise, with teaching, especially at the undergraduate level, seen as a mandated duty, and public service an obligation accepted with reluctance. Public universities, however, do perform several large categories of activities that are actually public service even though, up to now, few people may have thought of them under that rubric. Here are five examples of what I mean.

The first is the preservation of knowledge. This public service can stand alone as a prime function. To an encouraging degree, museums and libraries are coming to be seen as valuable teaching institutions in themselves. To whatever extent finances permit, universities can do the same thing. To accept this function as being coequal with research and teaching is to hark back to the ancient formulation that the three purposes of a university are to seek, to convey, and to preserve knowledge.

The second is the provision of aesthetic experience. On most campuses, appreciation of the various expressions of art and high culture are reinforced by the desire to learn or to teach. Beyond that, concert bureaus, radio, and television carry campus-based arts to statewide, even national, audiences.

A third cluster of university activities worth examining relates to the provision of direct consumer services to the community. This is exemplified by maintenance of hospitals, clinics, testing laboratories, publishing companies, hotels, restaurants, bookstores, and the like. These are usually created to fulfill needs related to teaching and research.

A fourth contribution of universities is the custodianship of young people of collegiate age. Although we no longer believe in completely open admission to college, we are prepared to admit most young people who want to enroll, so that they will have a chance to "find themselves" and so that their continued maturation will occur under relatively safe circumstances. The task would be reduced if students had more experience of life before they enrolled. However, short of war or some other vast campaign of national service (which we ought to seriously consider as part of the socialization process for future generations), we will probably continue to have students of about the same age as at present. If so, we must take the initiative to see that as many of them as possible are interested in learning and not simply spending critically formative years in our custodial care.

The fifth kind of activity is the university's role as entertainer for the masses, particularly the masses who watch intercollegiate athletic events. The most troubling consequence of big-time athleticism has to do not with its role as a public service but with its impact on campus instruction. The training of the body does not seem central to modern discussions of either athletics or the college curriculum. Today anybody who advocates education for the perfection of the body tends to be scorned as just another apologist for high-pressure athleticism. I hope that health and physical education departments will someday live up more fully to the literal promise of their name and that their professors will be central figures in discussions of liberal education.

When we examine these five clusters of activities, we discover that we are most comfortable with those that relate most closely to teaching or research. In fact, the level of quality of each of these five forms of public service is directly proportional to the extent to which each incorporates teaching or research.

After 75 years of full-scale experience, the major lesson we have learned about university-based public service is that it is best conceived as dynamic and creative teaching and research carried out in the full dimensions of the human life-span and the broad range of human association both on and off campus.*—RUSSELL G. MAWBY, *Chairman and Chief Executive Officer, W. K. Kellogg Foundation, Battle Creek, Michigan 49017*

*Adapted from a talk, "Public Service," presented as a plenary lecture on the occasion of the centennial celebration of the National Association of State Universities and Land-Grant Colleges on 10 November 1987.

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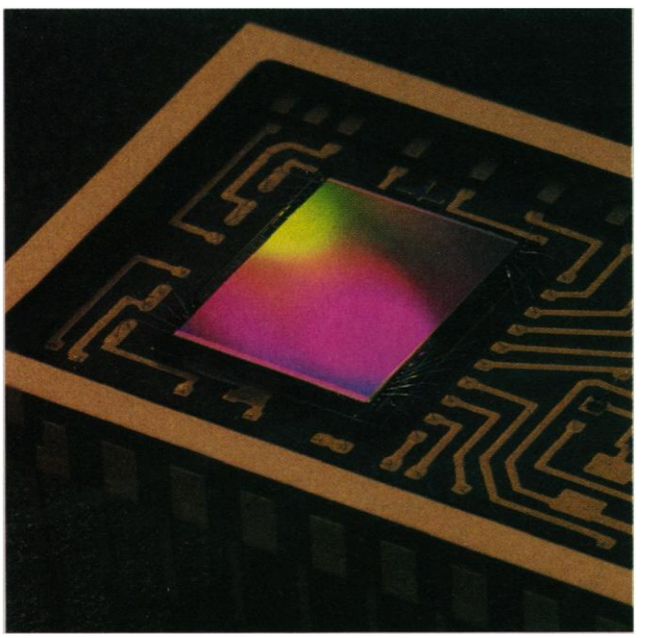

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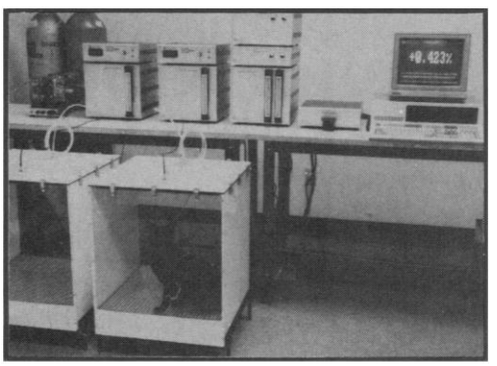

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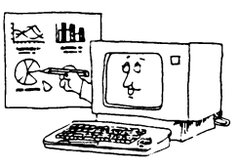

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Scientific Organization: M. Maggi (I) and C.J. Johnston (USA)

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Rome, Italy / June 1-3
Scientific Organization: G.A. FitzGerald (USA) and C. Patrono (I)

Advances in Biotechnology of Membrane Ion Transport
L'Aquila, Italy / September 19-20
Scientific Organization: R. Verna (I), P.L. Jörgensen (DK) and R.P. Garay (F)

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