

419 This Week in *Science*

## Editorial

421 Science and Technology Policy

## Letters

422 Malaria Vaccines: M. E. PATARROYO; D. HERRINGTON, S. L. HOFFMAN, M. M. LEVINE, D. GORDON; A. P. WATERS ■ Light Bending: Prediction and Theory: T. P. WILSON; B. BERGMANN; C. MCCAULEY; S. G. BRUSH ■ Water Temperatures: D. R. SMITH; R. POOL

## Association Affairs

425 Supply and Demand for Scientists and Engineers: A National Crisis in the Making: R. C. ATKINSON

## News & Comment

433 Who Will Do Science in the 1990s? ■ The Lost Generation?

436 Climate Extravaganza Bombs  
Bush Hails Science at NAS

437 Mountain Sheep Experts Draw Hunters' Fire

## Research News

439 Confusion in Earliest America ■ The Big Picture

442 Karposi's Sarcoma Puzzle Begins to Yield

444 Solar Neutrino-Sunspot Connection Found ■ Family Portrait

445 Who Will Win the El Niño Sweepstakes This Time?

446 *Briefings*: Physicists Balk at Journalist's Award ■ Harvard Takes Math Super Bowl ■ Research Shuffle at NIMH ■ Thinking About Mars ■ Monkeys in Limbo ■ Dulbecco Takes Salk Job ■ Engineer Wins Kudos from NSF ■ Bick Leaves NIH for Italian Foundation ■ Awards for Global Environment Crusaders ■ Spinoffs from AIDS Research

## Articles

450 The Underclass: Definition and Measurement: R. B. MINCY, I. V. SAWHILL, D. A. WOLF

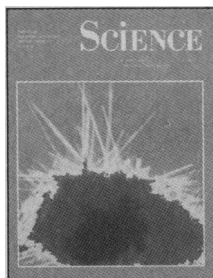
454 Atomistic Mechanisms and Dynamics of Adhesion, Nanoindentation, and Fracture: U. LANDMAN, W. D. LUEDTKE, N. A. BURNHAM, R. J. COLTON

## Research Article

462 Ultrahigh Pressure Melting of Lead: A Multidisciplinary Study: B. K. GODWAL, C. MEADE, R. JEANLOZ, A. GARCIA, A. Y. LIU, M. L. COHEN

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**COVER** Pseudocolor transmission electron micrograph of fibrous, lath-shaped, diagenetic illite (less than 0.1-micrometer-size fraction) from the Repetto Formation, Santa Barbara Channel, California. Analysis of the sizes of illites and other clay minerals indicates that they coarsen by a process known as Ostwald ripening. See page 474. [Photo by Reed Glasmann, Unocal Corporation]

## Reports

- 466 Coral-Bryozoan Mutualism: Structural Innovation and Greater Resource Exploitation: F. K. MCKINNEY, T. W. BROADHEAD, M. A. GIBSON
- 468 Twinning in  $MgSiO_3$ , Perovskite: Y. WANG, F. GUYOT, A. YEGANEH-HAERI, R. C. LIEBERMANN
- 471 GT-1 Binding Site Confers Light Responsive Expression in Transgenic Tobacco: E. LAM AND N.-H. CHUA
- 474 Ostwald Ripening of Clays and Metamorphic Minerals: D. D. EBERL, J. ŚRODOŃ, M. KRALIK, B. E. TAYLOR, Z. E. PETERMAN
- 477 Phosphorus Uptake by Pigeon Pea and Its Role in Cropping Systems of the Indian Subcontinent: N. AE, J. ARIHARA, K. OKADA, T. YOSHIHARA, C. JOHANSEN
- 480 RNA Polymerase II Transcription Blocked by *Escherichia coli* Lac Repressor: U. DEUSCHLE, R. A. HIPKIND, H. BUJARD
- 483 A 49-Kilodalton Phosphoprotein in the *Drosophila* Photoreceptor Is an Arrestin Homolog: T. YAMADA, Y. TAKEUCHI, N. KOMORI, H. KOBAYASHI, Y. SAKAI, Y. HOTTA, H. MATSUMOTO
- 486 A Bacterial Enhancer Functions to Tether a Transcriptional Activator Near a Promoter: A. WEDEL, D. S. WEISS, D. POPHAM, P. DRÖGE, S. KUSTU
- 490 Primary Structure of the  $\gamma$ -Subunit of the DHP-Sensitive Calcium Channel from Skeletal Muscle: S. D. JAY, S. B. ELLIS, A. F. MCCUE, M. E. WILLIAMS, T. S. VEDVICK, M. M. HARPOLD, K. P. CAMPBELL
- 492 Evidence That  $\beta$ -Amyloid Protein in Alzheimer's Disease Is Not Derived by Normal Processing: S. S. SISODIA, E. H. KOO, K. BEYREUTHER, A. UNTERBECK, D. L. PRICE
- 495 Two Gap Genes Mediate Maternal Terminal Pattern Information in *Drosophila*: D. WEIGEL, G. JÜRGENS, M. KLINGLER, H. JÄCKLE

## Technical Comments

- 499 Oldest Pinniped: C. A. REPENNING; A. BERTA AND A. R. WYSS

## Book Reviews

- 501 As We Forgive Our Debtors, reviewed by R. K. Z. HECK ■ Sickle Cell Disease, J. C. PARKER AND E. P. ORRINGER ■ Ecology and Evolution of Livebearing Fishes (Poeciliidae), F. W. ALLENDORF ■ Some Other Books of Interest ■ Books Received

## Products & Materials

- 505 Photodiode Array Spectrometer ■ X-ray Microanalysis System ■ Hybridization Incubator ■ Ultraviolet Cross-Linker ■ RNA Extraction Kit ■ Coverglass Chambers for Cell Culture ■ DNA and RNA Linkers and Transilluminators ■ Literature

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## Science and Technology Policy

Suddenly we are aware of living in a changed and changing world. The United States remains the top military power, but it is now the world's greatest debtor nation—more than \$600 billion in debt—and debt grows each year by at least \$100 billion. U.S. companies have lost market share in both mature and high-tech industries. U.S. higher education is preeminent, but half of the doctorates in crucial fields are going to foreign-born students. Uncertainties occasioned by the federal research grant system have affected morale of scientists. These were some of the matters discussed in the Fifteenth Annual AAAS Colloquium on Science and Technology Policy held in Washington, D.C., on 12 and 13 April. The theme for the meeting was “science and technology and the changing world order.”

The concluding major presentation was made by Robert M. White, president of the National Academy of Engineering. He reminded the audience of a major global evolution in technology and production and pointed to policy matters that need to be addressed. A crucial development has been a powerful trend toward globally operated engineering and production. Very large volumes of capital, goods, services, components, people, data, and technological know-how flow across national boundaries every day. U.S. businesses participate in a substantial part of the action. They have more than \$1.2 trillion in assets abroad, and in 1988 a third of U.S. multinational companies' earnings came from overseas operations. U.S.-owned operations abroad employ 6.2 million people and depend heavily on local production and technical and management capabilities. The movement of companies is not one-sided. Today more than 3 million Americans work for foreign multinational corporations with affiliates in the United States.

In the past, U.S. companies created overseas subsidiaries for access to markets or low-cost labor. With the growing excellence of engineering research and development overseas, more and more U.S.-based multinationals are buying high-technology goods and services in place. Globalization of technology has blurred corporate nationalities and dissolved the once strong bond between corporate and national interests.

Much of high technology has been fostered by knowledge created at U.S. universities. After World War II, these became global intellectual centers. They are regarded as keys to economic growth. Pressure has increased on scientific and technical and research universities to contribute to local, regional, and national economic development. Federal agencies increasingly expect research grants to contribute to national competitiveness. Congressional concerns are evident about foreign firms' active use of U.S. university research as a means to gain access to new technologies. In the future, U.S. universities are likely to be questioned about who pays for and who benefits from university research. If scientific and technological knowledge developed in the United States is available so that its benefits can be acquired by others, then our policies must make it possible to exploit more quickly the immense output of our universities. This is urgent, for they are a principal source of a possible competitive advantage.

In the light of the integration of the world economy, we need to consider what we must do to maintain a U.S. technological base for both military and economic security. At minimum we must have a full range of key technical competencies in the United States, especially in the high-tech areas. We should maintain capabilities in production of goods whether the facilities are owned by domestic or foreign competitors. If corporations locate where the economic climate is favorable and talent is plentiful, our policies must provide the economic incentives and talent that will induce them to locate in the United States. A key challenge is to determine how the United States can capture the benefits of technological advance no matter where it originates.

Restoring this country's competitiveness will not be done easily or quickly. We have many matters that need to be more effectively addressed. These include pre-college education, better retention of majors in science and engineering, support of graduate education, adequate support for small science, better interaction of universities and industry, and a level playing field in international high-tech trade. The problem is difficult and complex, but the matters require thoughtful action.—PHILIP H. ABELSON