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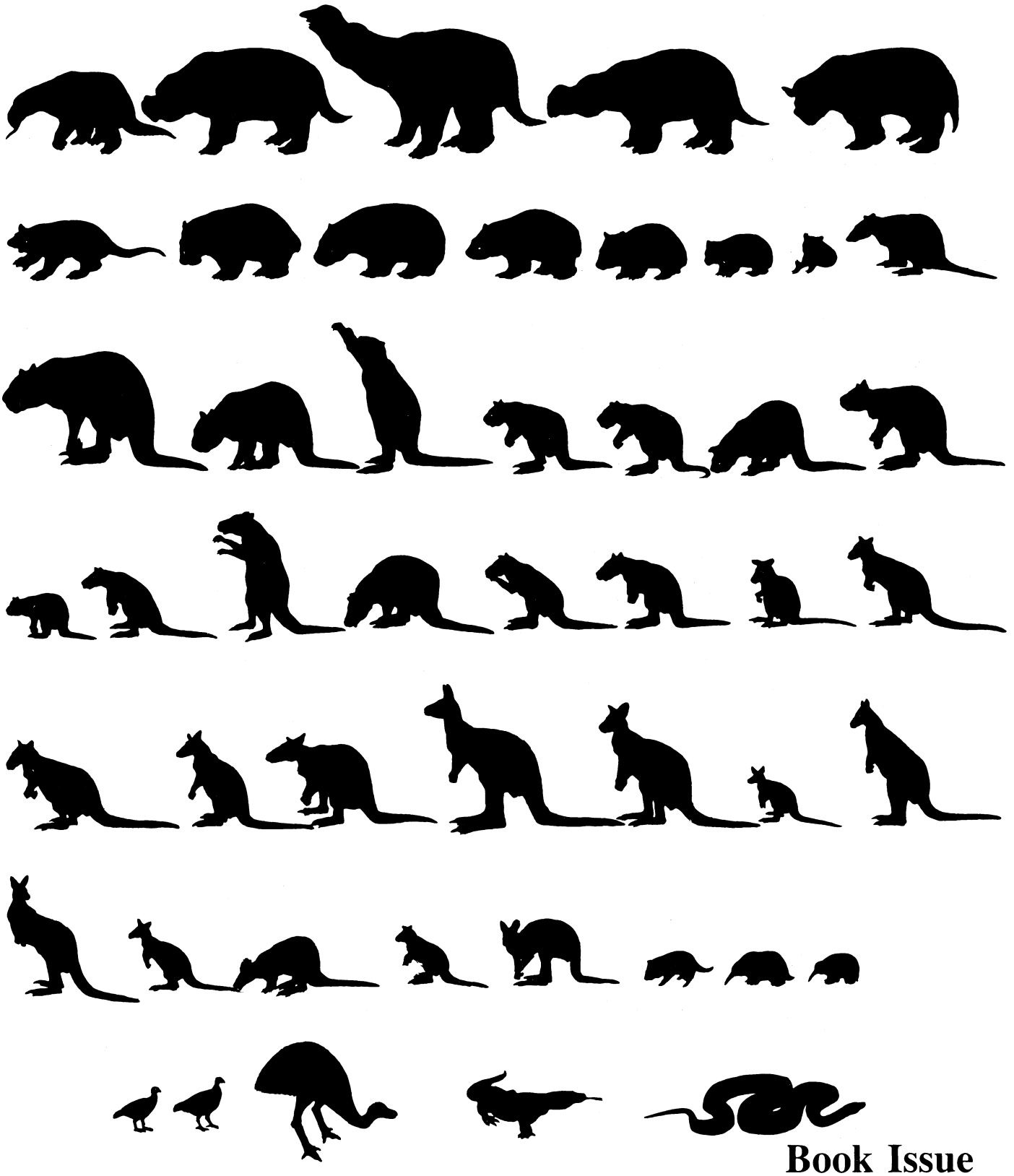

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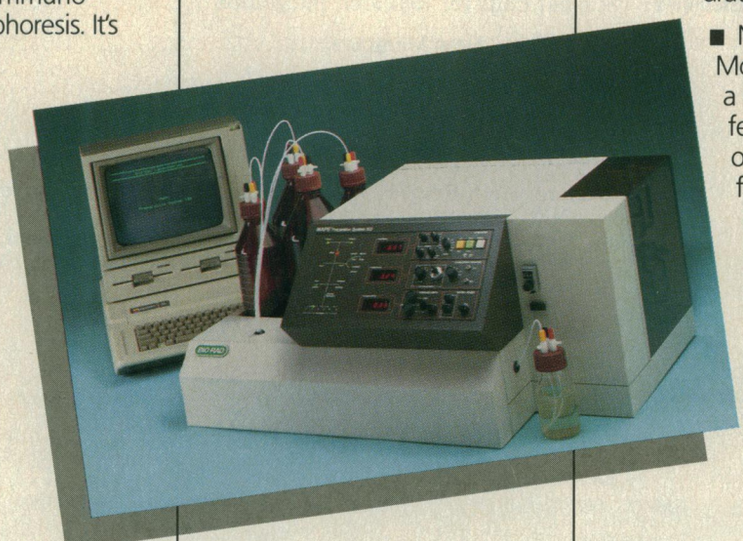

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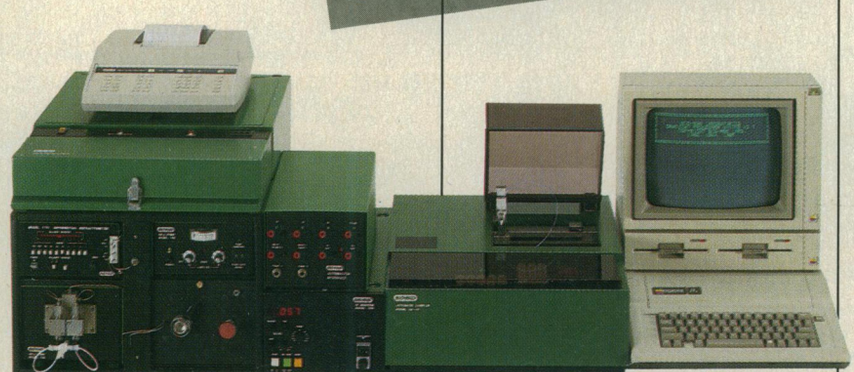

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COVER

Silhouettes of most of the extinct late Pleistocene Australian vertebrate species, drawn to scale. The height of the kangaroo in the center of row 5 is about that of an adult human male. [From Peter Murray, "Extinctions down-under: A bestiary of extinct Australian late Pleistocene monotremes and marsupials," in *Quaternary Extinctions* (Paul S. Martin and Richard G. Klein, Eds.), reviewed on page 870]

Mosaic proteins and genes in pieces

Seven years ago, the genes for the proteins of higher organisms were described as regions of DNA that contain the information for protein structure separated by regions of DNA that do not contain such information. The regions with the information were called exons, and the intervening regions were called introns. Gilbert, in 1978, suggested that the separation of these exons would permit their shuffling about the chromosome and their reassembly to form various specific genes. An example that indicates that this assemblage of exons has occurred has been found by Brown and Goldstein, and their co-workers Südhof, Russell, Sanchez-Pescador, and Bell (pages 815 and 893). The protein studied is a receptor that transports cholesterol into human cells, and the exons that are assembled into its gene have been described in detail. Like other proteins, each of its functions—binding cholesterol, attaching to the cell surface, traversing the cell membrane, and so forth—depends on a discrete region or domain, and each domain is produced from several exons. Gilbert (Perspective, page 823) reexamines the original predictions of the exon-intron construct in light of these new data and elaborates on the possible consequences of this construct for the evolution of protein systems.

Formation of Earth and other planets

The sizes, the relative positions, and the orbital paths of the four planets in our solar system that lie closest to the sun—Mercury, Venus, Earth, and Mars—are well characterized. The processes by which this happened are not. One theory for the formation of these planets suggests that they arose from small bodies, planetesimals, orbiting in concentric swarms. Collisions of planetesimals within a swarm may have produced larger bodies, and collisions between these larger bodies (giant impacts) may have resulted eventually in a single large body orbiting in each of the nonintersecting paths. This theory was tested with a computer simulation that incorporated a variety of possible starting conditions, and a set of conditions was defined for the late stages of planetary evolution that adequately accounts for the planets and their orbits as they are known today (page 877). Giant impacts could have melted the entire Earth, resulting in the formation of its core. Other properties of Earth, such as its mass, its relationship to the moon, and special characteristics of its atmosphere, are also logical outcomes of giant impacts between large orbiting bodies during this late stage of planet formation.

Cellular uptake of neurotransmitter

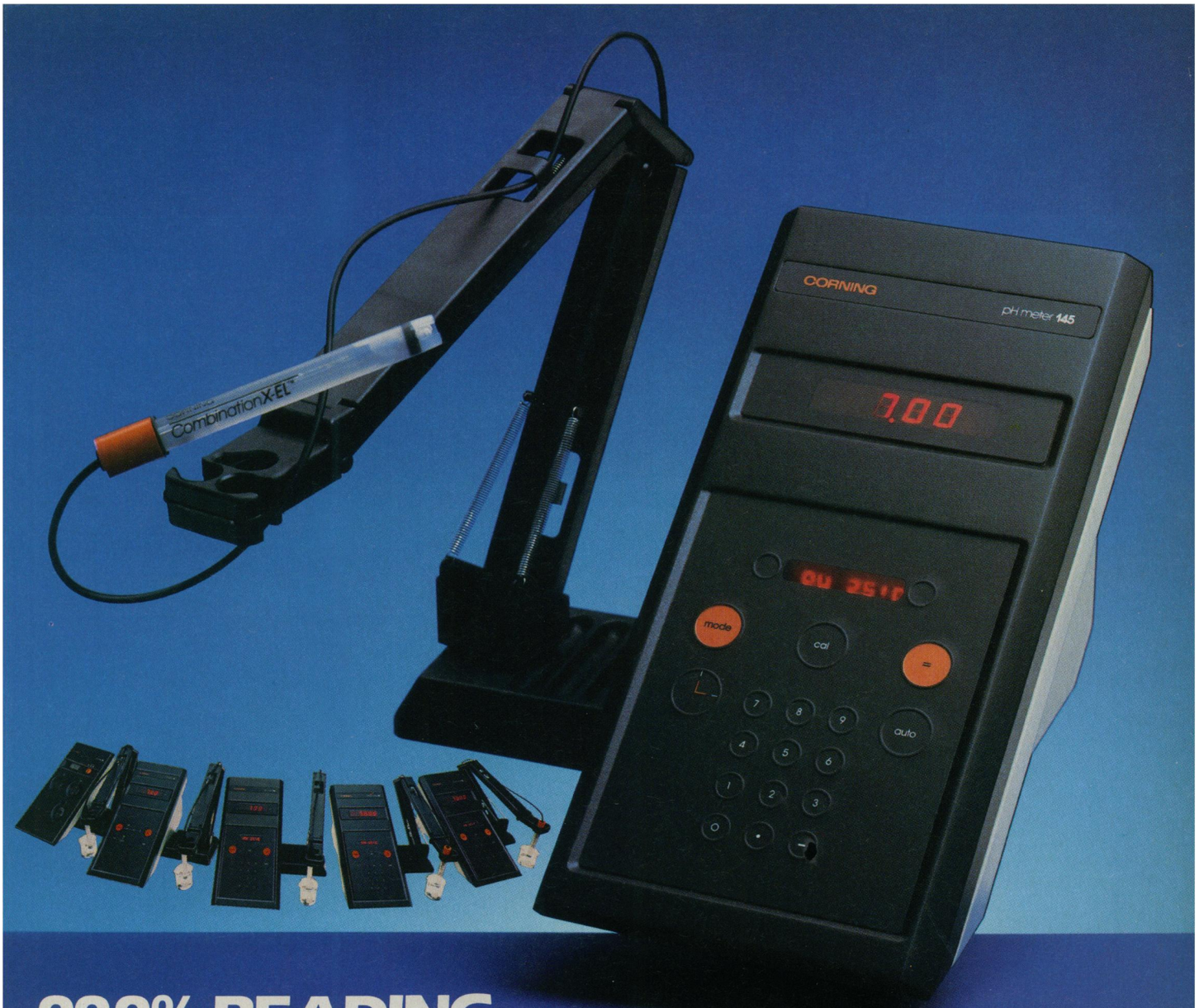
Serotonin is an important chemical that transmits signals between cells in the nervous system. This neurotransmitter has been implicated in the regulation of pain sensitivity, sleep and wakefulness cycles, temperature, aggressive behavior, and depression and other disorders associated with the nervous system. In tissue culture experiments (page 889), serotonin was taken up by astroglial cells, which are star-shaped cells that surround neurons and may influence the conditions of the local microenvironment. One antidepressant, chlorimipramine, inhibited serotonin uptake by the astroglial cells; antidepressants also block serotonin uptake by neurons. Because of the abundance of astroglial cells, understanding their contribution to both the normal and abnormal mechanisms for processing serotonin should prove to be significant.

Eye disease and vision protein

A protein that plays a role in vision has now been shown by Pfister to be capable of inducing an inflammatory disease of the eye (page 891). The protein, called 48K, was found to be identical by all criteria tested to the retinal S protein, which has long been used to induce uveoretinitis experimentally. In vision, the 48K protein acts as a quencher. As light strikes the retina, a series of biochemical and electrophysiological processes take place, and vision is the result. This series of reactions must be quenched, and the retina must become readapted to the initial state so that the eye can receive the next light signals. The linking of the 48K protein with uveoretinitis may help explain how sight is damaged in a disease that can cause serious visual handicaps, including blindness.

Body rhythms

Running in a wheel, which is apparently a locomotor function, and the release of an ovarian hormone, which is classified as an endocrine function, appear to be under the control of the same internal clock (page 898). Often the true rhythm of a biological clock is obscured by a rhythmic pattern imposed on it by an external factor, such as the daily cycle of light and darkness. If the external factors are removed, the true internal rhythm may be revealed. In hamsters living in constant light, two rhythms were examined: one for running and the other for hormone release. In some animals the activity rhythm and the hormone release resembled that normally seen in a light-dark cycle: a single peak of running activity each day and a single surge of hormone release. In some animals there were two peaks each day, spaced about 12 hours apart. Because in individual animals the rhythms of locomotor activity and hormone release were either intact or split coordinately, these two rhythms may be under the control of internal oscillators. Under the conditions of this experiment, it appears that two oscillators could be acting together. But in constant light, the oscillators become out of phase so that two peaks of locomotor activity and two peaks of hormone activity are observed.



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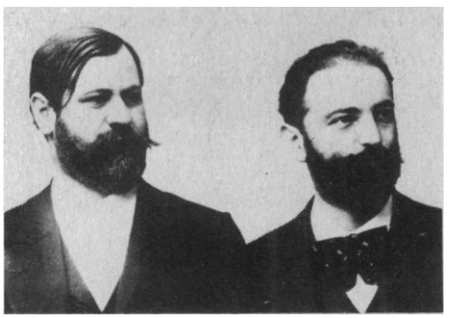

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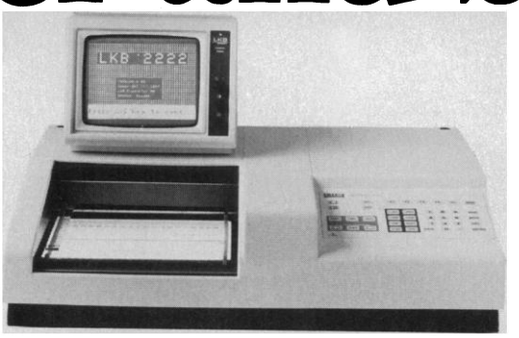

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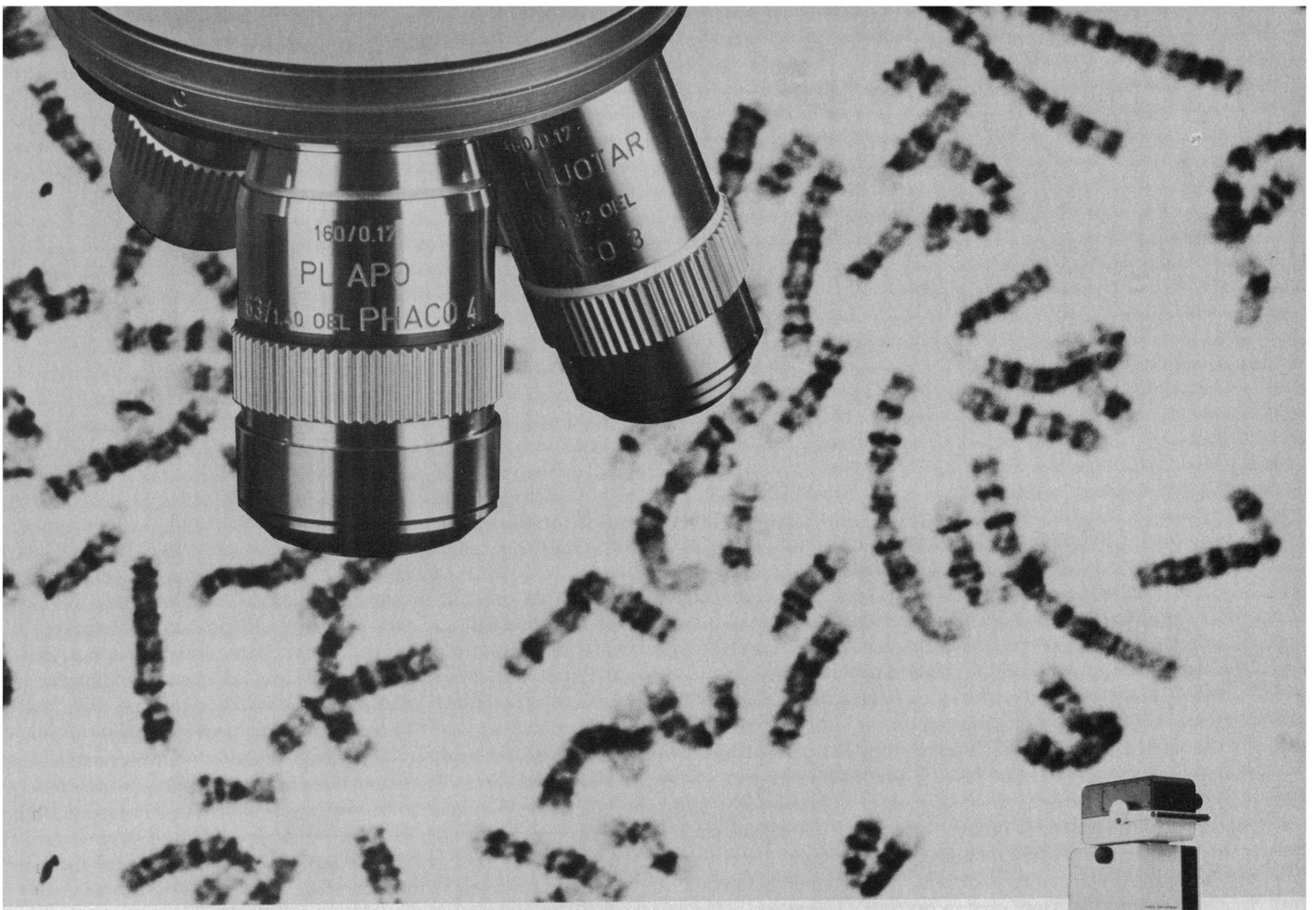

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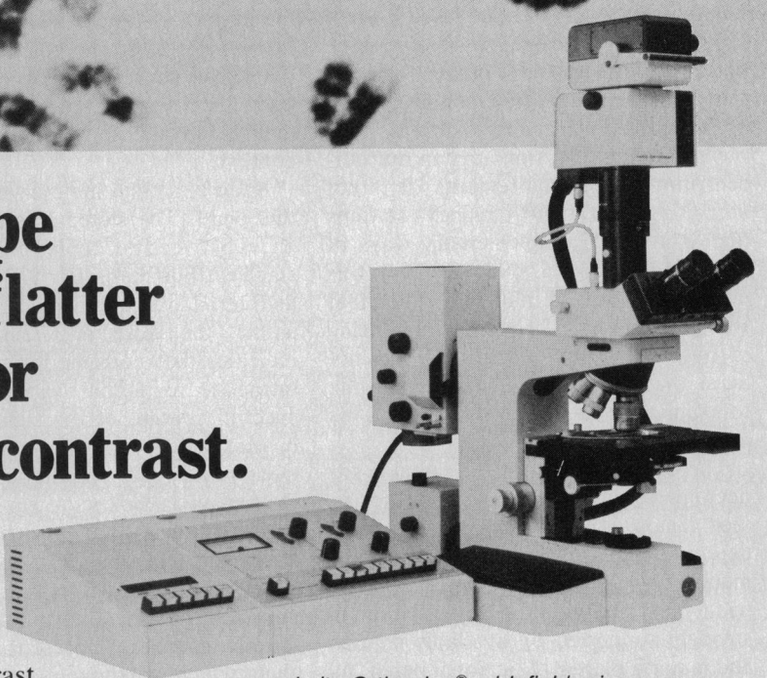

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17 May 1985, Volume 228, Number 4701 SCIENCE

A Welcome Grace Note

Now that the American and Soviet academies of science have agreed to have joint leadership meetings from time to time, a fragile but promising footbridge is in the process of being assembled on behalf of conflict avoidance. It deserves to be reinforced by support from the scientific and engineering societies, and its weight-bearing characteristics may well turn on the quality of that support.

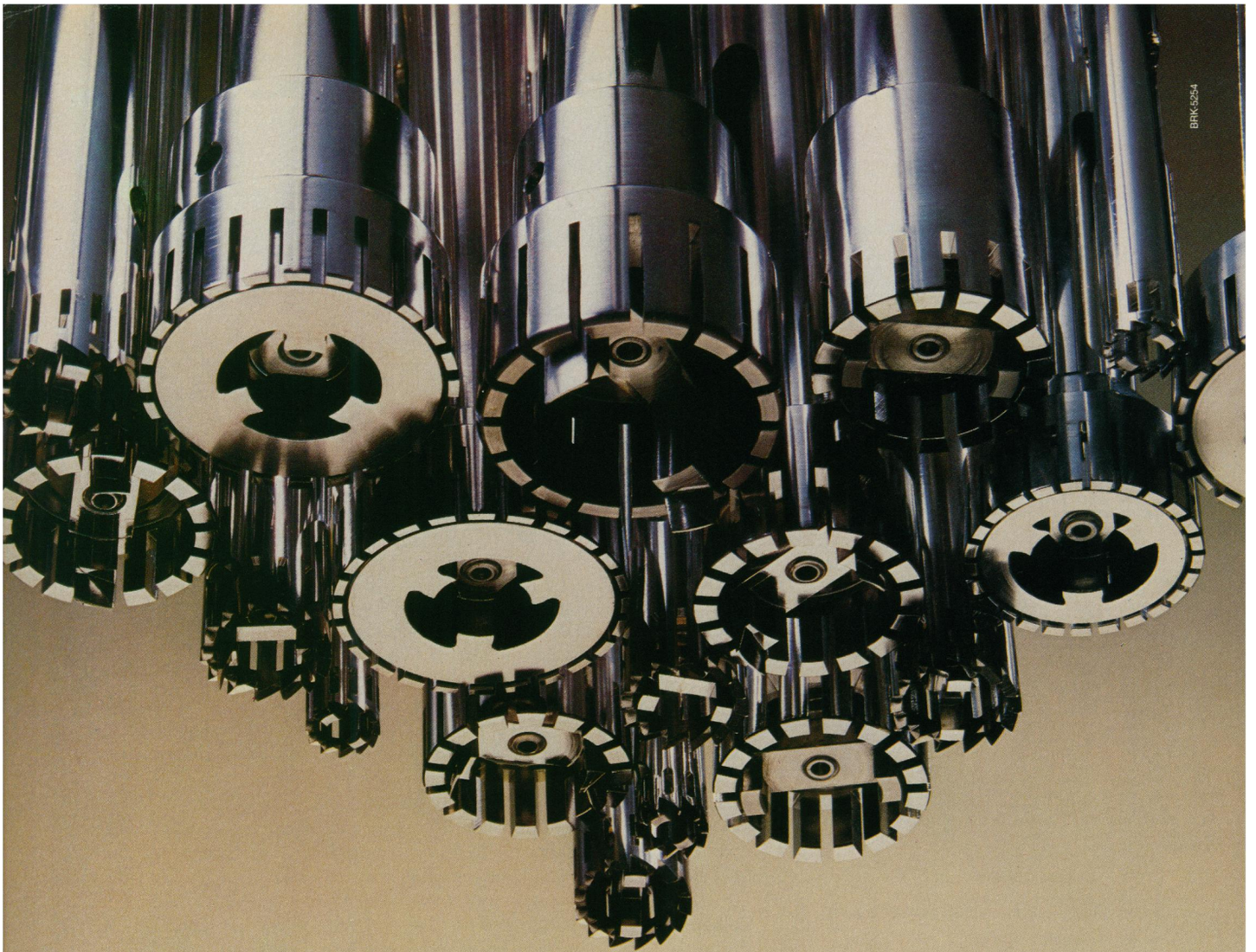
There are so few chances left to draw away some tension from the animosities that complicate the superpower interface that an understanding between the two great academies, even on limited terms, takes on more than usual significance. Although the academies are anything but strangers to each other, their working relationships have been chilled for 5 years. What brings them back to mutual discourse is the consensus of senior members of both organizations regarding the unacceptable global dangers posed by the escalating arms confrontation. Though solutions may be too much to expect, and none are being promised, there is an element of hope in the utility of the process itself.

There is a strong element of unreality to the best intentioned attempts to isolate a world power in science, even where the provocation is acute and felt deeply. When the two sides are unequal in their capacities for good science, withdrawal of contact has some effect. But when there is scientific parity in most fields, the case is quite different. Even so, it cannot have been an easy matter for the National Academy of Sciences to lift its freeze to the extent of reopening the channels of communication. No unconditional pardon has been issued that absolves the Soviets of past and present insults to scientific freedom and human rights, and there will be no dodging of these issues when the representatives of the respective academies come together. Since sanctions plainly have no visible effects on the activities of a police state, it is worthwhile to try an approach based on good offices and what appears to be a useful back channel for getting the American view across. Viewed in this light, the reapproachment between the academies could bring some measure of overdue relief for the harassed scientists whose plight will now be on the leaders' agenda. Should it turn out otherwise, controversy is likely to make the going rough.

The concept of scientific responsibility has been working its way into the moral framework of American science and its institutions for a considerable time. It seems a straightforward proposition, yet it is beset by dilemmas of choice and values, and the present case is no exception. Although a large cohort of the scientific community cannot find a good word to say for "Star Wars," their academic institutions seem to eye the prospect of sharing in the financial outlays with barely disguised satisfaction. But overall, the growing appeal of scientific responsibility is expressing itself in many ways including environmental sensitivity, self-regulation in medical research, accountability systems such as codes of ethics, concern for overpopulation, technology assessment, modeling studies on the biological and ecological effects of nuclear weapons exchanges, and initiatives to limit destabilizing weapons systems. In all these activities, disputes arise and heat is generated. But so is light.

As science and technology are swept up in the currents of civil and military passion, issues of conscience, values, and ultimately responsibility are forced to the surface, and choices must be made. Thirty years ago a presidential science adviser was heard to remark that his job produced an abundance of brilliant questions for which there were only dusty answers. The dust grows thicker.

However the idea of scientific responsibility may evolve over time, its essential relevance to the mitigation of global tension is unmistakable. This reality is the point from which to view the modest reconciliation of the American and Soviet academies of science. Against a desperate background, it comes as a welcome grace note.—WILLIAM D. CAREY



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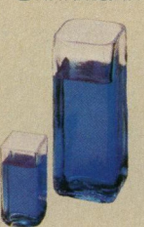

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the families. His decision to sail on the *Beagle* was a statement as to where his commitment lay. Within a month of Charles's departure Fanny became engaged to Robert M. Biddulph. His sisters' letters kept Charles informed of what was happening to Fanny. They reveal apprehension when informing him of Fanny's marriage and concern when recounting her difficulties after giving birth to a daughter. Fanny herself wrote to Charles on several occasions during the trip, and these letters have a wistful and nostalgic quality. Emotions had run deep.

The great bulk of the letters are from the period of the voyage of the *Beagle*. It is good to have all the *Beagle* correspondence together. One is struck by how little overlap there is among Charles's letters, even when he wrote them at the same time. Notable exceptions are his descriptions of the tropical vegetation, of his first encounter with the Fuegians in the spring of 1833, and of the sight of the ruins of Concepción after the great Chilean earthquake of 1835. He wrote to his sister Caroline in April 1833 that "an untamed savage is I really think one of the most extraordinary spectacles in the world.—the difference between a domesticated & wild animal is far more strikingly marked in man" (pp. 302–303). The shock of this encounter was also vividly conveyed to Henslow, to Fox ("A wild man is indeed a miserable animal, but one well worth seeing"; p. 316), and nine months later to Whitley ("I have seen nothing, which more completely astonished me, than the first sight of a Savage"; p. 397). From these letters and from the entry in his diary for that time it is clear that the Fuegians brought home to Darwin the continuity between humans and lower forms of life.

A touching aspect of the *Beagle* correspondence is the burgeoning of love and respect between father and son. One of the most poignant entries in the volume is the one letter Robert Waring Darwin sent his son during the voyage of the *Beagle* (p. 301). At Charles's suggestion Robert had bought a banana tree, which flourished "so as to promise to fill the hothouse." This six-foot-three, 300-pound man wrote the letter in his hothouse sitting under the banana tree thinking of his son "in similar shade." Charles "almost cried for pleasure" when he received his father's note. He deeply appreciated his father's attempts to empathize with him in the pleasure he obtained contemplating and communing with nature. Before this incident, Charles was always apprehensive and apologetic when he withdrew money

Reviewed in This Issue