

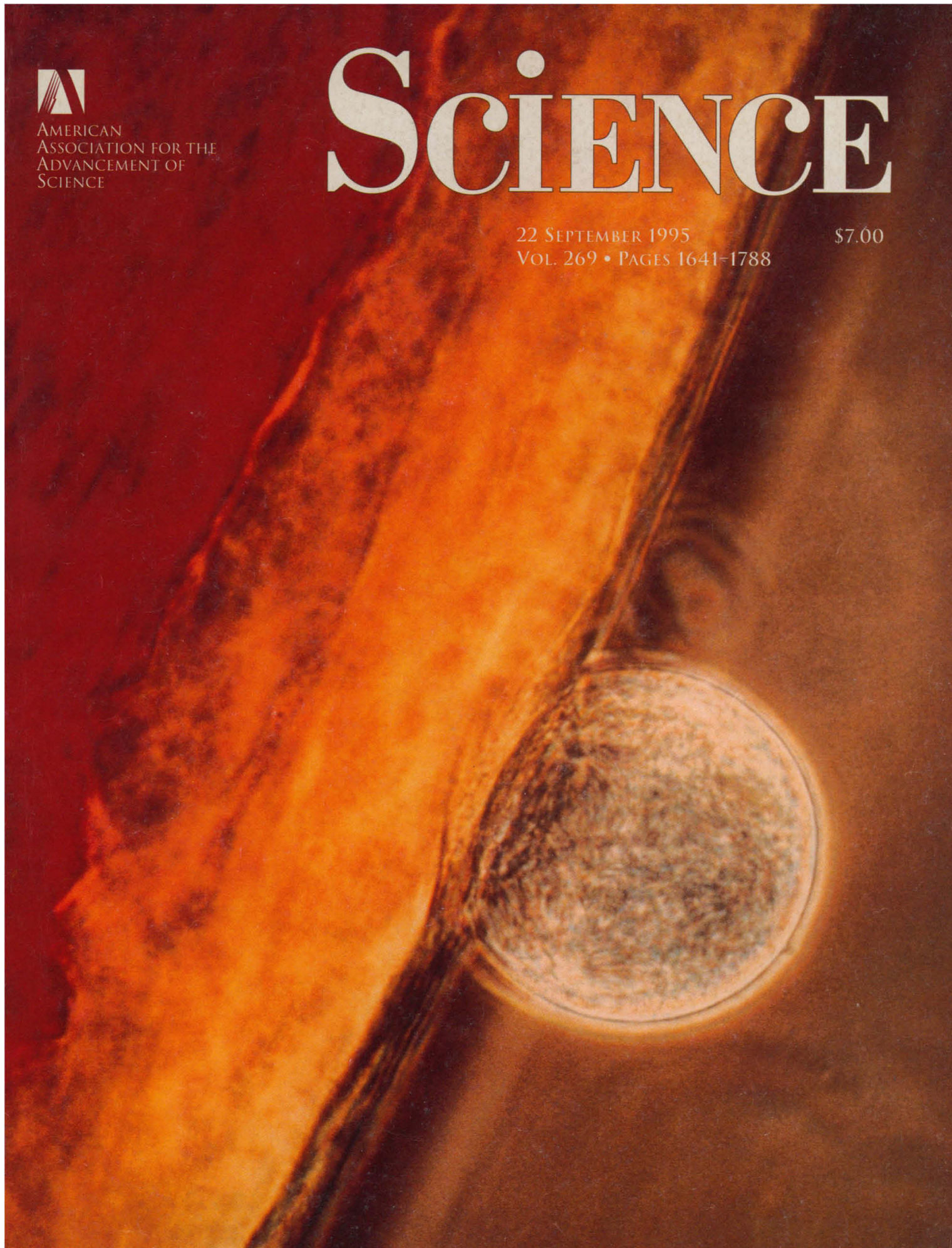


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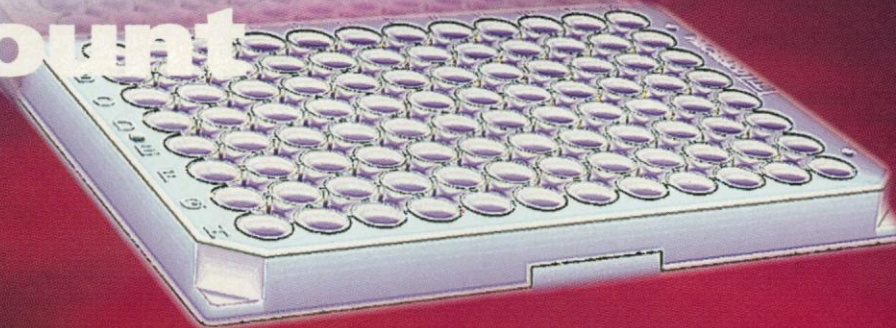
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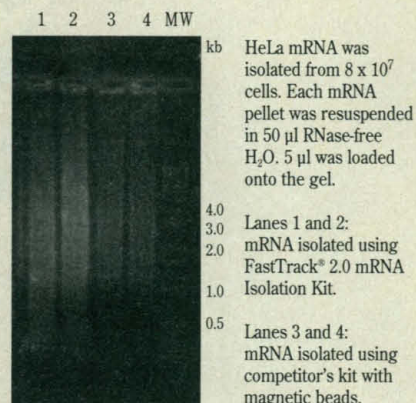


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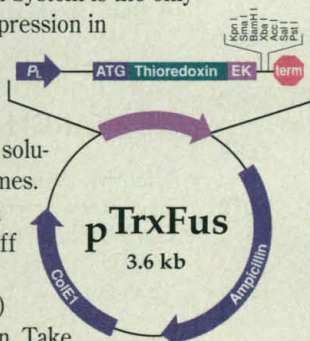


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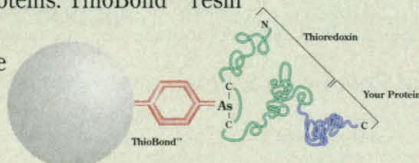


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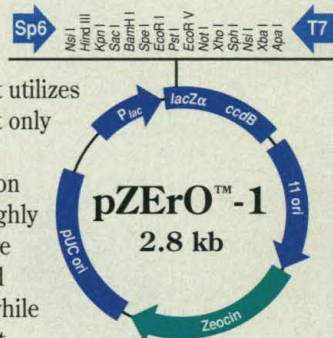


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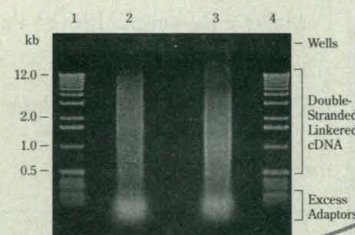


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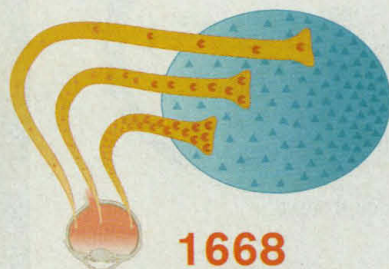
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## COVER

Mature oocyst stage (40 to 60  $\mu\text{m}$ ) of a human malaria parasite on the midgut wall of a wild-caught, blood-fed anopheline mosquito from Madang, Papua New Guinea. Measurement of genetic heterozygosity of this stage reveals that the malaria parasite is highly inbred in

Papua New Guinea, which has significant implications for the spread of drug-resistant parasite strains. See page 1709 and the related News story on page 1670. [Image: Courtesy of P. Graves, Department of Preventive Medicine and Biometrics, University of Colorado]



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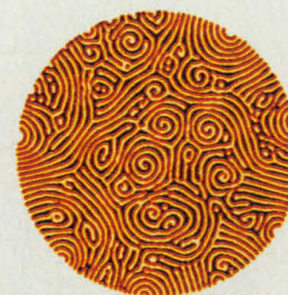
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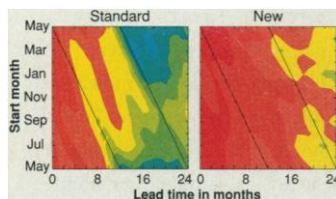
## Convection confounded

In Earth's atmosphere, heat is released when water condenses to form clouds. Convective heat flow can occur in part because water is lighter than  $O_2$  and  $N_2$ . On the giant planets, however, the main condensable species are heavier than the  $H_2$  and He that predominate. A theoretical analysis by Guillot (p. 1697) shows that if condensable species are sufficiently abundant (water on Jupiter and Saturn and methane on Uranus and Neptune), their transport could inhibit convection. Heat is likely transported by radiation or diffusive convection instead.

■

## Forecasting El Niño

Most of the models used to make long-range forecasts of an El Niño cycle run into a "spring barrier" that has been thought to be an intrinsic unpredictability of the system. Chen *et al.* (p. 1699) show that a model that uses only wind data but that explicitly takes into account air-



sea interactions during its initialization overcomes this spring barrier when tested on data sets from the 1970s and 1980s. The improvement may stem from filtering out high-frequency signals in the initialization that contribute little to predicting this low-frequency, large-scale climate event.

■

## Spirals and spins

A chaotic flow involving spiral structures has recently been observed in Rayleigh-Bénard con-

## Nicotine and synaptic transmission

Nicotine produces a number of psychophysical effects, yet electrophysical studies of the role of nicotinic acetylcholine receptors (nAChRs) in the central nervous system (CNS) have not revealed transmission directly mediated by postsynaptic nAChRs. McGehee *et al.* (p. 1692; see the Perspective by Calquhoun, p. 1681) now show that nanomolar concentrations of nicotine (typical of blood levels in a moderate smoker) activate presynaptic nAChRs and, by increasing presynaptic intracellular calcium, enhance synaptic transmission mediated by fast excitatory transmitters such as glutamate.

vection. Individual spirals with distinct handedness form, unlike other kinds of defects that are always created in pairs. Ecke *et al.* (p. 1704) used rotation to break the symmetry of this system and found numerous parallels with magnetic spin systems in the presence of a symmetry-breaking applied magnetic field. A theoretical model in which the spirals are viewed as a collection of spin-1 objects with nearest-neighbor interactions gives quantitative agreement with the fluid dynamics data.

■

## Calcium in muscle

Contraction of muscle cells is controlled by release of  $Ca^{2+}$  from the sarcoplasmic reticulum (SR). Tsugorka *et al.* (p. 1723), used confocal laser scanning microscopy and a  $Ca^{2+}$ -sensitive fluorescent dye to detect  $Ca^{2+}$  release events in skeletal muscle cells that appear to correspond to opening of single channels in the SR. As in cardiac muscle, depolarization leads to increases in the number of occurrences of the elementary events rather than an increase in the amount of  $Ca^{2+}$  released in an individual event. Differences in the magnitude of these events apparently underlie the fundamental differences in control of  $Ca^{2+}$  release in these two types of muscle cells.

## Going with the grain

The large seed grains of sorghum, rice, and maize, which require human aid for the propagation, were derived through mutations in small-seeded wild grasses that dispersed their seed naturally. Paterson *et al.* (p. 1714) show that in each of these grasses many of the same quantitative trait loci control the key traits essential for domestication—seed mass, the shattering of mature seeds, and sensitivity of flowering to day length. Despite 65 million years of genetic isolation, similar small sets of genes account for these traits in these grains.

■

## Attractive and stimulating

Chemokines are a family of cytokines that share structural similarities and are thought to function primarily in promoting cell migration. For example, low concentrations of the chemokine RANTES mediate lymphocyte and leukocyte chemotaxis. Now Bacon *et al.* (p. 1727) show that high concentrations of RANTES also cause protein phosphorylation, lymphokine production, and proliferation when added to T cells. Thus, at least in vitro, RANTES can function as an antigen-independent activator of T cells.

## Interferon regulation

STATs (signal transducers and activators of transcription) are transcription factors activated in cells treated with interferons (IFNs) or other cytokines. STATs are activated by tyrosine phosphorylation, and their activity can also be regulated by serine phosphorylation. David *et al.* (p. 1721; see news story by Barinaga, p. 1673) find that mitogen-activated protein (MAP) kinase (a serine-threonine kinase) associates with the interferon- $\alpha/\beta$  receptor in vivo and in vitro. Dominant negative MAP kinase also inhibited IFN-induced transcription. Thus MAP kinase, well known to transmit signals from other types of receptors, may also participate in regulation of transcription by IFNs.

■

## Postsynaptic clusters

Two reports have clarified how a class of glutamate receptors, the N-methyl-D-aspartate (NMDA) receptors, specifically cluster in specialized regions of the postsynaptic plasma membrane. Ehlers *et al.* (p. 1734) showed that a region of the cytoplasmic tail of a subunit of the NMDA receptor was required for the formation of clusters of receptors associated with the plasma membrane in cells transfected with the subunit. This clustering was regulated by phosphorylation of the region and by alternative splicing of the messenger RNA encoding subunit to include the clustering domain. Kornau *et al.* (p. 1737) identified a postsynaptic density protein, PSD-95, that specifically interacted with the cytoplasmic tails of a second type of NMDA receptor subunit. This interaction may help establish and maintain strong synaptic contacts between neurons.



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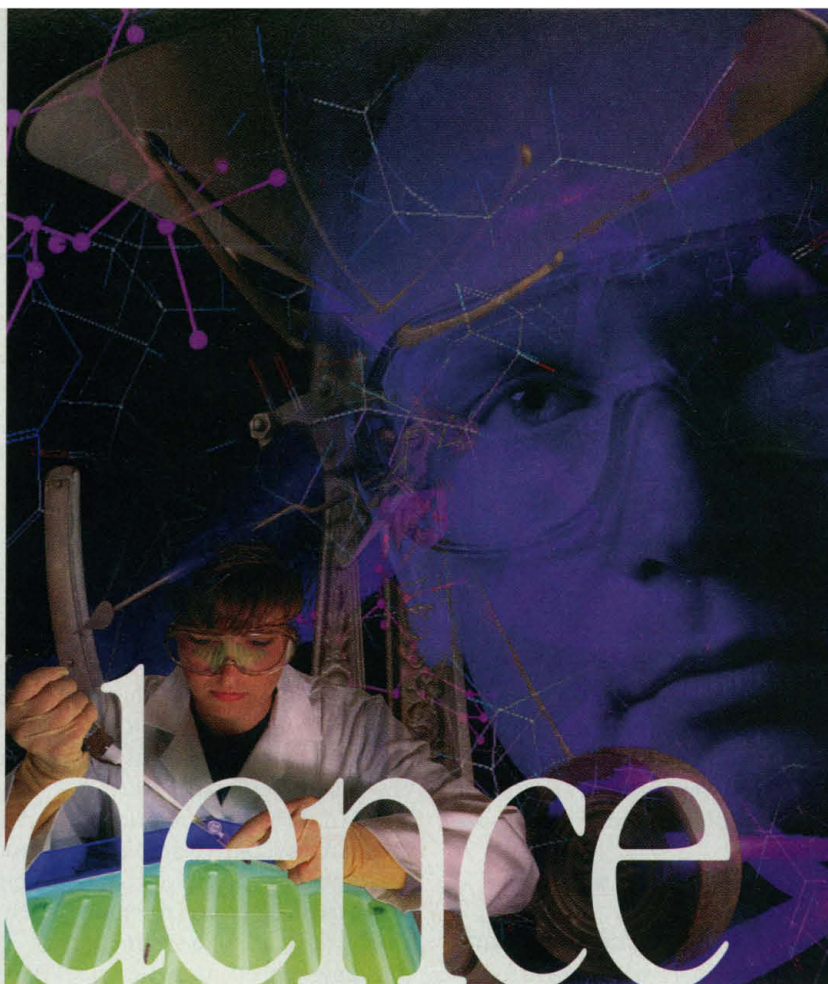
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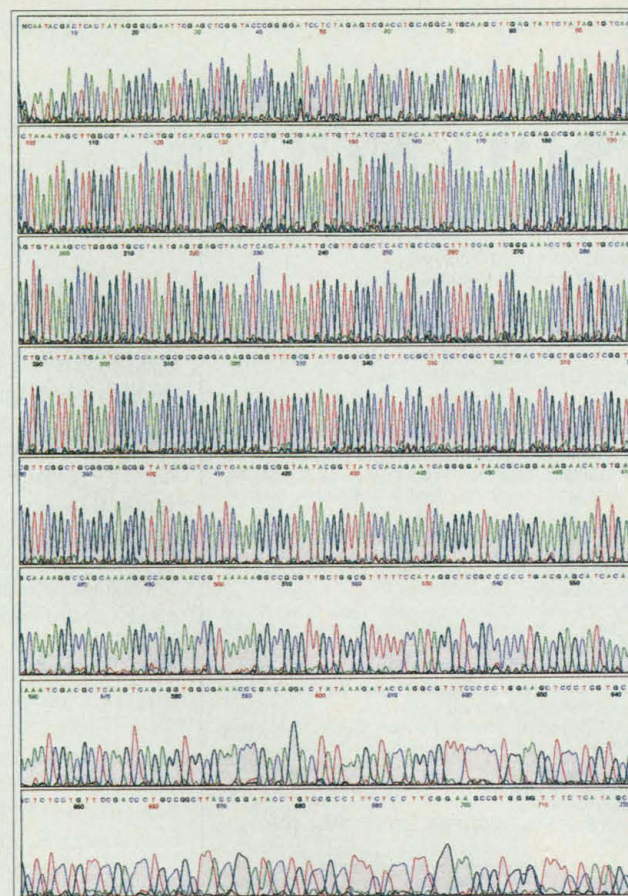
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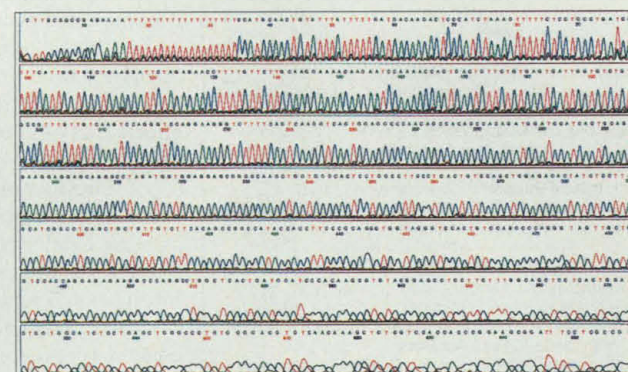
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1. Proc. Natl. Acad. Sci., USA, 92(14), pp.6339-6343, (1995).

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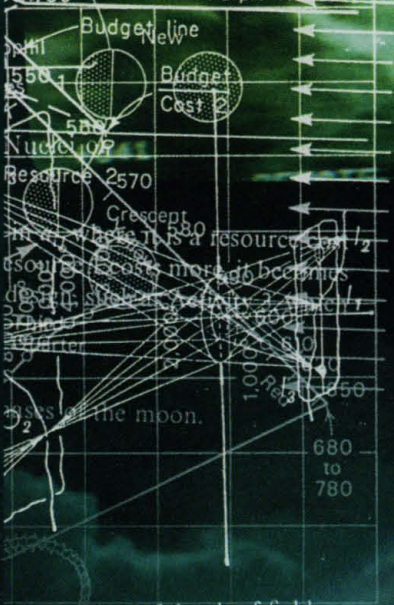


Activity 1  
Activity 2  
Activity 3



loading determinations on wires with  
frequency of 270 cps. A = 0 at. % H,  
B = 1.0 at. % H, C = 2.0 at. % H,  
D = 5.0 at. % H, E = 7.6 at. % H,  
F = 10.0 at. % H.

0.520-780 crescent. Spectrum focus  
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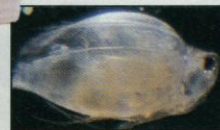
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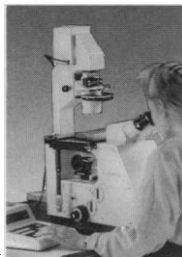


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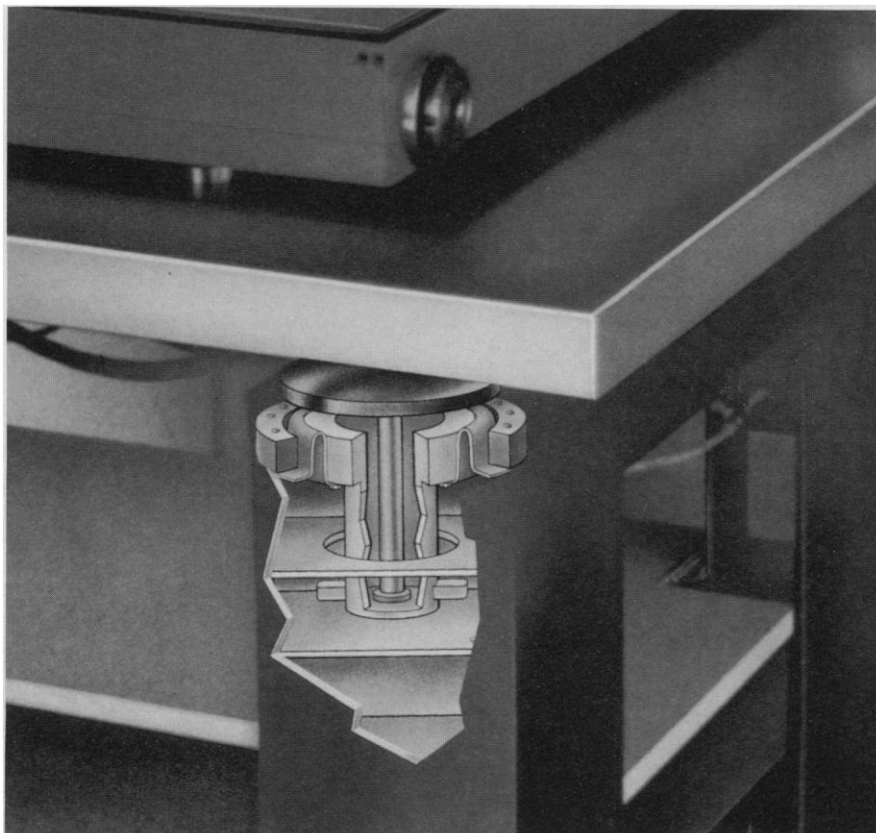
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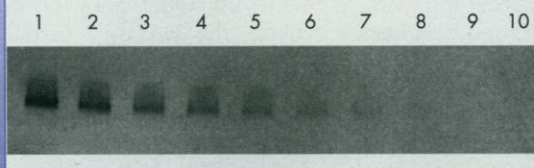
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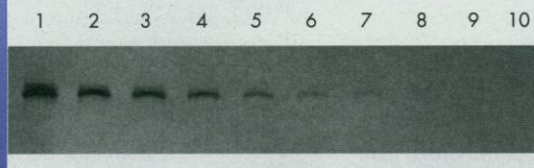
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