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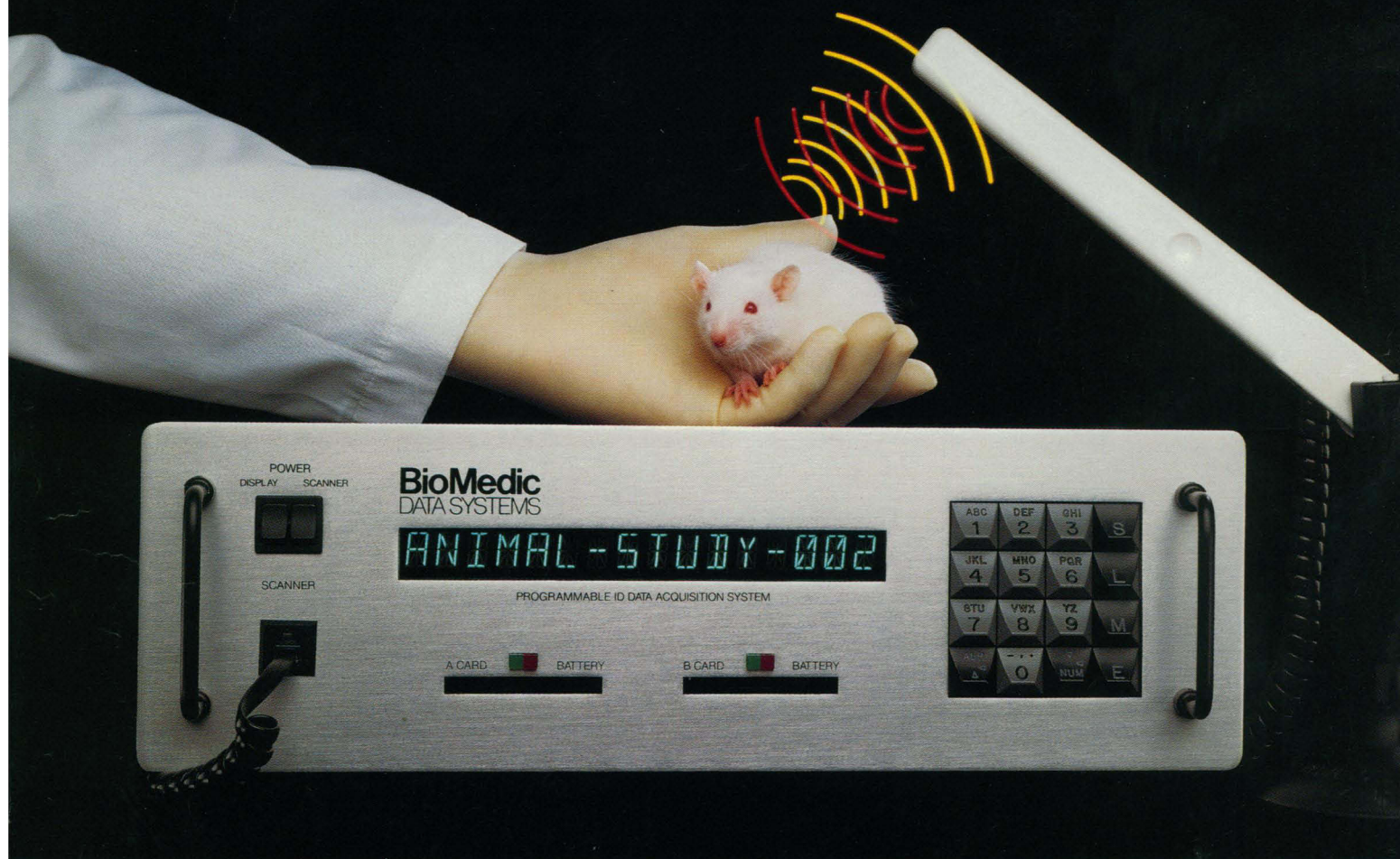
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COVER Model of the complex of human growth hormone and the extracellular domain of its receptor. One hormone molecule (red) is bound to two receptor molecules (blue and green); the pebbled yellow surface represents the cell membrane. The dimerization of the extracellular domains by the hormone is likely to aggregate the intracellular domains of the receptor as well, thereby producing signals leading to cell growth differentiation. See page 306. [Graphics by T. Hynes and A. M. de Vos with MIDAS-plus software]

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This Week in SCIENCE

Josephson computers

Superconducting Josephson junctions may one day form the basis for ultrafast computers. Hasuo (p. 301) reviews progress that has been made through the use of high-quality niobium junctions. Large-scale integrated circuits have been made that are much faster than existing semiconductor circuits. The first commercial products may be specialized processors and hybrids with existing computers.

Growth hormone and receptor complex

Binding of human growth hormone (hGH) to its receptor stimulates the growth and metabolism of muscle, bone, and cartilage cells; de Vos *et al.* (p. 306; cover) report the x-ray structure of hGH complexed with the extracellular domain of its receptor (hGHbp). Two receptor molecules form the complex with hGH. Although the two hGHbp molecules donate similar residues, the structures of the two binding sites are quite different. The two hGHbp molecules also form extensive carboxyl-terminal contacts, which suggests a sequential mechanism for dimerization that may have implications for signal transduction.

One charge at a time

The ultimate in digital electronics is to use a single electron to change the state of a device; Su *et al.* (p. 313) report the incremental charging of the potential well of a resonant tunneling device by single electrons. In order to separate the effects of size quantization and charging, the submicrometer-sized heterostructure was grown so that one of the barriers of the quantum well was more transparent than the other. When the voltage polarity is chosen so that the emitter was more transparent than the collector, electrons accumulate in the well, and sharp steps are observed in the tunneling current because of Coulomb blockade.

Alkane activation

Measurement of the gas-phase reaction rates for the addition of the normally "unreactive" alkanes to a rhodium complex has verified that these reactions proceed through the formation of a 16-electron intermediate. Wasserman *et al.* (p. 315) irradiated $(\eta^5\text{-C}_5\text{H}_5)\text{Rh}(\text{CO})_2$ to dissociate one of the CO ligands. Almost every collision of the resulting "naked" complex with alkanes such as neopentane caused activation of carbon-hydrogen (C-H) bonds. In a second step these activated intermediates undergo oxidative addition, breaking the C-H bond.

Cyclic 3' ends

In the major mature form of U6 RNA, one of the small nuclear RNA molecules involved in pre-mRNA splicing, the 3' end has an unusual cyclic 2',3'-phosphate group on a uridyl residue. Lund and Dahlberg (p. 327) identified this apparently post-translational modification through ribonuclease T1 fingerprinting and chemical modification analyses. The formation of the cyclic phosphate may act to inhibit shortening or elongation at the 3' end, thus fixing its length, or may form a transient covalent linkage with another spliceosome component.

Coral siblings

Wide distribution, longevity, and clear annual bands of the reef-building coral *Montastrea annularis* has made it the "lab rat" for many ecological, physiological, and geological studies, especially for the poorly understood episodes of coral bleaching. Knowlton *et al.* (p. 330) show that *M. annularis* is really a complex of genetically and morphologically distinct sibling species that differ in important attributes such as coloration and growth rates, a finding that brings into question the widely held assumption that its colony morphology reflects environmental plasticity.

Recognizing more HIVs

Immunization of mice with a recombinant vaccinia virus from one HIV isolate, followed by restimulation of cytotoxic T cells (CTLs) from another isolate with a single substitution at a critical V3 loop residue, generated CTLs with broad specificities. Takahashi *et al.* (p. 333) found that using peptides with aliphatic substitutions at residue 325 during restimulation generated CTLs that could respond to variant sequences at this critical site.

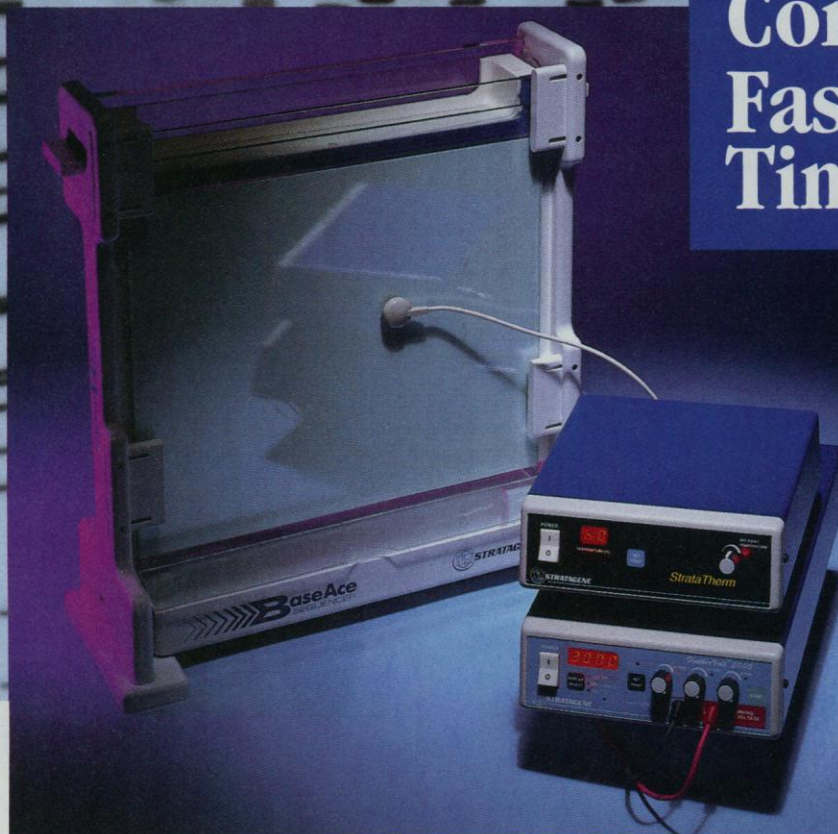
Endosperm evolution

Evidence for the origin of endosperm in flowering plants has been obtained by Friedman (p. 336), who studied the stages of development of the desert shrub *Ephedra* from pollination through formation of cellular protoembryos. Friedman had showed that double fertilization took place in this plant; by serially sectioning 400 ovules, he now shows that the development pattern in *Ephedra* is similar to that in primitive flowering plants, except that the second fertilization product forms additional embryos. This embryo-producing tissue may have evolved into endosperm.

Artificial photoreceptor

Bacteriorhodopsin (bR) films have been used to create image-sensing devices. Miyasaka *et al.* (p. 342; see news story by Flam, p. 289) used Langmuir-Blodgett techniques to coat tin oxide electrodes with bR; the film was covered with an aqueous gel electrolyte and sealed with a gold counterelectrode. These photocells were then constructed into a pixel array to make an image sensor. Like biological photoreceptors, the photocells produce a rectified photocurrent. A constant light intensity produces a rapidly rising photocurrent that peaks and rapidly returns to background. Such response would be useful in optical imaging applications.

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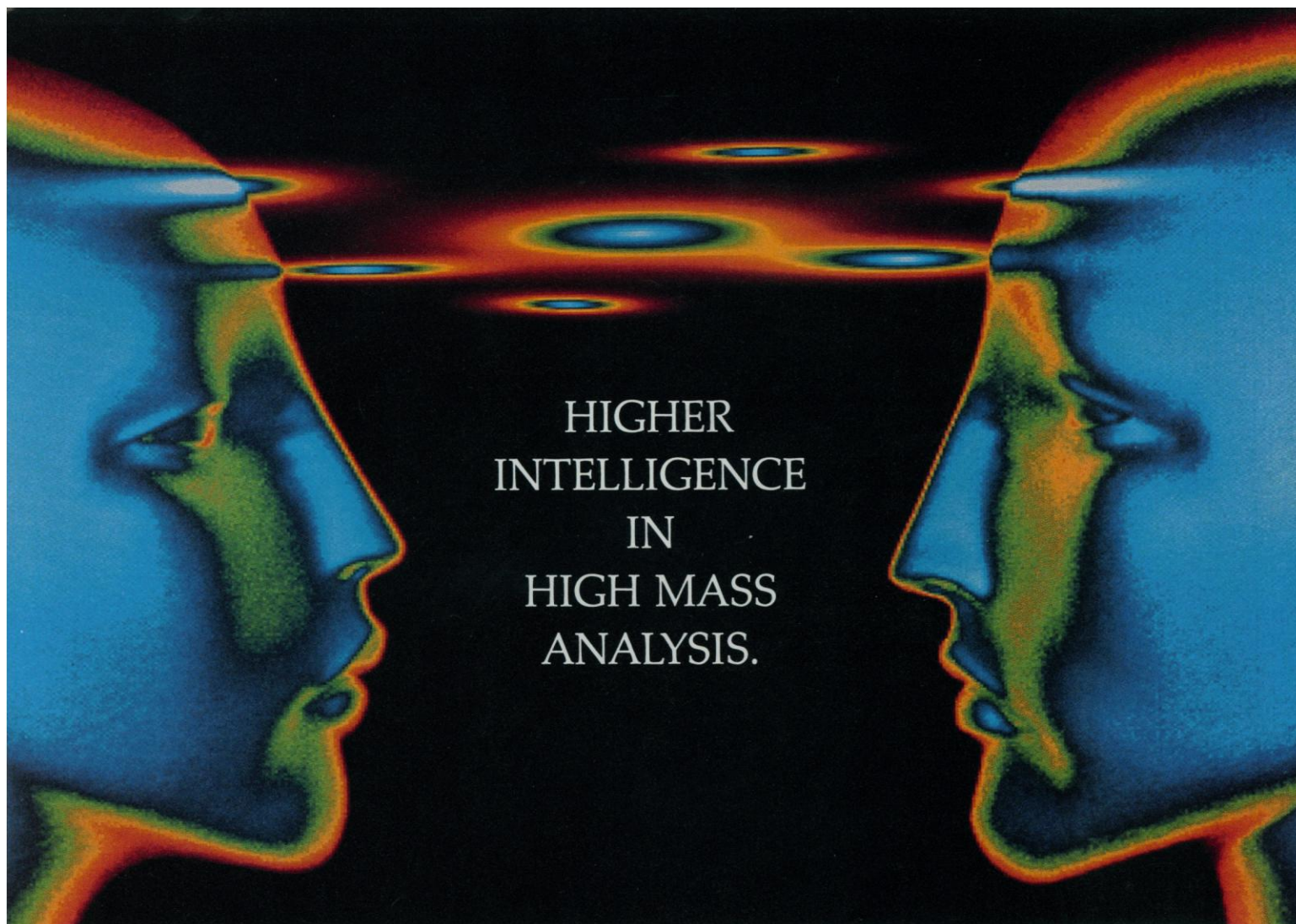
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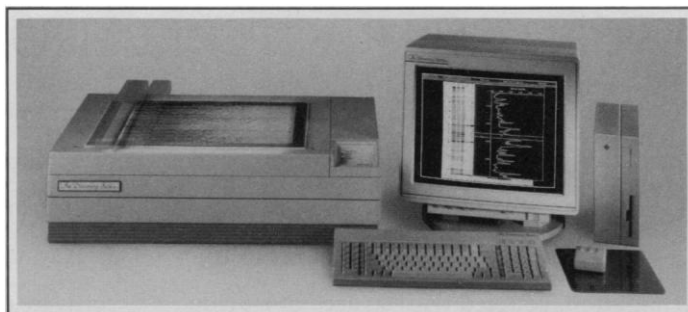
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