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SCIENCE

9 APRIL 1993
VOL. 260 • PAGES 133–264
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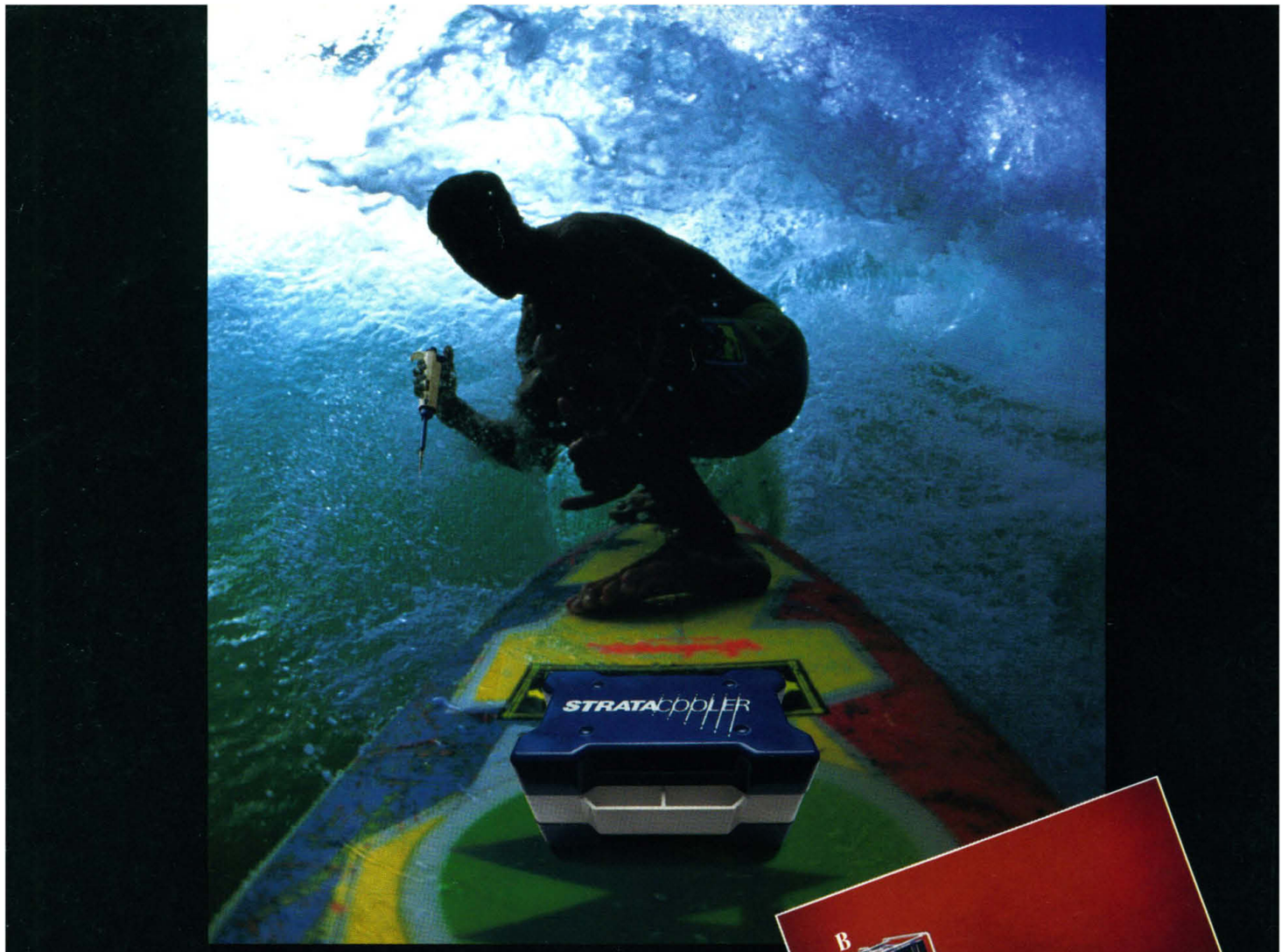

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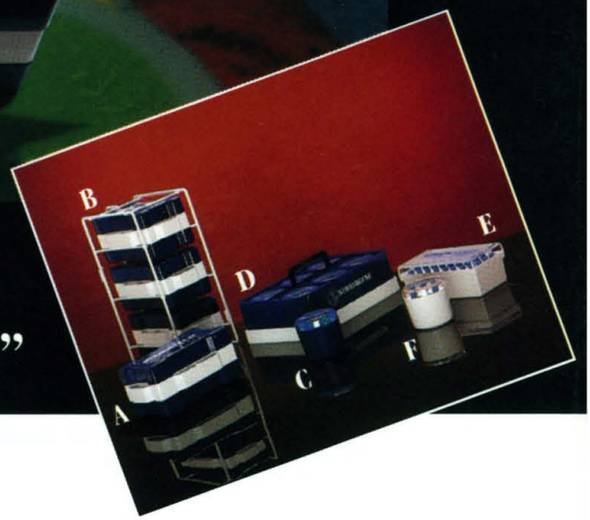

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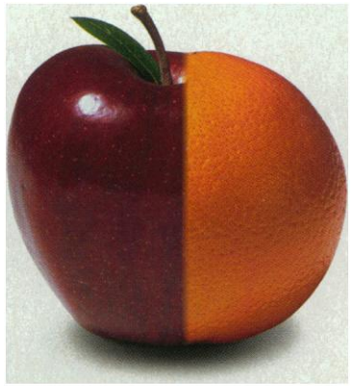

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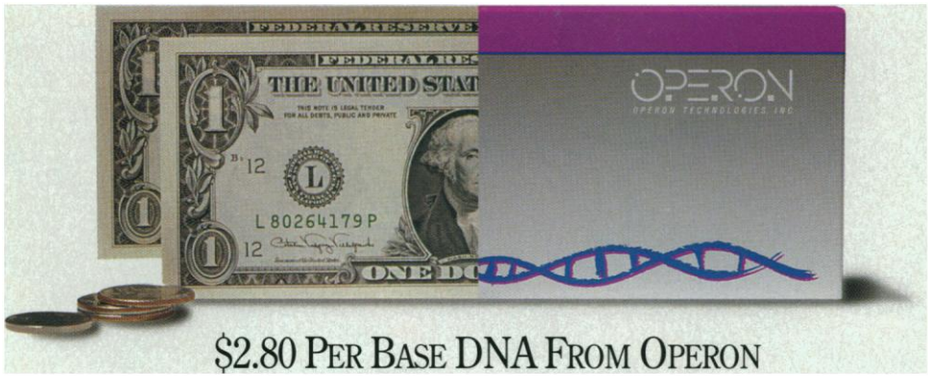

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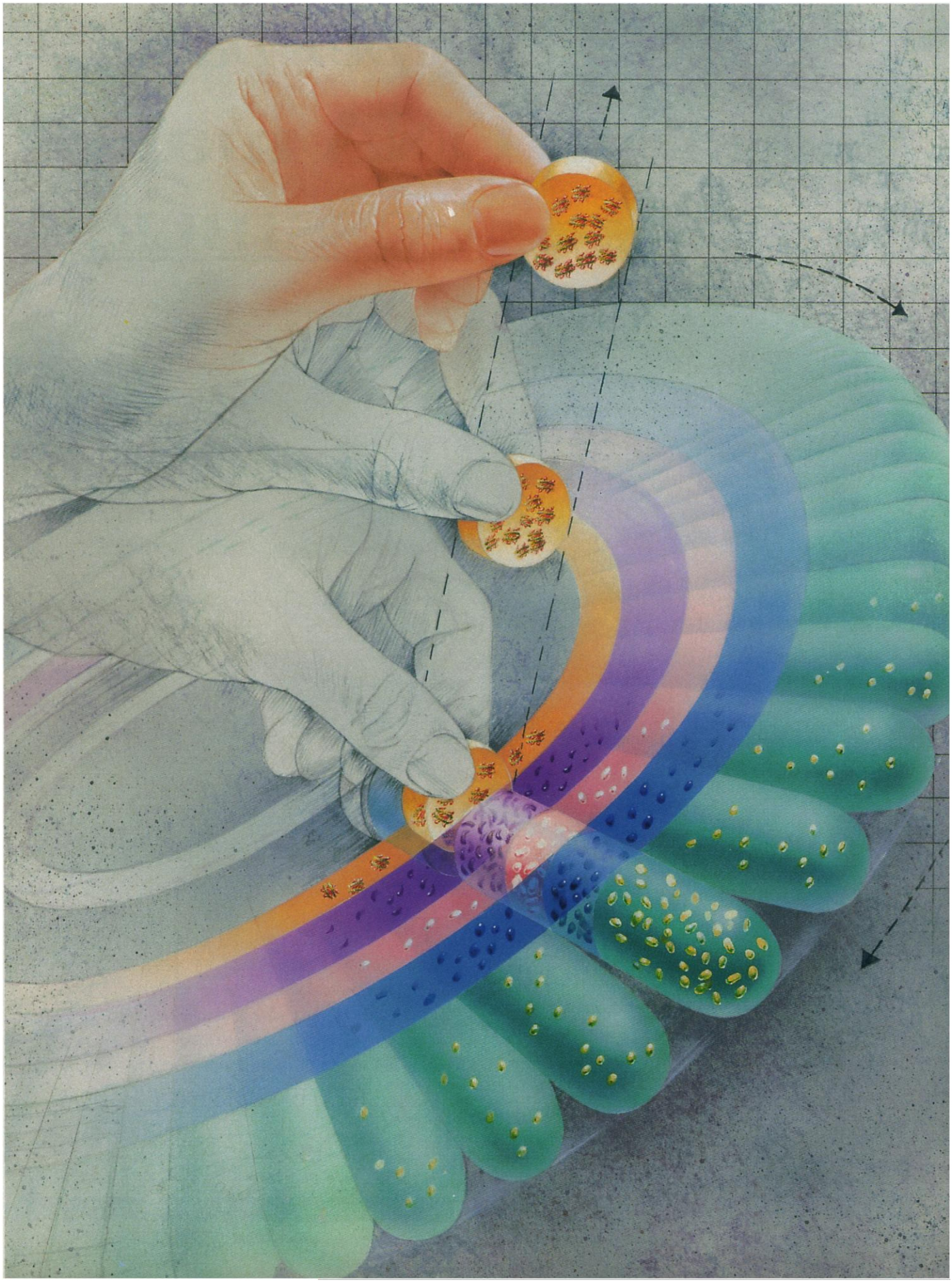

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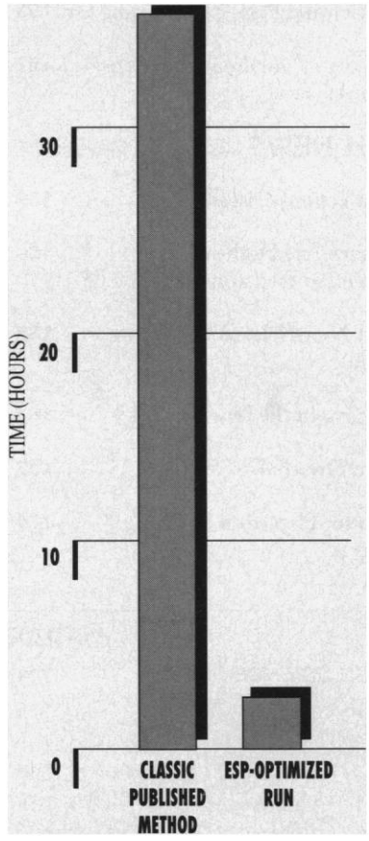

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ISSN 0036-8075
9 APRIL 1993
VOLUME 260
NUMBER 5105

SCIENCE

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Balanced polymorphisms

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Taxol from a fungus

NEWS & COMMENT

RESEARCH NEWS

PERSPECTIVES

ARTICLES

RESEARCH ARTICLES

DEPARTMENTS

COVER

Fishes of the suborder Scombroidei, like this school of *Euthynnus affinis* in the Red Sea, are capable of endothermy. A molecular phylogeny of this suborder (which includes mackerels, bonitos, tunas, and billfishes) indicates that endothermy has evolved three times within Scombroidei. Comparison of endothermic scombroids with their closest living ectothermic relatives provides a further understanding of how endothermy evolved. See page 210 and the News story on page 160. [Photo: Jeffrey L. Rotman/Peter Arnold, Inc.]

REPORTS

TECHNICAL COMMENTS

167 & 186
Meteorite origins

Indicates accompanying feature

■ **SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1333 H Street, NW, Washington, DC 20005.** Second-class postage (publication No. 484460) paid at Washington, DC, and additional mailing offices.

Domestic individual membership and subscription (51 issues): $87 ($47 allocated to subscription). Domestic institutional subscription (51 issues): $205. Foreign postage extra: Mexico, Caribbean (surface mail) $50; other countries (air assist delivery) $95. First class, airmail, student and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. **Change of address:** allow 6 weeks, giving old and new addresses and 11-digit account number. **Postmaster:** Send change of address to *Science*, P.O. Box 2033, Marion, OH 43305-2033. **Single copy sales:** $6.00 per issue prepaid includes surface postage; Guide to Biotechnology Products and Instruments, $20. Bulk rates on request.

The identification code for *Science* is 0036-8075/83 $1 + .10. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

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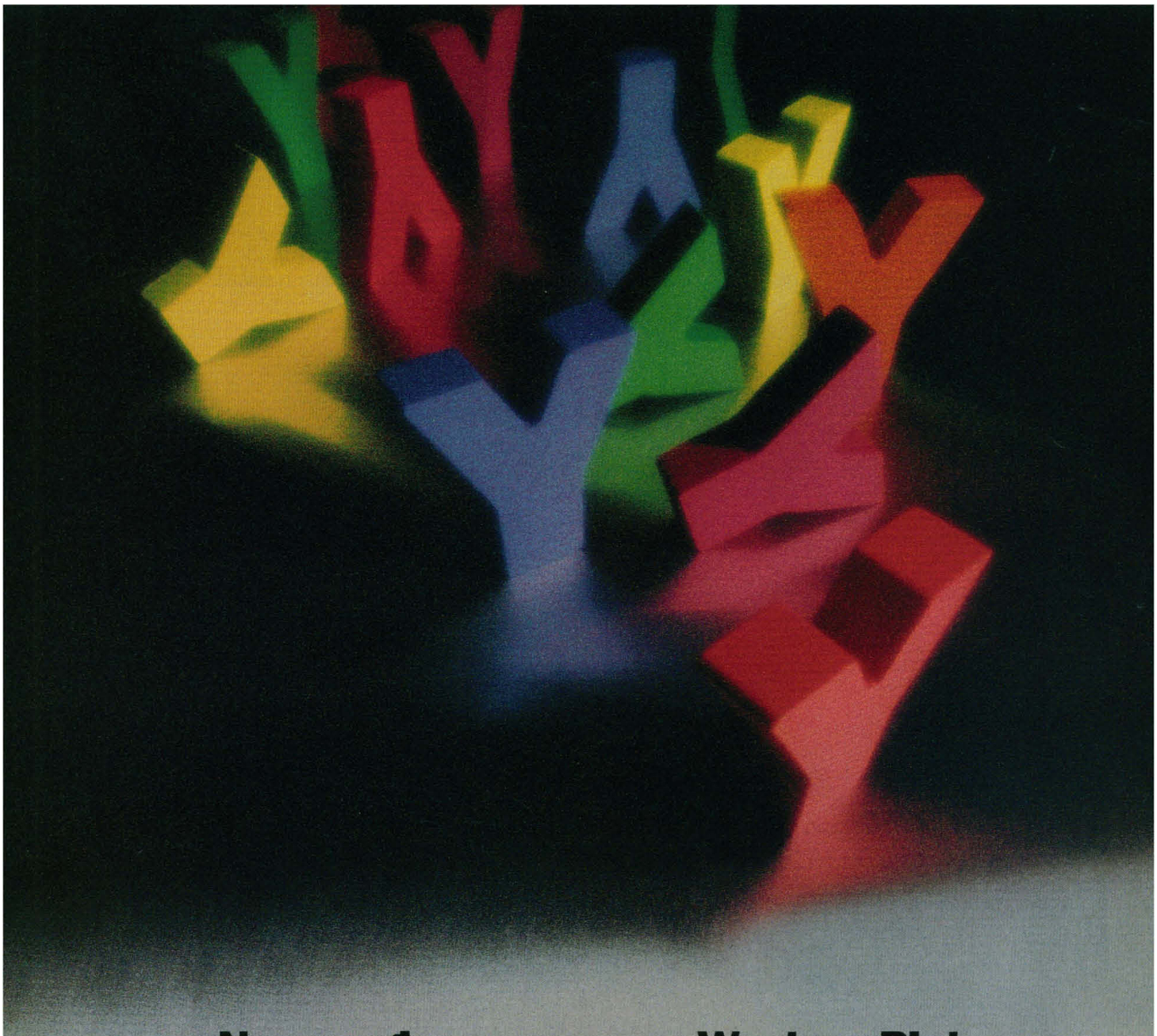

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edited by PHIL SZUROMI

Making Met-Cars

Gas-phase reactions of vanadium and titanium with hydrocarbons can form clusters such as V_8C_{12} and Ti_8C_{12}, which have dodecahedral structures, as well as larger species. Metallo-carbohedrenes, or Met-Cars, have now been found in a solid-phase product. In a process analogous to the synthesis of fullerenes, Cartier *et al.* (p. 195) find that arc discharge of a metal-graphite composite rod can produce Met-Cars. The products, which are stable in air, were produced with yields of about 1 percent.

■

Crystals in curved space

How disordered are amorphous materials? On scales of a few angstroms, there is the bonding and coordination of individual atoms, whereas on scales of hundreds of angstroms there may be little observed order. The degree of order on scales of 5 to 20 angstroms is less well understood. Winters and Hammack (p. 202) report an observation of pressure-induced amorphization of a metallic crystal, the intermetallic alloy *R*-Al_5Li_3Cu, in which medium-range ordering was probed by x-ray diffraction. This ordering can be studied by the mathematical stratagem of examining a crystal in curved space.

■

How much methane?

An enormous amount of methane, a greenhouse gas, is presumed to be trapped along continental margins in and beneath a layer of methane hydrate. The base of the hydrate layer seems to be marked seismicly by a prominent bottom-simulating reflector (BSR). Singh *et al.* (p. 204) show that seismic reflection data can be used to infer the thickness of the zone of gaseous methane beneath the BSR and estimate the amount of trapped methane on a global scale.

■

A choice of channels

The concentration of intracellular calcium in neuronal cells can be increased by Ca^{2+} influx through various ion channels. However, the cell does not respond in the same manner to increases in intercellular calcium that result from influx of Ca^{2+} through these different channels. Bading *et al.* (p. 181) found that entry of Ca^{2+} into cells through two different channels—voltage-sensitive L-type Ca^{2+} channels or the *N*-methyl-D-aspartate (NMDA) receptor—activated transcription of c-*fos* through two different elements in the c-*fos* promoter. Although Ca^{2+} from both sources activated Ca^{2+}-calmodulin–dependent protein kinase II, the activity of that enzyme was required only for transcriptional activation resulting from Ca^{2+} entry through L-type Ca^{2+} channels. Thus, Ca^{2+} appears to regulate specific signaling pathways depending on its mode of entry into the cell.

Asteroid-meteorite link

Binzel and Xu (p. 186) present evidence that the asteroid Vesta is the source of many basaltic achondrite meteorites on Earth and, in a Perspective, Gaffey (p. 167) overviews the origin and dynamics of the mani-belt asteroids.

■

Recombination and DNA repair

Cells of the immune system can respond to the diversity of antigens they encounter by recombining the lymphocyte antigen receptor genes. This process, V(D)J recombination, can be activated in nonlymphoid cells by introducing the recombination activation genes *RAG-1* and *RAG-2*. The recombination process generates DNA double-strand breaks both at the genes and at their conserved flanking sequences. Taccioli *et al.* (p. 207) introduced the *RAG* genes into cell lines that had defective DNA repair and identified two mutants that did not correctly repair DNA during V(D)J recombination; this impairment differs from that seen in *scid* mutants. They provide evidence for the presence of two nonlymphoid-specific genes that express factors that are involved in both DNA repair and V(D)J recombination.

■

Two fish stories

Some fish are endothermic and maintain a higher body temperature than the water they live in. Two different strategies have evolved in the *Scomboidei* for endothermy. Billfishes and mackerels warm only the brain and eyes, whereas tunas, like birds and mammals, have vascular countercurrent heat exchangers. In a phylogenetic analysis, Block *et al.* (p. 210; cover) show that endothermy arose three separate times and was associated with niche expansion.

Lake-dwelling cichlid fish feed on the scales of other fish and have mouths that open to the right (right-handed) or to the left. Hori (p. 216) shows that the mouth direction is determined by a one locus–two allele system and that the frequency of each type oscillates around unity. Conditioning of prey drives selection: As right-handed fish become more abundant, prey fish tend to guard their left side, making the rarer left-handed predators more successful until the balance shifts. Watson (p. 160) overviews both studies in news stories.

■

Selective splicing

Many pre-mRNAs are alternatively spliced to produce tissue-specific products. Zahler *et al.* (p. 219) examine the activity of multiple pre-mRNA splicing factors (SR proteins) and find that particular SR proteins allow differential splice-site selection in an in vitro splicing system. They also demonstrate that SR proteins vary in expression in different tissues. Thus, SR proteins may regulate tissue-specific alternative splicing in vivo.

■

Controlling circadian rhythms

Circadian rhythms in mammals are controlled by a biological clock in the suprachiasmatic nucleus (SCN) of the hypothalamus. Selective exposure of animals to light can shift the behavioral rhythms. The shifts are associated with increased expression of c-*fos*. Ginty *et al.* (p. 238) produced an antibody that specifically recognizes the phosphorylated, active form of the transcription factor CREB (cyclic adenosine monophosphate response element binding protein). They used the antibody to show that CREB became phosphorylated in the SCN of hamsters exposed to light at the appropriate time to shift their circadian rhythm. The results suggest that CREB takes part in control of circadian rhythms.

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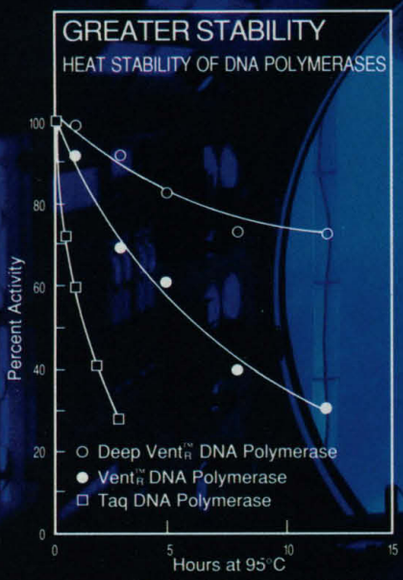
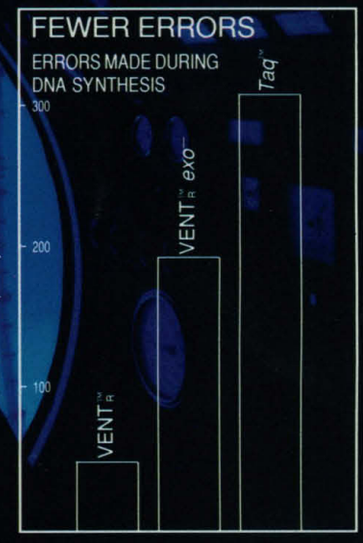


Heat stability of various thermal stable DNA polymerases. All were incubated at 95°C under standard assay conditions.



Reversion frequency reflects error rate in DNA synthesis and was measured by the opal codon reversion assay. Kunkel et al. (1987) Proc. Natl. Acad. Sci. USA 84, 4865-4869. Mattila P. et al. (1991) Nucleic Acids Res.19, 4967-4973.

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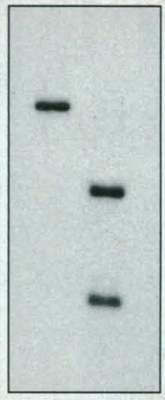

Analysis of microbial genomes: Southern blot of genomic DNA from (i) *Yersinia pestis* and (ii)(iii) *Yersinia enterocolitica* digested with *Eco*R1 on Hybond™-N, hybridized with an IRP2 gene specific probe, using ECL random prime labelling and detection system. 6 minute exposure to Hyperfilm™-ECL *Data supplied by Dr Carniel, Laboratoire de Bacteriologie Moléculaire Médicale, Institut Pasteur, Paris, France.*

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