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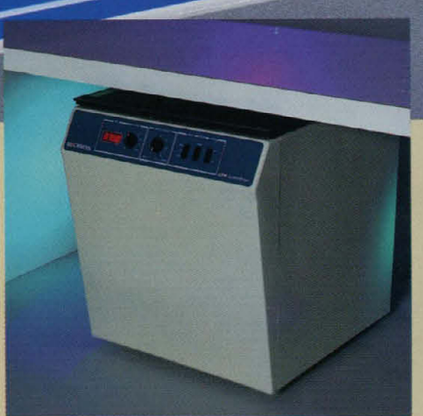

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COVER Harris' hawk family in the Los Medaños area of New Mexico. These young individuals, atypical of most birds, will remain in their natal area and associate with their parents and siblings for up to 3 years. This social behavior, to some extent, is linked to the formation and success of cooperative hunting "parties." See page 1525. [David A. Ponton, Mountain Route Box 93, Jemez Spring, NM 87025]

Reports

Book Reviews

Products & Materials

Author Index to Volume 239 is found on pages I–X
Information for Contributors is found on pages XI–XII

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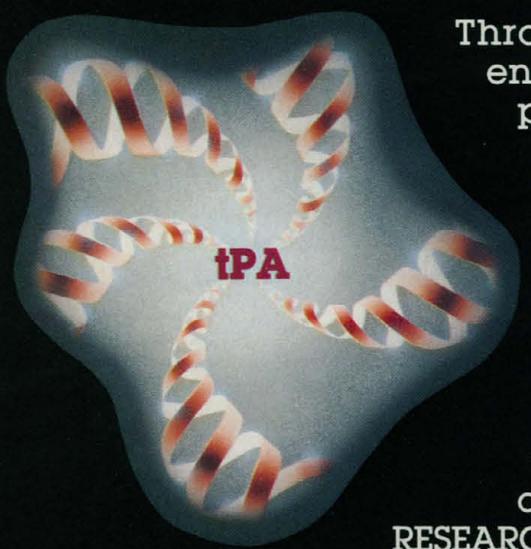

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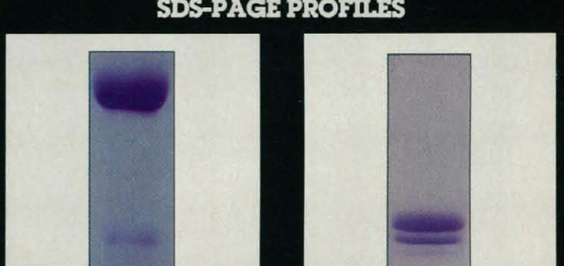

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This Week in SCIENCE

Science and the law

THE plethora of "toxic torts," legal cases that center around chemicals and other substances in the environment that are suspected of causing diseases, is expanding the interface between the law and science (page 1508). Judges, juries, and lawyers, who usually are not trained in science, are, nonetheless, required to rely on scientific evidence and to evaluate the validity and the fine points of such evidence; resolution of scientific disputes in the context of toxic tort cases requires thorough consideration of such evidence. Black discusses the traditional legal approach to scientific evidence (which developed more in connection with forensic techniques than with medical science) and the evolving situation with respect to the admissibility of scientific evidence. He suggests that more stringent judicial review of scientific evidence and the acceptance of evidence only when it meets established scientific standards should be encouraged.

Game depletion theory discounted

THE Siona-Secoya Indians of the Amazon live in small impermanent communities (page 1521). It has been thought that availability of game and subsequent depletion of game by hunters were the controlling factors for both community size and community dissolution, but this is apparently not so. One Indian community was studied for 10 years, starting around the time that individuals settled near the Aguarico River in northeast Ecuador (40 kilometers from their previous home) until about the time that they abandoned their settlement. The Indians hunted and fished, planted gardens, and built canoes and dwellings. Their main game was peccaries (pig-like ungulates), and these remained in plentiful supply. They also hunted deer, tapir, and various birds, primates, rodents, reptiles, and edentates; except for woolly monkeys, curassows, and trumpeters, supplies of all of these continued to meet demands. Vickers concludes that the reason the community began to pick up stakes was not because prey was limiting but because migration offered a fresh start, including new close-by agricultural lands, new supplies of building materials, and an escape from decrepit surroundings and pests.

Cooperation among hunting hawks

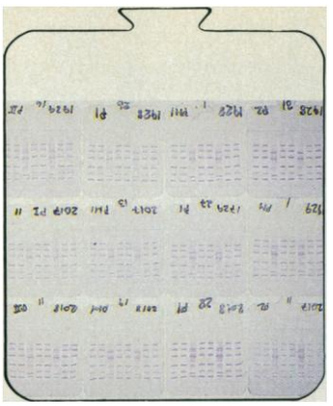
MORNING dawns in the Los Medanos raptor area in New Mexico, the hunting party assembles and then splits up into small subgroups, the members "leapfrog" from high pillar to high post until prey is sighted, and then a coordinated attack occurs (page 1525). In this way, Harris' hawks (cover) cooperate as they go after their prey—most often cottontails and jackrabbits. The common strategies—a surprise pounce, a flush-and-ambush, a relay attack—used by the party could not be so successfully employed (if at all) by a solo hunter. The bigger the party (parties observed ranged from two to six members) the greater its success and the more food that became available for use. All members of the party—a breeding couple and other adults as well as young hawks—shared the food. Bednarz describes the significant benefits of team hunting over solo hunting—the ability to capture large prey, to counter defensive attacks by the prey, and to guard meat until all can be eaten—and suggests that such benefits may have helped to both shape and preserve group living among these raptorial birds.

More Australian marsupials

FOSSILS of marsupials in a previously unknown order have been discovered in freshwater limestone deposits in northwestern Queensland, Australia (page 1528). V-shaped molars of members of the new order Yalkaparidontia (the name is taken from the aboriginal word for boomerang) have "come back" to tell of the existence of animals in two species of this now extinct order. Along with the teeth, jaw and skull bones were also collected. Archer *et al.* review the features of the fossil specimens that mark them as marsupials and describe their distinct characteristics that set them apart from the five other known marsupial orders. The Yalkaparidontia were alive in the middle Miocene (10 to 15 million years ago) and most likely inhabited regions that were lowland rainforests; they and the rainforests may have died off together sometime in the middle to late Tertiary. This discovery adds to the diversity of the Australian marsupial fauna. The marsupial fossils were found in deposits from which more than 200 new fossil species of Tertiary vertebrates have also been recovered.

Zellweger syndrome

ZELLWEGER syndrome is a genetic disorder; signs of the syndrome include aberrant development of the brain and a number of abnormalities associated with the kidneys, the liver, and other organs and tissues (page 1536). Many systems function improperly—for example, there are severe neurologic defects—and death occurs usually within the first few months of life. While most of the cellular organelles appear normal in the cells of patients with Zellweger syndrome, one organelle, the peroxisome, is apparently incompletely assembled and is dysfunctional. Santos *et al.* detected only rudimentary peroxisomes (membrane ghosts) within the cells of a Zellweger syndrome patient. The peroxisomes lacked matrix proteins (the proteins that have traditionally been used for detecting peroxisomes, thus explaining why these organelles were thought to be entirely missing in the disease); some enzymes are absent from cells while other enzymes that normally enter the peroxisomes are properly synthesized but float free in the cell sap. The discovery that there is improper assembly of this cellular machinery inside which so many crucial metabolic processes normally take place can account for the occurrence of metabolic deficiencies in Zellweger syndrome.



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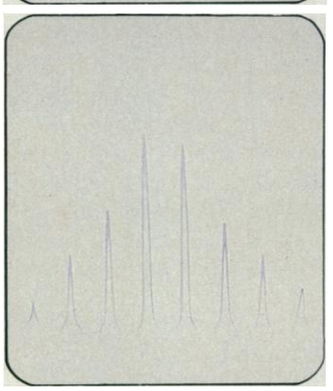

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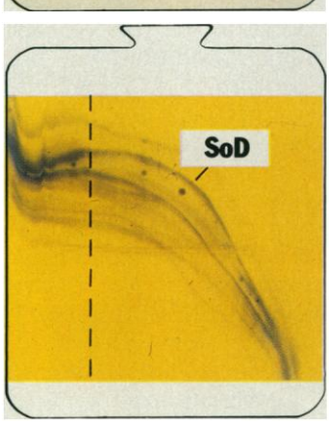

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Women in Science

The threat of a serious shortage of scientific personnel looms in the years ahead. Many predictions are, of course, notoriously unreliable. If a shortage is a realistic scenario, however, it is important to find ways to employ underrepresented groups more equitably—for reasons of national interest as well as of equality.

Women are one conspicuously underrepresented group in the higher echelons of academia and industry. Records of their transit through the system may help provide clues to appropriate remedial actions. Some trends in the data are promising. For example, in the 1930s women received 7% of the Ph.D. degrees in mathematics and the physical sciences, 15% of those in the life sciences, and 16% in the social sciences. But by the early 1980s those percentages had all doubled. Recently, however, the figures appear to have leveled off.

Tracing the progress of women through the system shows that the percentages roughly parallel those of men for total percentages in science through high school, college, and entrance into graduate school. The serious differential in participation occurs at the postdoctoral level. For example, 93,000 men and 94,000 women undergraduates were majoring in the biological sciences in 1984; the respective graduate enrollments were 22,000 and 17,000. At the next level, however, women are poorly represented on faculties and on average receive lower salaries than do men in comparable positions. One survey showed that although women had 10% of the doctoral degrees in chemistry, they had only 4% of the faculty jobs. At no stage in the educational process is there an indication that the attrition is caused by lack of academic performance.

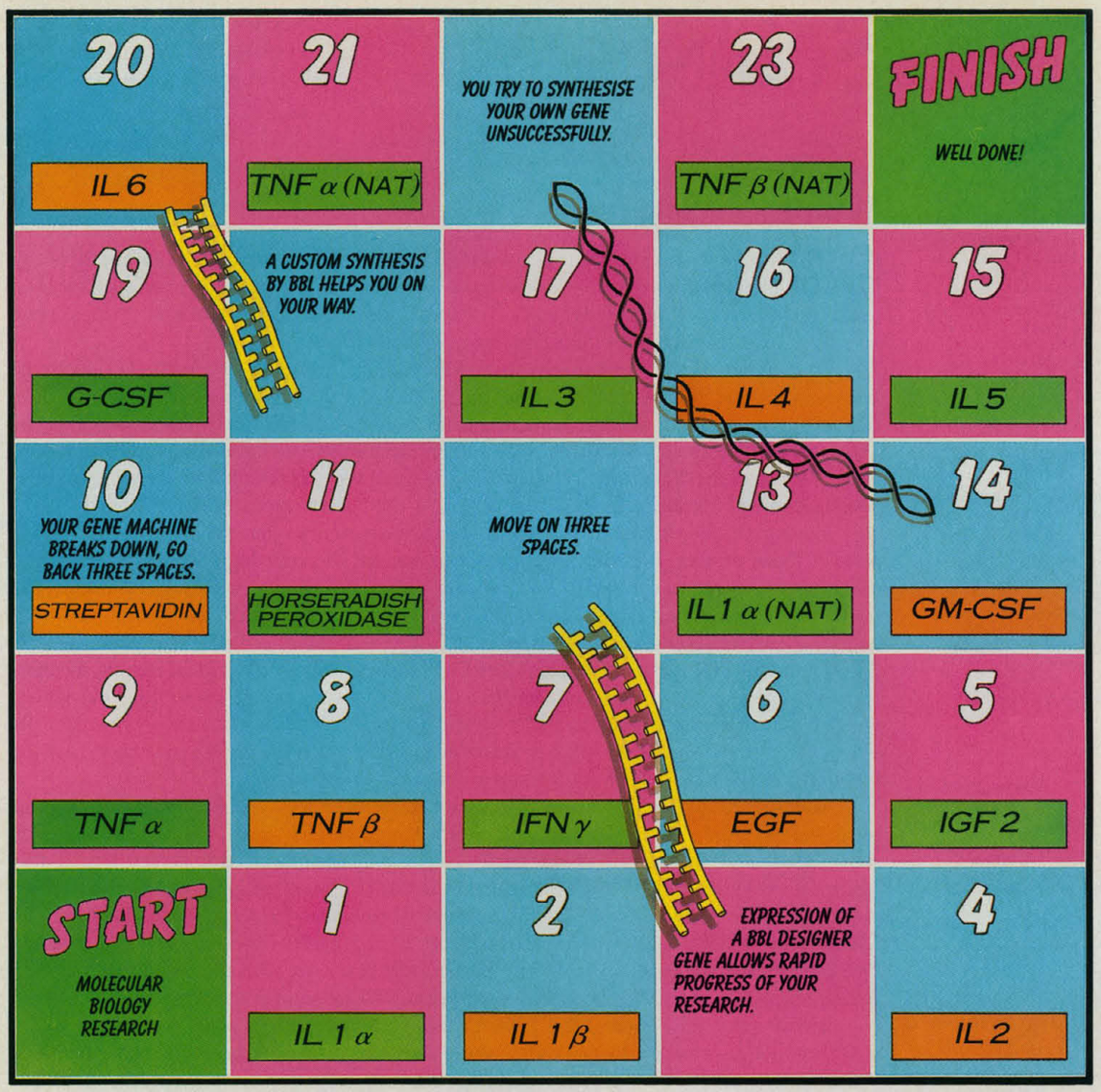
Attempts to understand the attrition have so far been unsuccessful, but some theories seem better than others. In the past, certainly, prejudice from the "old boys" was widespread, and it has only been partly eradicated. Moreover, the perception of this historical prejudice can be a subtle deterrent in today's more enlightened, but imperfect, world. The lack of role models can be a source of insecurity, a point made eloquently by Sheila Widnall in her AAAS presidential address. That situation may change as more women take important roles in our society, and particularly in science. But the insecurity may be a decisive factor during the period between graduate school and tenure, an interval of intense competitive pressure. Those who have pedagogical or administrative roles need to be sensitive to the stress of the pressured student or the untenured assistant professor. The support of a steady friend with encouragement to stay the course and an occasional congratulations for work well done can be crucial in developing the self-confidence that is essential for a research investigator.

Words are important, but actions are more so. Important contributions would be programs to make it easier for women during childbearing years to continue their professional involvements. Several universities have introduced "stop the clock" programs that allow women who are raising children to have tenure decisions postponed. Other programs, such as half-time appointments, "extend the clock" on grants, or on-site and subsidized day care are particularly appropriate (see also Carl Djerassi, Letters, 1 Jan., p. 10). Women not only bear the children, they are the prime organizers of their upbringing, and in these years they need a special form of encouragement. Since equality of responsibility is not yet here, not only are the demands on women faculty members greater, but they are more subject to criticism. A man who does less teaching because he serves on editorial boards is excused as normal, whereas a woman who asks to do less teaching to help raise a child is viewed as a burden. Today there is less prejudice at the time of promotion, but obstacles confronted before tenure decisions are sufficient to discourage a significant portion of talented women scientists.

Although the problems for ethnic groups are not the same as those that women face, they have some of the same characteristics. There are relatively few role models, and the need for encouragement of pioneers in potentially hostile territory is real.

As the country expands into an ever-increasing technological base, the need for women and minorities in both academia and industry increases proportionally. It may cost some money, some effort, and some understanding, but the voyage to full equality can be even more exciting and worthwhile than the voyage into space.—DANIEL E. KOSHLAND, JR.

DESIGNER GENES FROM BRITISH BIO-TECHNOLOGY



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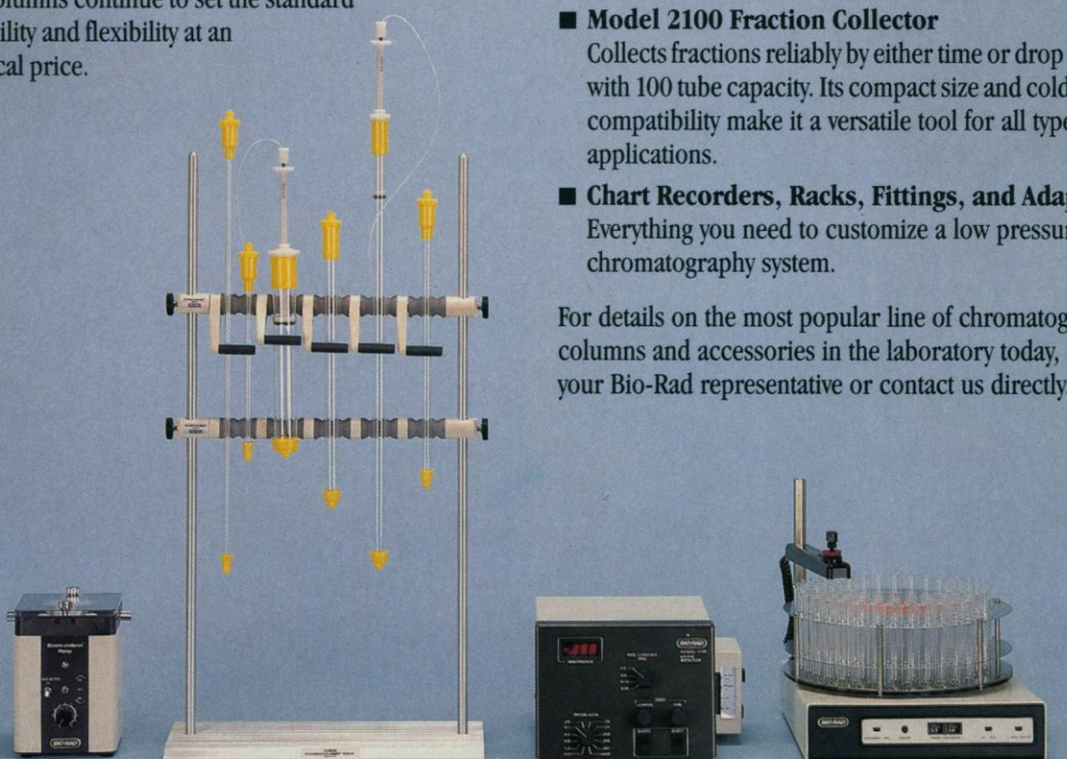

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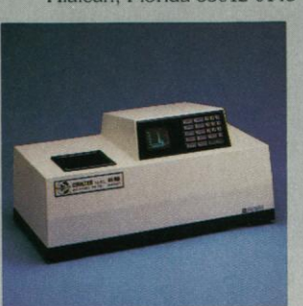

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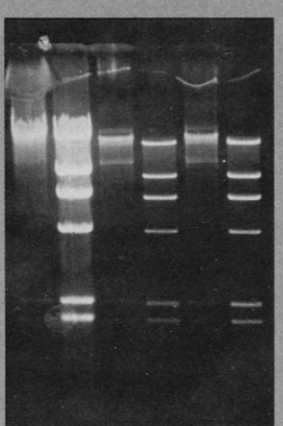

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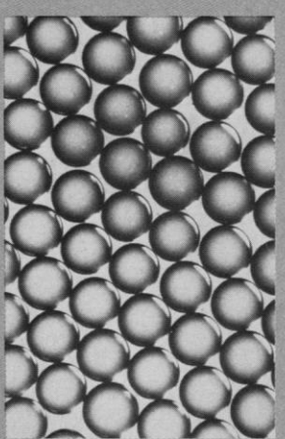

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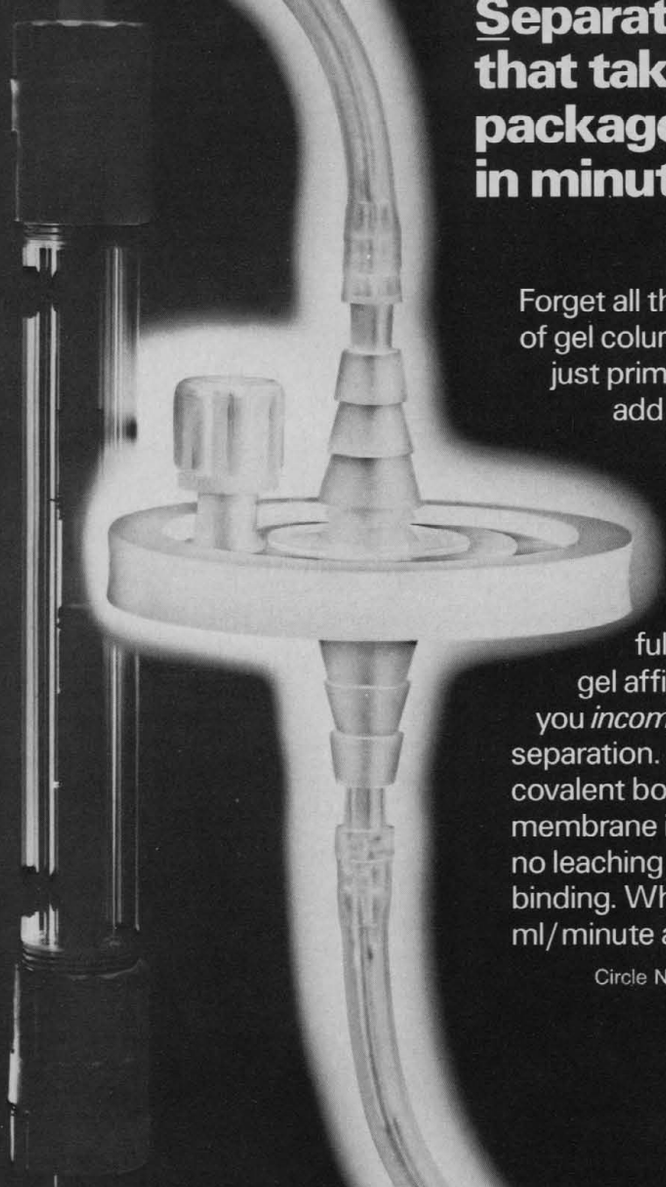

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1) the names and telephone numbers of the authors;

2) the title of the paper and a statement of its main point;

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Units of measure. Use metric units. If measurements were made in English units, give metric equivalents.

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Proofs and reprints. One set of galley proofs is sent to the authors. An order blank for reprints accompanies the proofs.

Scheduling. Papers are scheduled for publication after *Science* has received corrected galley proofs from the authors. Papers with tables or figures that present problems in layout, or with color figures or cover pictures, or that exceed the length limits may be subject to delay.

Cover Photographs

Particularly good photographs that pertain to a paper being submitted will be considered for use on the cover. Submit prints (not slides, negatives, or transparencies) with the manuscript.

tebrate phylogeny are present in these papers. The controversy on lungfish phylogeny that has resurfaced in the last ten years after being dormant for most of this century is thus well represented in this volume.

What is disappointing about the papers on phylogeny is the near total lack of quantitative methods in the analysis of characters. Only Marshall makes an attempt to develop a taxon-by-character data matrix and to analyze it using parsimony algorithms. All the other authors present unconvincing qualitative analyses of their data that suffer from the unjustified a priori exclusion of characters, and even Marshall concludes by adducing ad hoc reasons for not believing the results of his analysis. Schultze explicitly ignores all soft-tissue characters derived from the study of living lungfishes, claiming that because such characters are not discernible in fossil material they should not be included in a phylogenetic analysis. In contrast, other authors such as Northcutt (writing on neural characters of lungfishes), Bemis (analyzing the morphology of the skull and feeding mechanisms), Wake (who summarizes urogenital morphology), and Burggren and Johansen (who evaluate the circulatory and respiratory systems of lungfishes) all present data that have important implications for the phylogenetic position of lungfishes and the relationships of the three living genera.

Continuing the practice of qualitative data analysis and authoritarian a priori exclusion of characters will only lead to continued confusion over the pattern of historical diversification in lower vertebrates. A summary data matrix of all characters known in both living and fossil clades is needed, and a parsimony analysis of this matrix should be executed to produce the best overall branching diagram available from current data.

Another strength of this volume is the information provided on the natural history and ecology of the living genera. Greenwood reviews the biology of African species, Kemp provides data on the Australian lungfish, and Fishman and his co-authors describe the process of estivation in *Protopterus*. Relatively little information is given on the South American genus, *Lepidosiren*, owing primarily to the surprising lack of knowledge about its biology. These papers emphasize the clear distinctions among the three lungfish genera and the remarkable diversity of ecology in what is often taken to be a relatively homogeneous group. Finally, Conant provides a useful indexed bibliography of over 2200 references from 1811 to 1985 on all aspects of lungfish biology and evolution.

Given the extensive research on vertebrate phylogeny over the last century, there is still a remarkable lack of agreement on principal features of the historical record. Lungfishes, which have played a central role in generating controversy in vertebrate phylogeny, will likely play an equally crucial role in ultimately resolving it. Volumes such as this which present new data and interpretations contribute significantly to progress in understanding the pattern of vertebrate evolution.

GEORGE V. LAUDER
School of Biological Sciences, University of California, Irvine, CA 92717

Activity-Dependent Learning

The Neural and Molecular Bases of Learning. J.-P. CHANGEUX and M. KONISHI, Eds. Wiley-Interscience, New York, 1987. xiv, 559 pp., illus. $110. Life Sciences Research Reports, 38. From a workshop, Berlin, F.R.G., Dec. 1985.

Mechanisms of learning and memory have preoccupied neurobiology for decades, since before neurobiology was recognized as a distinct discipline, and the Hebb synapse will be 40 next year. What has changed over the decades is not so much the basic issues as the way we look at them, and this is changing very rapidly. *The Neural and Molecular Bases of Learning* is timely because it is devoted to some of the currently popular ways of viewing the problem. The book places the traditional questions about learning and memory in the context of control of gene expression, second messenger systems, activity-dependent developmental changes, and neuronal network properties.

Reflecting the organizational principles of the Dahlem Workshop on which it is based, the book consists of four group reports on assigned topics along with the position papers that served as the basis for each group's deliberations. Three of four group reports stress the role of neuronal activity in learning and memory (although the exact meaning of "activity" differs from group to group).

The first group report ("Activity-dependent regulation of gene expression") is the most molecular one. It examines examples of how cellular activity can alter gene expression and focuses mainly on the way in which a particular cell's activity pattern can alter which genes that cell expresses. For example, the type of myosin muscle cells express depends on how frequently the muscle is instructed by motoneurons to contract. Although the types of activity effects discussed in this section are interesting, probably more relevant to learning is the phenomenon of transsynaptic control of gene expression, a rich topic, unfortunately mostly neglected in this volume, that includes more than a cell's "activity."

The second group report ("Activity-dependent regulation of synaptic transmission and its relationship to learning") covers the phenomena of long-term potentiation and long-term depression and includes several cellular analyses of invertebrate learning and a description of synaptic plasticity in the cerebellum and cerebral neocortex. The third report ("Activity-dependent modification of functional circuitry as a possible basis for learning") deals with possible structural changes underlying learning and the potential relationship between memory mecha-