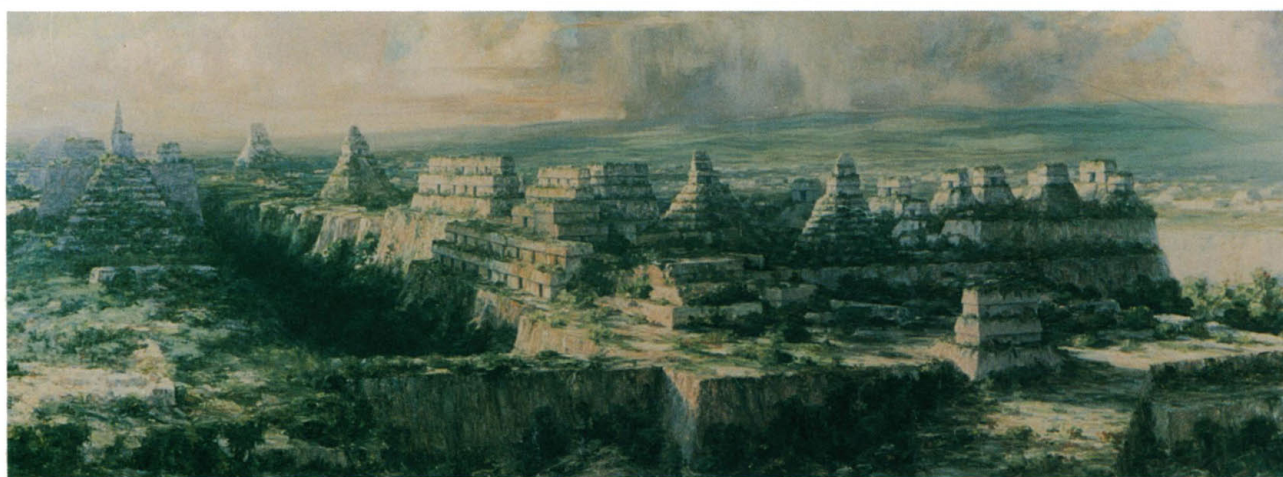


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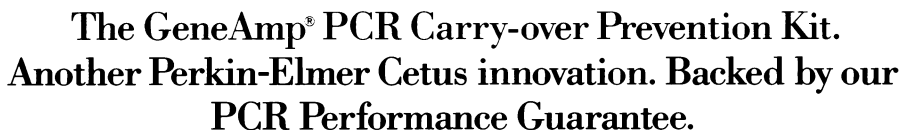


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603 This Week in *Science*

Editorial

605 Federal Impediments to Scientific Research

Letters

606 Saving Science Education: J. RABINOW ■ Biology Textbooks: J. D. McINERNEY ■ Carcinogens and Human Health: Part 3: V. J. COGLIANO, W. H. FARLAND, P. W. PREUSS, J. A. WILTSE, L. R. RHOMBERG, C. W. CHEN, M. J. MASS, S. NOSNOW, P. D. WHITE, J. C. PARKER, S. M. WUERTHELE; B. N. AMES AND L. S. GOLD

ScienceScope

615 Star projects in astronomy; listening for global warming; etc.

News & Comment

616 Science Budget: Growth Amid Red Ink ■ Science Increases Will Test New Regime
619 Is U.K. HIV Strain Really LAV? Pinning Down Gallo's Virus
620 East Meets West to Look For Toxic Waste Sites
621 Cooling the Greenhouse Cheaply
622 *Briefings*: Politics in the Classroom (Cont.) ■ Facilities Awards ■ New Round in Purloined Data Case ■ Eternal Obfuscation . . . ■ Physicists Walk Planck—and Survive ■ New *NEJM* Editor ■ Genetics "Force de Frappe" ■ Muscular Dystrophy Findings ■ No Tech Fix for Auto Population Bomb ■ Canadian Statistics

Research News

624 Dioxin Risks Revisited ■ High Dioxin Dose Linked to Cancer ■ Monsanto Studies Under Fire
627 Did Turing Discover How the Leopard Got Its Spots?
628 Mathematics—Amid War—in San Francisco: Under Control ■ Women in Mathematics—"Riding the Wave" ■ Making Mathematics Graphic by Computer and by Hand
630 New Hope for Vaccine Against Schistosomiasis

Perspective

632 Nucleation of Population and Water Storage Among the Ancient Maya: R. E. W. ADAMS

Articles

633 Mesoscopic Conductors and Correlations in Laser Speckle Patterns: S. FENG AND P. A. LEE
640 Graphite: A Mimic for DNA and Other Biomolecules in Scanning Tunneling Microscope Studies: C. R. CLEMMER AND T. P. BEEBE, JR.

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COVER Painted mural of Tikal, Guatemala, illustrating the scale of landscaping and reservoir construction during the Late Classic (A.D. 600 to 900) in portions of the southern Maya Lowlands. Carlos Vierra painted this mural in 1914-15 for the Panama-California Exposition in celebration of the completion of the Panama Canal. See page 658. [With permission of the San Diego Museum of Man, which commissioned the mural; photograph courtesy of Peter D. Harrison]

Research Article

- 643 Sequence-Specific Antirepression of Histone H1-Mediated Inhibition of Basal RNA Polymerase II Transcription: G. E. CROSTON, L. A. KERRIGAN, L. M. LIRA, D. R. MARSHAK, J. T. KADONAGA

Reports

- 650 Modeling of Turing Structures in the Chlorite-Iodide-Malonic Acid-Starch Reaction System: I. LENGUEL AND I. R. EPSTEIN
- 652 Potassium in Clinopyroxene Inclusions from Diamonds: G. E. HARLOW AND D. R. VEBLEN
- 655 The Search for Evidence of Large Prehistoric Earthquakes Along the Atlantic Seaboard: D. AMICK AND R. GELINAS
- 658 A Water Storage Adaptation in the Maya Lowlands: V. L. SCARBOROUGH AND G. G. GALLOPIN
- 662 Large Protein-Induced Dipoles for a Symmetric Carotenoid in a Photosynthetic Antenna Complex: D. S. GOTTFRIED, M. A. STEFFEN, S. G. BOXER
- 665 Fibroblast Growth Factor Receptors from Liver Vary in Three Structural Domains: J. HOU, M. KAN, K. MCKEEHAN, G. MCBRIDE, P. ADAMS, W. L. MCKEEHAN
- 668 Inability of Malaria Vaccine to Induce Antibodies to a Protective Epitope Within Its Sequence: Y. CHAROENVIT, W. E. COLLINS, T. R. JONES, P. MILLET, L. YUAN, G. H. CAMPBELL, R. L. BEAUDOIN, J. R. BRODERSON, S. L. HOFFMAN
- 671 Ability of the *c-mos* Product to Associate with and Phosphorylate Tubulin: R. ZHOU, M. OSKARSSON, R. S. PAULES, N. SCHULZ, D. CLEVELAND, G. F. VANDE WOUDE
- 675 A68: A Major Subunit of Paired Helical Filaments and Derivatized Forms of Normal Tau: V. M.-Y. LEE, B. J. BALIN, L. OTVOS, JR., J. Q. TROJANOWSKI
- 679 Generation of cAMP-Activated Chloride Currents by Expression of CFTR: M. P. ANDERSON, D. P. RICH, R. J. GREGORY, A. E. SMITH, M. J. WELSH

Book Reviews

- 684 Contrasts in Scientific Style, *reviewed by* W. H. BROCK ■ Redirecting Science, V. F. WEISSKOPF ■ Polar Oceanography, J. E. WALSH ■ Community Food Webs, J. H. STEELE ■ Books Received

Products & Materials

- 691 Notebook Computer ■ Cytocentrifuge Acquires New Features ■ Fluorescent DNA Fragment Analyzer ■ Monoclonal Antibodies ■ Thermocycler for PCR ■ Glass Filter Housings ■ Literature

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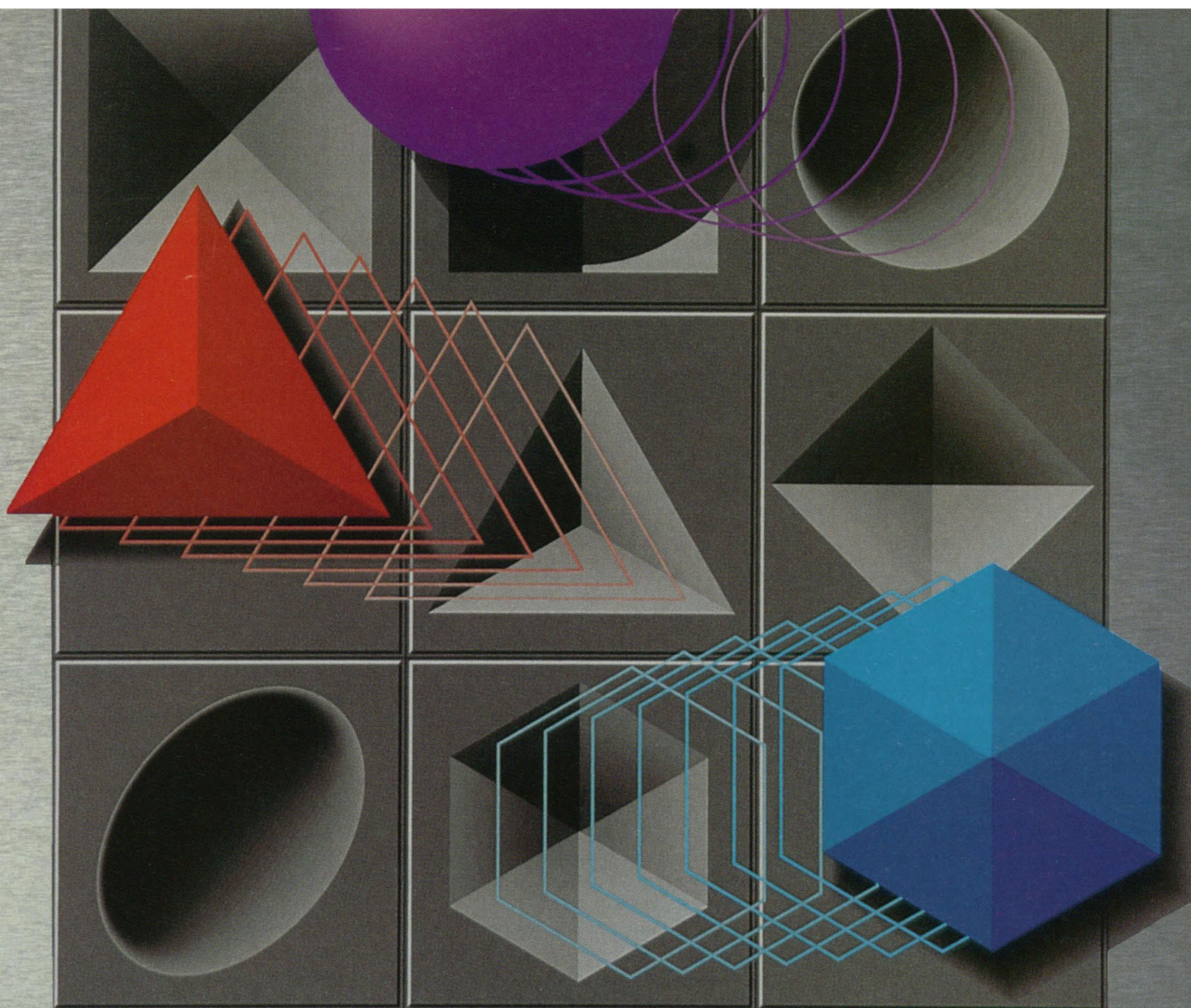
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This Week in SCIENCE

Phantom DNA

WHAT were thought to be surface features of DNA seen at high resolution in the scanning tunneling microscope may in fact have been surface features of the conducting substrate when the DNA was deposited on graphite (page 640). Clemmer and Beebe show that steps (that typically extend for thousands of angstroms), regular periodicities along the step edges, moiré patterns, and handedness—all of which are characteristics or attributes of DNA and other biomaterials—are present in scanning tunneling images of freshly cleaved highly ordered pyrolytic graphite (HOPG) onto which no biomaterials were deposited. In addition, in the HOPG images there is evidence of “molecules” meandering across the steps. These artifacts appear to arise when the HOPG surface has been disrupted or flaked. Although the scanning tunneling microscope has been used for almost a decade for examining the shapes of biological molecules and for confirming features predicted from molecular models, this study indicates that HOPG is not a suitable substrate for use with these materials.

East Coast earthquakes

How likely is it that a large earthquake like the one that rocked Charleston, South Carolina, in August 1886 will occur there again? From an analysis of seismically induced liquefaction features present along the Atlantic seaboard, Amick and Gelinas conclude that the Charleston area, which is not near an active plate boundary, appears to be situated in an unusual seismotectonic setting (page 655). None of the other coastal sites that were examined had similar paleoliquefaction features. In the last 2000 years large earthquakes have occurred in coastal South Carolina roughly every 500 to 600 years; although the intervals farther back are more uncertain, the evidence suggests that large earthquakes have been occurring there

for at least 5000 to 6000 years. The Charleston area is therefore likely to be hit again, but the pattern of a several-hundred-year return period for the historic earthquakes suggests that the threat to the area at present is low.

Maya culture and water

TIKAL, Guatemala, was one of the great Maya ceremonial centers. Its peak occupation occurred around A.D. 750, and by about A.D. 1000 it was largely abandoned. Like other big Maya cities, Tikal was not situated near a natural source of water; its climate at the time of the occupation included rainy periods and an extended (4-month) annual dry period. To satisfy the water needs of Tikal, a complex system of reservoirs had been built in which rainwater could be collected and stored (cover). Scarborough and Gallop propose that the reservoir system may have been a major factor in attracting people into this and similar large cities and that the centralization of water management may have conferred social power and a political edge to an elite sector of the community that controlled the allocation of water (page 658). Adams provides further perspective on how water resource management could have contributed to city organization, and he suggests a possible role for water availability in community decline (page 632). The collapse of Maya civilization has yet to be satisfactorily explained; a change in the availability of a resource as important as water may have been a significant contributing factor.

Snafus in malaria protection

VACCINE preparation is something of a fine art. Animals might make a variety of cellular and antibody responses to different determinants in a vaccine and yet they may not be protected from a subsequent challenge with the infectious agent against which the vaccine is directed.

Some of the subtleties and difficulties involved in inducing protective immunity to the malaria parasite *Plasmodium vivax* in monkeys are illustrated in the work of Charoenvit *et al.* (page 668). An injection of (mouse monoclonal) antibodies specific for a sequence of four amino acids—alanine, glycine, aspartic acid, and arginine—protected the monkeys from malaria. These amino acids are components of a larger (nine-amino acid) repeating segment that is part of the parasite's circumsporozoite protein. However, when the nine-amino acid repeating peptide was injected directly into monkeys, the animals were not protected from infection. They produced many types of antibodies in response to the vaccine but none to the previously identified protective amino acid foursome.

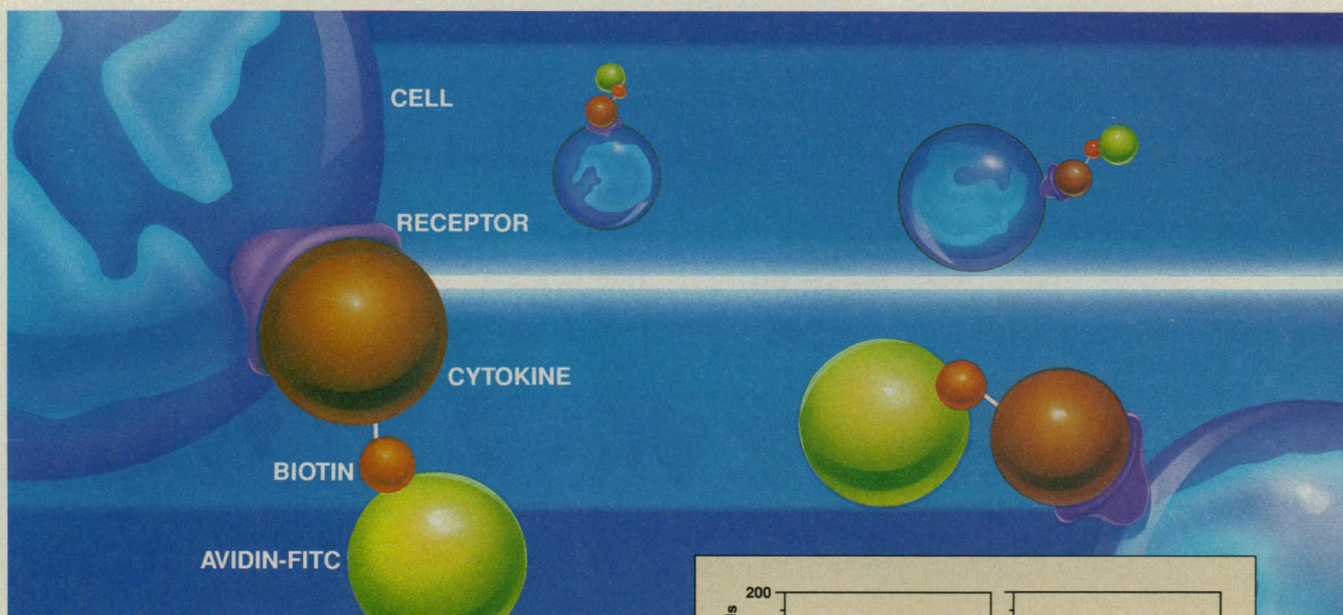
Protein in Alzheimer's disease

THE brains of people with Alzheimer's disease are dotted with neurofibrillary tangles that contain paired helical filaments. A likely source for the filament protein A68 has now been identified (page 675). A68 was purified from brains of patients with Alzheimer's disease and Down syndrome. The backbone of A68 was found to be like that of the τ protein, a molecule that is typically associated with microtubules (cytoskeletal structural elements) of cells. But τ and A68 differed in their phosphorylation patterns. One amino acid (a serine residue at position 396) was identified as a phosphate acceptor in A68 but not in the parent τ molecule. Other unusual acceptors may also be present. Lee *et al.* propose that abnormal or excessive phosphorylation of τ might prevent the molecule from binding to microtubules. It would then be available for deposition into neurofibrillary tangles. Thus a dysfunction of the normal cellular phosphorylation mechanism might contribute to the pathogenesis of Alzheimer's disease and other diseases in which similar brain lesions are deposited.

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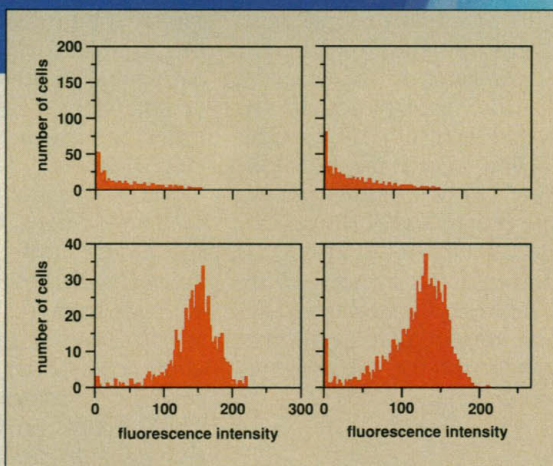
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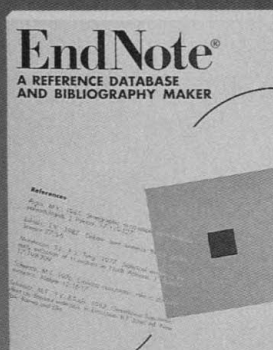
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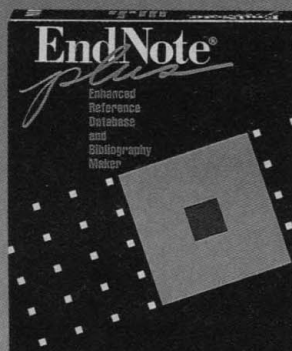
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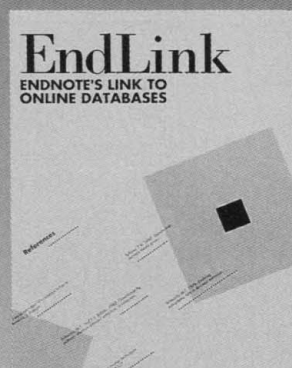
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discovery of yet another species (3) which is now the undisputed progeny (uncertain species at hand. While the true origin of this larger reptile is thought to be from central or eastern Asia.

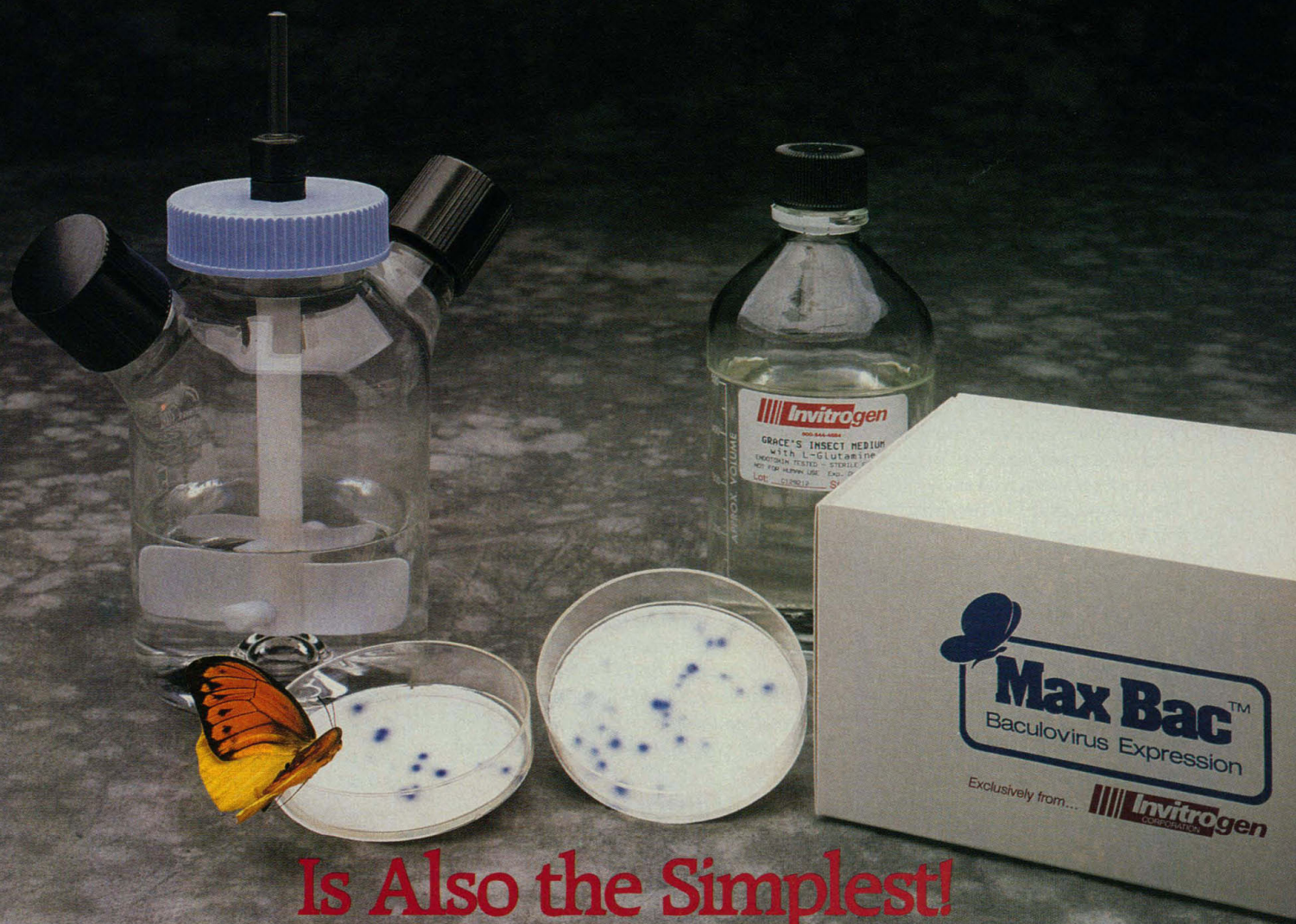
Where the other species (15) arose is a mystery. If it was central Asia, we can reasonably infer that other reptiles were not dominant in this ecosystem. Some we will never know. However, fossils currently in the museum in evidence that the emerging reptile was a small-boned and duck-billed, larger wing-like arm.

References

1. M. B. Turnhouse
2. T. V. Billoski, *Science*
3. S. I. Morehouse, R.
4. M. T. Schwartz
5. M. V. Argus,
6. R. Zartman
7. H. Akiyos (1988).
8. A. Logan
9. B. Carter,
10. O. Concho
11. R. Hall, *Jou*
12. M. T. Schwartz (Barnes and Ell



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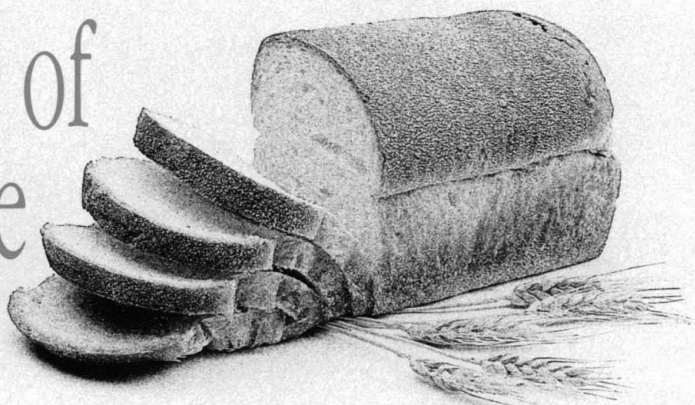
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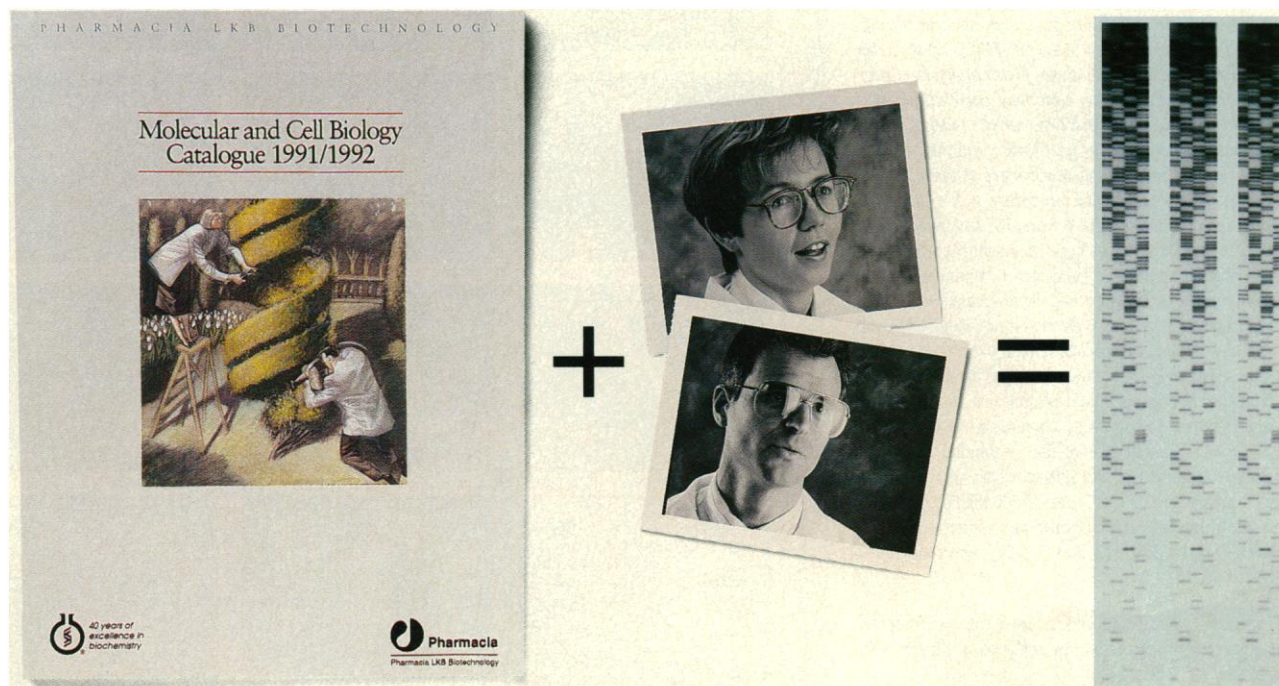
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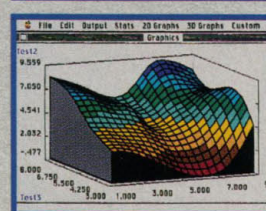
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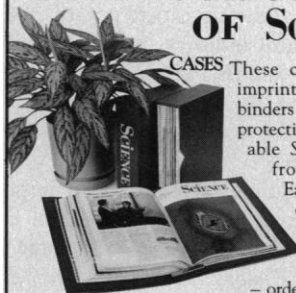


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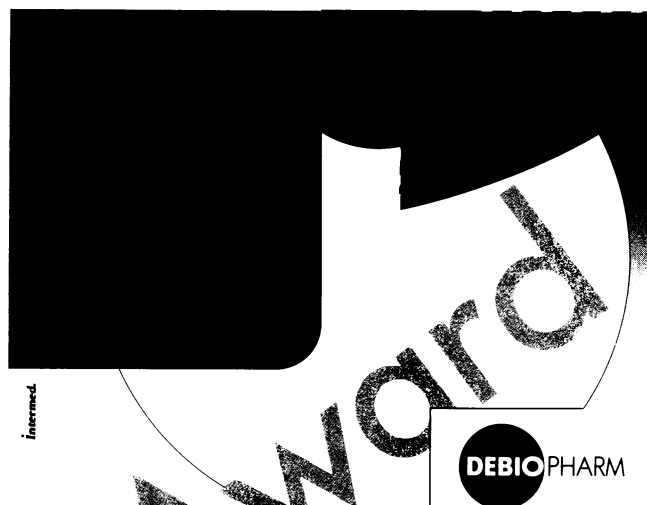
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