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Language Development: Form and Function in Emerging Grammars by Lois BLOOM

Review by: Melissa Bowerman

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thology, Scripps Clinic and Research Foundation, La Jolla, CA

WEBER, Neal A. *Gardening Ants: The Attines*. Memoirs, American Philosophical Society, Vol. 92. 146 pp. 1972. \$8.

The gardening or fungus-growing ants have attracted the attention of many biologists because of the symbiotic relationship between the ants and their fungi. These ants include the leaf-cutters, whose huge nests and spectacular foraging columns are familiar to anyone who has spent much time in the tropics. The leaf-cutters strip leaves from a wide variety of plants and do millions of dollars damage each year to crops from the southern United States through Central and South America. Consequently, this book will appeal to agriculturalists and applied entomologists, as well as persons interested in ecology, mycology, and symbiosis. The book is written in an elementary style that will introduce students or specialists in diverse disciplines to the complex biology of the ants, the fungi, and their interaction.

Dr. Weber has studied the attine ants for more than 37 years, but within the last five years his research has been significantly extended by the efforts of biochemists and mycologists. For a long time biologists have wondered how the ants maintain a thriving garden of a single species of fungus in a moist subterranean chamber that must contain immense numbers of potentially competing fungi and microorganisms. The three main explanations for the resulting monoculture are that the ants (1) weed out all other species, (2) have an antibiotic which controls other species, and (3) provide ecological conditions favorable for only one species of fungus. Weber briefly mentions somewhat contradictory evidence supporting all three hypotheses but considers the third most important, primarily as a result of work by M. M. Martin et al. The fecal material of the ants provides essential nitrogenous nutrients and proteolytic enzymes which permit the fungus to digest the leaf material, thrive, and thereby outcompete other fungi present.

The book includes brief suggestions on raising attines in laboratory nests and on culturing the fungi. Gross external morphology, the life cycle of the ants, and the development of colonies are discussed, but internal morphology and physiology are neglected (primarily because of the lack of research in these areas). The description of different types of nests is one of the strong features of the book. The distribution and taxonomy of the 12 genera and nearly 200 species of attines are briefly discussed at the generic level with a key to genera included in the appendix. The chapter on guests, parasites, and predators, and the table of almost 150 species associated with these ants indicate that virtually nothing is known about the vast numbers of animals living with attines. Although neither author claims completeness, there is

a surprising lack of concordance between those genera of guests listed by E. O. Wilson (in *The Insect Societies*) and those listed by Weber for the same group of ants.

Many readers may be disappointed that the coverage of many topics is so superficial, but Weber makes no pretense that his is an exhaustive scholarly book; he claims it is only an "introduction." The book provides an excellent guide to more than 50 papers by Weber and nearly 300 publications by other authors. There are 192 figures, including excellent line drawings and more than 50 black and white photographs that give comprehensive support to the text. The index is unusually thorough, including species and authors in addition to numerous subjects.—*Carl W. Rettenmeyer, Biological Sciences, University of Connecticut*

YAMAMOTO, Tadashi, and Haruo Sugano, eds. *Experimental Leukemogenesis*. Gann Monograph on Cancer Research, No. 12, 321 pp. University Park Press, 1972. \$29.50.

This book is the twelfth in the series of monographs of the Japanese Cancer Association. The conference from which it was derived was held in Tokyo, in November 1970. Viral leukemogenesis is most extensively covered, with 200 of the 319 pages devoted to the topic. The remainder is comprised equally of studies on differentiation of leukemic cells, radiation leukemogenesis, and chemical leukemogenesis. While many of the observations are not unique, having been made in other countries, the studies are well documented and clearly presented. Particularly praiseworthy are the photomicrographs, which are sharply detailed throughout.

Among the papers of greater than average interest are those on Friend and Rauscher virus-induced leukemias, in which the cellular site of action of Friend virus is shown to be the proerythroblast (Ikawa, Sugano, and Furusawa) and in which Rauscher virus is shown to cause the appearance of Gross-virus (G) and Friend-Moloney-Rauscher (FMR) antigens *in vitro*, supporting the concept of a hybrid nature of the Rauscher virus (Ishimoto, Ito, and Maeda). Studies with temperature-sensitive mutants of avian sarcoma virus are presented which indicate that the viral genome must specify functions for both the initiation and maintenance of cellular transformation (Toyoshima). Papers on RNA-RNA, DNA-DNA and RNA-DNA polymerases are extremely topical and suffer somewhat from the delay in publication for that reason. Comments providing a theoretical framework are included at the end of the volume, although their inclusion at the beginning might have been more helpful.

The book suffers from what might be called a lack of scientific daring, a probing into highly speculative areas, preferring instead to flesh out details in well-established areas. Its biological scope is also considera-

bly limited and is inferior to that of such a compendium as *Comparative Leukemia Research* (1969) in the Bibliotheca Haematologica series. Thus, while it is unquestionably a worthwhile addition to the library of the specialist in viral oncogenesis, it does not provide the insights or indicate fruitful paths of investigation that would have made it of value to nonspecialists in related fields.—*Malcolm Mitchell, Pharmacology, Yale University*

WHITEHEAD, G. Kenneth. *Deer of the World*. 194 pp. Viking Press, 1972. \$14.95.

To some, deer are fair game during the hunting season. To others, they are fascinating objects of scientific interest. To most people, however, they are among the most exquisitely graceful animals in the world. Native to all continents except Africa and Australia, the no less than 40 species of deer in the world range in size from the tiny Pudu standing scarcely 14 inches high, which still survives in the deep forests on the slopes of the Andes, to the Alaskan moose towering 7 feet high at the shoulders and tipping the scales at 1,800 pounds.

Not in this century has anyone attempted the monumental task Whitehead set for himself—a task, however, which has surely been a lifelong labor of love. The literature on this subject is often sequestered in notoriously obscure sources, yet the author has stalked even the most elusive references in his quest for information; and when this failed to yield the necessary facts, he carried on personal correspondence to the far corners of the earth to verify the status of little known species. The result has been the most comprehensive account of the world's deer ever published.

The carefully prepared distribution maps showing the ranges of nearly 200 subspecies are invaluable to the serious student of *Cervidae*. In the text, the natural history of each species is described in detail. Here is a rich mine of scientific data for mammalogists and wildlife biologists, laced with such anecdotes as how the Duke of Bedford saved Père David's deer from extinction and the story of the thriving trade in antlers as a source of aphrodisiacs in the Orient. In all, Whitehead is to be congratulated on his superb contribution to the world of the deer.—*Richard J. Goss, Biology, Brown University*

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## Behavioral Sciences

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BLOOM, Lois. *Language Development: Form and Function in Emerging Grammars*. 270 pp. M.I.T. Press, 1970. \$8.95.

Many studies of language acquisition of the last decade have relied on distributional analysis to reveal the rules of children's internalized grammars. But, according to

Lois Bloom, because distributional analysis focuses exclusively on the superficial form and co-occurrence of linguistic elements in utterances, it can provide only partial information about children's knowledge of linguistic structure. Bloom argues persuasively that additional important information about children's understanding of grammar can be obtained only by considering the *meaning* of utterances, or the child's intentions, in relation to linguistic forms. While a child's intentions can never be known with certainty, Bloom demonstrates how nonlinguistic information from context and behavior at the time of speech can be used to arrive at reasonable hypotheses about meaning.

Using both linguistic and nonlinguistic information in an analysis of the early syntactic knowledge of three American children during their development from about 20 to 27 months, Bloom found that the children had clearly learned more about the structural relations between linguistic elements than just their permissible patterns of juxtaposition. Specifically, they showed "an awareness of some of the possibilities for combining lexical items with different relationships between them to correspond with different semantic experiences." For example, they could order linguistic elements appropriately to express relations between actor and action and between possessor and object possessed.

To give formal representation to the knowledge of linguistic structure demonstrated by her subjects, Bloom wrote transformational generative grammars, based on large spontaneous speech samples, for each child at one or more stages of development. Sentences are given both deep structure and surface structure representations, with apparent meaning used to help identify underlying grammatical relations such as those which hold between subject and predicate. Unlike distributional analysis, this approach allows superficially similar or identical utterances to be structurally distinguished if they are judged to have different meanings. For example, "Mommy sock," produced on two different occasions by one child, is given one interpretation as a possessive construction (as in "(this is) Mommy's sock") and another as a subject-object string ("Mommy (is putting on my) sock").

In connection with her presentations of the grammars, Bloom provides thoughtful discussions of many important topics in child language development. These include a consideration of the relationship between the deep and surface structures of children's utterances, an analysis of individual differences in children's initial approaches to syntax, and an exploration of the development of syntactic negation in relation to the different semantic functions of negative utterances. While some of Bloom's solutions to problems of grammar writing are debatable, they are generally carefully presented and justified and should inspire constructive discussion.

Bloom's book is finding a receptive audi-

ence both among linguists and psychologists interested in the nature of the child's capacity to acquire language and among clinicians wishing detailed accounts of normal language acquisition to help in diagnosing and treating language-disturbed children. Advanced students of child language will find the work invaluable both for its content and as an example of a comprehensive and meticulous piece of research addressed to basic issues.—*Melissa Bowerman, Linguistics and Bureau of Child Research, University of Kansas*

CHEIN, Isidor. *The Science of Behavior and the Image of Man*. 348 pp. Basic Books, 1972. \$12.50.

Chein announces that the thrust of his book is to argue against a view of man as robot and to argue in favor of a view which sees man as an "active, responsible agent." The robot model is that of "man as an impotent reactor, with his responses determined by . . . (1) the forces impinging on him and (2) his constitution (including in the latter term, for present purposes, momentary physiological states)." Contrary to our expectations, we are not given a marshalled array of facts and arguments for dualism and interactionism in the senses which were first made clear by Descartes. Furthermore, Chein gives us no arguments for a view which has man contributing a unique endogenous source of variance, sui generis, apart from man's genetic constitution, current circumstances, and past history (including in the latter the current residues of his prior behavior). The body of the text indicates, however, that Chein is a determinist, a materialist, and, it seems, pretty much of a peripheralist.

The dust jacket informs us that this book is "the definitive answer to B. F. Skinner's controversial book, *Beyond Freedom and Dignity*." Not so! Although Chein cannot be held responsible for his publisher's interpretations of his volume, it is clear to this reviewer that the book will provide Skinner and other behaviorists little cause for concern. Certainly they will not be alarmed by a man who says of wishes or desires: "I take such terms as referring to behavior in an early stage of execution"; and who says that it is his "postulate that there are no awarenesses that are not behaviors." However, neither Skinner nor the cognitivists are likely to rally to the standard of one such as Chein who defines behavior in such a way as to exclude all the responses of reflexes and instrumental acts such as walking.

It is difficult to determine the audience for which this book is intended and the purpose of the author in writing it. In the introduction, Chein tells us that he is giving a systematic account of the way in which he sees the field of psychology. And he concludes the volume with the statement that he does not expect to "change the face of psychology" by his work. The book is a highly personal statement of philosophical

and psychological position. It is caustic and dogmatic by design and deliberately omits all bibliographic accouterments of scholarship. Although it concludes with an expression of a desire to turn graduate education in psychology in directions which Chein considers appropriate, it is not a book for graduate students. It either assumes a great amount of knowledge of philosophy, psychology, and physical science (merely just to know the sources of the ideas which Chein is either attacking or borrowing), or else it demands a blind acceptance of the author's pronouncements.—*Stephen Winkur, Psychology, California State University, Hayward*

GELDARD, Frank A. *The Human Senses*, 2nd ed. 584 pp. Wiley, 1972. \$12.50.

Geldard has managed to treat most of the essential facts—both psychological and physiological—about seeing, hearing, smelling, tasting, and feeling, an amazing feat at a time when we know so much about the human senses and yet understand them so little. Sensory facts do not fall into a waiting superstructure, so there they lie, poor orphans of our largely nonspeculative, antiphilosophical era. Nevertheless, subtleties abound, and Geldard pays them heed, devoting dozens of pages to theories of color perception, pitch perception, thermal sensations. Mostly, however, he writes about stimuli, receptors, thresholds, adaptation, temporal and spatial factors, single neurons, and so on. He certainly knows his material and has provided the best textbook for an undergraduate course in sensation.

This second edition is organized almost exactly like the first edition published in 1953, but text pages have increased by 200 and references have doubled to 667. Thus this book can serve as a good introduction to the literature in nearly any area of sensory psychophysiology, especially since the references span a broad range of time (right up to 1971) and place.

The writing is sometimes forced and plodding, seldom crisp. But Geldard is clear. It's a pity he had so little to say about loudness, brightness, and sound localization. Perhaps, too, the book could have achieved some unity had it made better use of Stevens's power law, which applies to all the senses. Let's not quibble. Once again, Geldard has done yeoman service. On the whole, he has chosen his material wisely and included nearly everything that ought to be known by the beginning student of the senses.—*Bertram Scharf, Psychology, Northeastern University*

DAWES, Robyn. *Fundamentals of Attitude Measurement*. 165 pp. Wiley, 1972. \$7.50 cloth, \$3.95 paper.

This book is the ninth publication in a series of abbreviated introductory textbooks in social psychology. Each textbook reviews a selected topic in the field and is written