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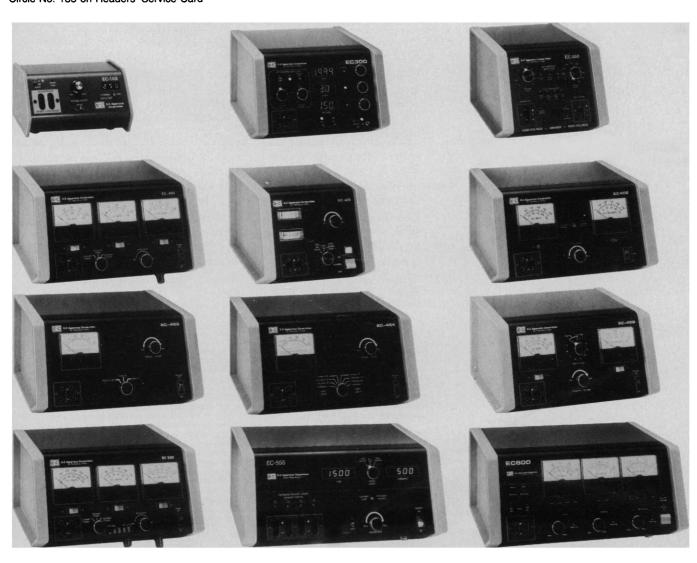
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American Association for the Advancement of Science

# Science

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COVER Athapaskan wooden plaque mask. The mask "was created to tell the story of a woman who went to pick blueberries. But rather than collecting the fruit she danced with her basket, pretending to be industrious. The mask has many features similar to those employed by Bering Sea Eskimos and of religious significance to them. These include a down-turned mouth and chin tattoos, symbols of females; a pair of goggles, an indication of a supernatural quality; and hoops and feathers, references to celestial bodies. The symmetry of the mask is typical of Athapaskan workmanship as are the woman's red cheek spots." [University Museum Anvik NA 5822b; collected by L. Dimoski; accessioned 1917. Height 31.9 centimeters excluding feathers. From *Raven's Journey*, reviewed on page 1005]

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#### This Week in

### **Science**

#### **American family incomes**

onsumption appears to be more conspicuous than ever in America (videocassette recorders, compact discs, gourmet foods), yet, at the same time, the middle class has been described as vanishing (page 923). Levy addresses these seemingly incompatible trends, describing factors that have led to changes in the distribution of incomes and the composition of the economic classes since the second World War. American incomes grew steadily across the economic spectrum until the early 1970s; thereafter, average incomes stagnated and a moderate divergence of incomes—rich getting richer, poor getting poorer—took place. Consumption did not, however, drop as fast as workers' wages: more families relied on two earners, growing numbers of singles had only themselves to support, and many were willing to incur large personal debts. The financial and demographic adaptations that made it possible for consumption to go on cannot continue endlessly. The economic challenge facing American families can be met only if worker productivity and wages again increase so that incomes can begin to grow.

#### **Baroque strings**

reventeenth century harpsichords can now be restored with strings that are appropriate to the baroque music that the instruments were built to play (page 927). These harpsichords were larger than their predecessors and had longer and stronger strings. Although the strings were thought to be made of steel (steel strings are used in pianos), in fact the durable strings were not steel (iron plus carbon) but were a specifically selected low-carbon phosphorus-iron alloy that had been developed around 1600. Most old instruments no longer have their original strings; however, original string samples were available from three unrestored harpsichords, and these were examined metallographically and chemically by Goodway. Phosphorus was an unexpected component of the

wire, because it is generally a poor alloying agent (when carbon is present). But, very strong wires, replicas of the baroque ones, were pulled from a low-carbon phosphorus-iron alloy in a trial alloying and drawing operation.

#### Earthquake pattern

LTHOUGH no great earthquake (magnitude 8 to 9) has been recorded along the Washington-Oregon coast in the past two centuries, geologic evidence suggests that probably six such earthquakes did occur there during the past 7000 years (page 942). The earthquakes in this region would have emanated from the Cascadia subduction zone, where the Juan de Fuca plate is slipping beneath the North American plate. Atwater studied marine cores and outcrops along the Washington coast and found that layers of mud and sand alternated with layers of peat. The layered pattern could have been produced by actions of subduction earthquakes and associated tsunamis (tidal waves) followed by quiescent periods: a great earthquake could cause the well-vegetated lowland (peat) along the coast to suddenly sink; the tsunami would then wash sand and mud over the land. With time, vegetation would grow again, a peaty layer would form, and additional layers would be added. The findings suggest that the northwestern coast could be hit by a great earthquake again.

#### **Isotype regulation**

ISTINCT biologic functions are carried out by different classes and subclasses (isotypes) of immunoglobulins (page 944). What isotype is produced will vary depending on the nature of the immunizing substance, and, in the course of many immune reactions, a switch can occur in the isotype that is made. IgG1, IgG2a, IgG2b, IgG3, IgM, IgE, IgA, and IgD are the isotypes of mice. Isotype preference and switching in mice appear to be regulated, at least in part, by lymphokines, stimulatory substances secreted

by helper T lymphocytes. Two lymphokines—gamma interferon (IFN-γ) and B cell stimulatory factor-1 (BSF-1) reciprocally but independently influence isotype production by mouse B lymphocytes. BSF-1 causes lymphocytes to express IgG1 and IgE; it inhibits production of IgG2a and other isotypes. IFN-y induces resting B lymphocytes to produce IgG2a but inhibits production of IgG1, IgE, and others. Snapper and Paul suggest that selection during evolution may have reinforced the association of certain lymphokines with those isotypes best suited to protect against specific pathogens and other immunogenic substances; thus, for example, in response to certain viruses and tumor cells, IFN-y was stimulated and IgG2a produced, whereas in response to parasitic infections, BSF-1 was stimulated and IgE produced.

#### **Movable feasts**

N 1983, a survey of 100 islands in the Bahamas indicated that populations of spiders were low on islands where lizards were living (page 949). Predation and competition for food the lizards and spiders are both insectivores, with the lizards being the more successful of the two-have now been demonstrated to contribute to the balance of species in these island communities. Schoener and Spiller staked out, subdivided, and in some cases enclosed plots (each 83.6 square meters) on one large Bahamian island. Censuses of lizards, spiders, and other insects were regularly made for more than a year. Removal of lizards caused dramatic increases in spider densities and in the densities of other insect populations and also caused an increase in the number of spider species. Elsewhere, lizards quickly disposed of spiders added to islands where none had been before. Lewin elaborates on factors affecting the lizard-spider interactions, differences between this ecosystem and marine ecosystems, and the importance of these experiments in clarifying processes at work in the formation of patterns that exist in natural communities (page **917**).

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#### Evolution and Growth at NSF

The National Science Foundation is in the process of change. New initiatives, if successful, will result in continuing increases in NSF's budget and in its role in science, engineering, academia, and industry.

The NSF is demonstrating new flexibility in its experiments with Engineering Research Centers and the proposed Science Centers. At its inception and for nearly 30 years, the policy of NSF was to support basic research but little else. The rationale and defense to Congress was that out of basic research would inevitably come practical applications. There were few mechanisms for rapid transfer of knowledge from campus to industry. When results of research were published in the open literature, they were as available to the Japanese and others as to the Americans.

Not long after its establishment in the early 1950s, NSF budgets benefited from anxiety about Russian competitiveness brought on by Sputnik. But after that spurt, increases were slow. In the meantime, the National Institutes of Health were also growing from modest beginnings. The NIH budget is now about \$6 billion, and for most of the past 30 years, it has had three to four times as much funds as NSF. The difference between the two agencies is in large part due to the wisdom of James Shannon, who was director at NIH from 1955 to 1968. He realized that basic research is important, but that improvement of medical practice was essential if basic research were to enjoy liberal funding. The policies he established have been followed.

During those earlier three decades, there were differences in the political climate in which the two agencies operated. Most everyone is in favor of better health. In the earlier days, fostering industrial competitiveness hardly seemed necessary.

The circumstances have changed. There is growing concern about our trade balances and loss of jobs. Some 200 members of Congress have formed a caucus on industrial competitiveness. President Reagan, in his State of the Union message, advocated a doubling of the NSF budget during the next 5 years. Political fads come and go in Washington. But lack of competitiveness is not a fad, and it will not disappear short of 10 years, if ever. All in all, NSF director Erich Bloch is on firm ground when he seeks means of improving the effectiveness of transfer of knowledge from campus to industry. His position was strengthened by responses to a request for proposals from universities to establish Engineering Research Centers. In the first two competitions, NSF received 244 proposals from 114 engineering schools requesting a total of \$3.5 billion in support. There was also substantial interest on the part of industry in fostering this type of industry-university interaction.

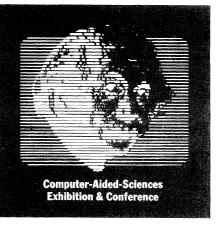
Six of the centers were authorized in 1985, with five more in 1986. Two or three more will be established in 1987. The total contribution from NSF will be about \$35 million, a tiny fraction of the total NSF budget.

It is too early to judge the effectiveness of the centers in creating and transferring knowledge and technology and in engineering education. However, a reading of two volumes describing the centers issued by the National Academy Press leaves the impression that the funds for the experimental Engineering Research Centers are money very well spent. Much of the research being conducted involves advanced computer and materials sciences. The efforts tend to be cross-disciplinary and choices of goals tend to involve inputs from industry.

Performance of the various centers is likely to be uneven. Their efforts will be conducted to advance different areas of technology. The academic climates and university administrations will vary. Perhaps most important will be the skill of leadership in defining worthwhile goals and in fostering enthusiasm, cooperation, and drive of collaborators to achieve those goals. Progress at the various centers will be monitored closely by NSF and advisory groups. The intent is to learn from experience and to modify procedures if that seems desirable.

Erich Bloch is determined to increase the effectiveness of cooperation between universities and industry in the effort to achieve better industrial competitiveness. He is a man with vision and a mission who is operating in circumstances that will enable him to have considerable impact.—PHILIP H. ABELSON







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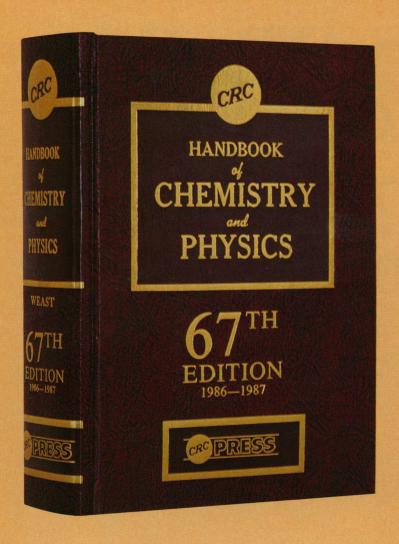
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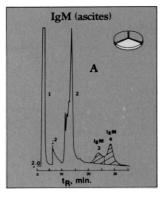
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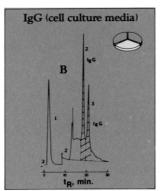
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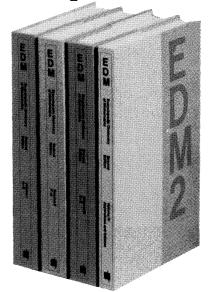
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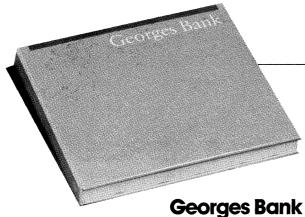
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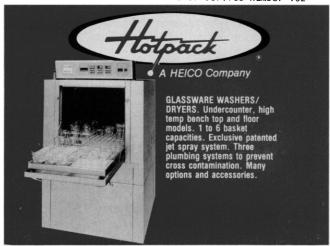
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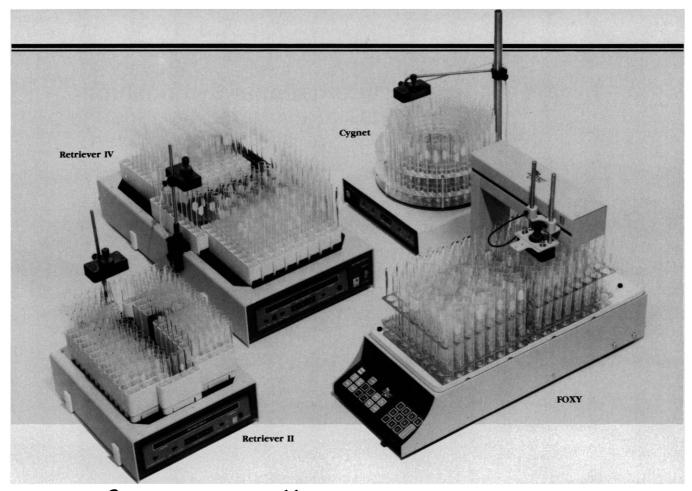
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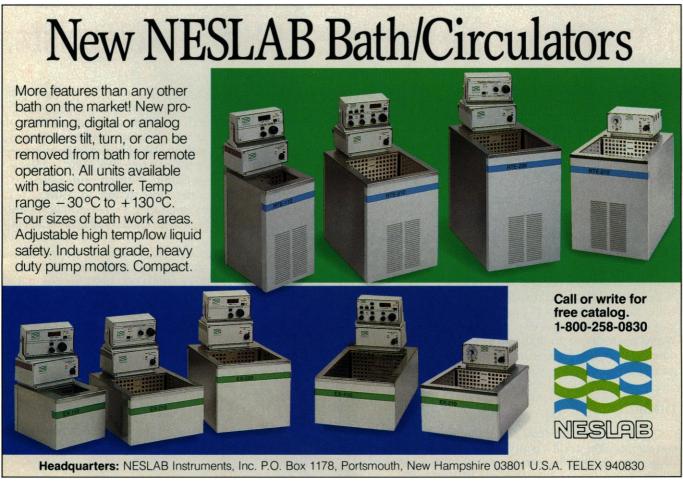
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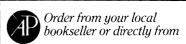
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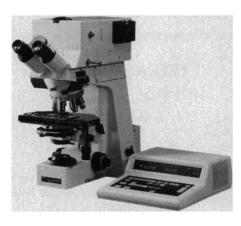
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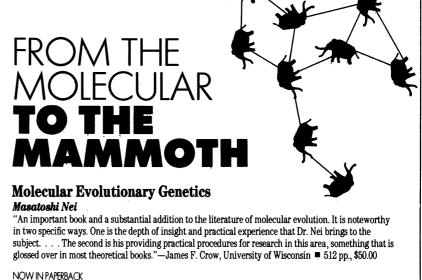
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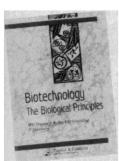


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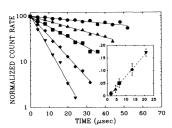
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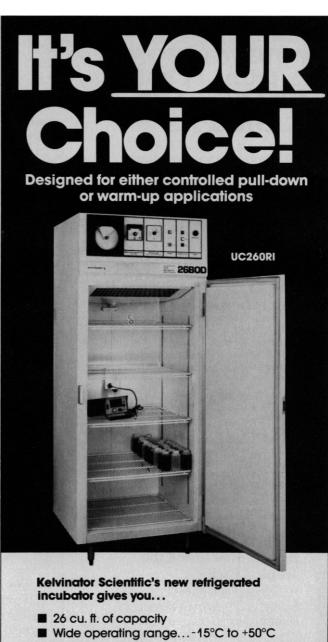
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