

creates an independent peer-review board, gives \$20 million a year to the host state, creates the Office of the Negotiator to enter into negotiations with the states on behalf of the federal government, provides for an on-site representative from the state to conduct oversight activities, and cancels the second repository.

Did Carter's book influence the restructuring of the nuclear waste program? A summary of the book published in 1987 in *Issues in Science and Technology* (vol. 3, no. 2, pp. 46–61) was widely distributed among congressional staff. At a Senate hearing, Senator Johnston referred frequently to Carter's summary in his questioning of the former Governor of Nevada, Grant Sawyer. The summary was subsequently reprinted in a Senate hearing report (S. HRG. 100–230, Pt. 1). The similarity between Carter's recommendations and the provisions in the legislation is striking. Yes, Carter's work had an impact.

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Response Hierarchies

Higher Brain Functions. Recent Explorations of the Brain's Emergent Properties. STEPHEN P. WISE, Ed. Wiley-Interscience, New York, 1987. xxii, 382 pp., illus., + plates. \$79.95. Wiley Series in Neurobiology.

Higher Brain Functions is a collection of essays on approaches to those emergent aspects of brain function that do not lend themselves to strictly biological analyses. The general focus of the collection is on high-level motor programming and the modulation of sensory processing by behavioral context.

The book is divided into three parts: Motor Aspects of Higher Brain Function, Effects of Preparatory Set, and Cerebral Organization. Parts 1 and 2 focus on presentations of the authors' research, whereas part 3 includes syntheses of research on the intrinsic circuitry of cerebral cortex, the evolution of language, imaging techniques, and the evolution of neocortex. The third section is not as thematically integrated as the first two, but the syntheses are interesting in and of themselves.

Several aspects of this collection make it particularly enlightening. First, the papers represent results and discussions at different levels of inquiry. Because the results were obtained with many techniques (from studies of performance times to studies of single brain cells) and species (from humans to

crickets), the collection could have been confusing; instead, moving from one chapter to the next tends to illuminate some interesting general principles. Second, the authors have succeeded in placing their results in a broad context, thus allowing the reader to see the mutual implications of results presented in different chapters. Third, the authors have taken to heart the editor's directive to express opinions and have produced some provocative assertions about how some higher functions are implemented by the brain.

A principle addressed in several chapters is the abstract nature of motor programming. While it seems obvious that motor behavior must reflect high-level abstraction and decision-making, it is not obvious how these processes are organized and implemented. Rosenbaum's chapter presents evidence from performance studies of humans for a hierarchical organization of motor program execution. Sequences of movements are parsed into related units in a branching tree structure. This type of organization explains results in assays of speech and finger movements, as well as some aspects of memory recall. A similar generalization of motor frameworks to higher level functions such as memory and language is the basis of MacNeilage's chapter on the evolution of language.

Another aspect of the abstract nature of motor encoding is represented in the motor equivalence results of Abbs and Cole. It appears that movements are encoded in terms of combinations of muscles, so that for any single muscle there is considerable intertrial variability but sets of muscles covary in a predictable pattern. The authors argue that "motor equivalence is the product of on-line afferent-based judgments among the constituent movements so as to accomplish planned speech goals" (p. 30).

To attain this goal-based motor programming guided by sensory information, there must be an intimate interchange of information between the output programming systems and sensory systems. The section on the effects of preparatory set deals with issues related to the interaction between sensory and motor systems. The problem of making different responses to seemingly similar stimuli on the basis of context is one that all but the most simple animals must solve. Context-dependent changes in sensory responses are presented for animals as diverse as crickets and monkeys. Some of these effects seem attributable to gating of sensory transmission: for example, a sensory response can be turned off or attenuated during certain phases of a movement. Other sensory changes, however, seem to be due to selective attention; sensory responses at sev-

eral levels can be modulated by many different behavioral processes.

Higher Brain Functions demonstrates that an interdisciplinary approach to questions pertaining to the implementation of behavior by the brain can be very profitable.

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Hosts and Parasites

Genetics and Plant Pathogenesis. P. R. DAY and G. J. JELLIS, Eds. Blackwell Scientific, Palo Alto, CA, 1987. x, 352 pp., illus. \$50. From a meeting, Egham, U.K., Dec. 1985.

Populations of Plant Pathogens. Their Dynamics and Genetics. M. S. WOLFE and C. E. CATEN, Eds. Blackwell Scientific, Palo Alto, CA, 1987. viii, 280 pp., illus. \$80. From a meeting, Leeds, U.K., Dec. 1983.

Genetic relationships in interactions between hosts and parasites occupy a central and influential position in phytopathological research. Knowledge of the number of genes involved and the ways in which they condition host resistance and parasite virulence has important consequences for studies on subjects ranging from biochemical and cellular aspects of plant pathogenesis to the population genetics of plant pathogens and the breeding of disease-resistant crops. *Genetics and Plant Pathogenesis* and *Populations of Plant Pathogens* are composed of papers given at two meetings of the British Society for Plant Pathology. Together they represent the current approaches employed in examining the genetics of host-parasite relationships at the molecular, individual, and population levels.

Genetics and Plant Pathogenesis describes recent research on the genetics of pathogenicity and virulence of plant pathogens and on the expression of host resistance. In the first paper Peter Day sets the tone of the book by discussing how molecular biology might be used to conduct research deemed to be intractable by classical genetics. The identification of avirulence genes in *Pseudomonas syringae* through transformation, cloning, and nucleic acid hybridization is discussed along with the prospects of using transformation to isolate and characterize pathogenicity genes in fungi. Also included is the use of restriction fragment-length polymorphism (RFLP) to distinguish different *formae specialis* of *Erysiphe graminis*, an important fungal pathogen of cereals. Day concludes by discussing the prospects of