likelihood of use of any drug beyond marihuana. Roizen's study was of alcoholics. The remaining three studies began with large and presumably representative samples of defined and important populations, but of the original samples the final waves included only 73 percent (Johnston *et al.*), 66 percent (Kandel *et al.*), or 44 percent (Josephson and Rosen). Josephson and Rosen demonstrate, and it seems likely to be true for the other studies, that it was precisely the drug users, poorer students, and truants who were lost. Data on the percentages lost from different schools and on the ethnic and social class mix of the schools also indicate that it is lower-class, minority-group members who are most likely to be lost.

The above, of course, is not a criticism of the studies cited but points to the need to extend these studies to the missing segments of the general population before final conclusions are drawn.

Smith and Fogg report on only a small part of the masses of data they have been accumulating, and this reviewer would agree with Clausen's judgment that their study will probably prove the most valuable of those reported on here, because of the wealth of psychological variables, measured long before the onset of drug use and with measurement repeated often enough to show the effects of drug use on them as well as their effect on drug use. This may be one of the first studies with data adequate to specify the feedback relationships that undoubtedly exist.

Smith and Fogg here use their data to predict who will use marihuana. Their method is to examine differences among nonusers, early users, and late users. The last are defined as those who first used the drug in the 10th through 12th grades. It may well turn out that Smith and Fogg have actually studied the determinants of age at first use of marihuana, a variable that is strongly associated with many others and of more theoretical interest than the mere fact of use. Even the oldest students in their sample are still quite young, and many of the current nonusers may become users later. An extension of the research to follow at least a subsample beyond the 12th grade would be well advised.

In addition to the eight papers with substantive focus, there are five devoted to methodological issues. Kandel herself opens with an overview of all the papers, seeking convergences, summarizing major findings, and touching on problems. One of those problems is that few investigators have used identical measures, for example for extent of drug use. The contributors to this volume have already formed the core of several NIDA committees and prepared useful monographs—Elinson and Nurco's *Operational Definitions in Socio-Behavioral Drug Use Research* and Johnston, Nurco, and Robins's *Conducting Followup Research on Drug Treatment Programs*—to suggest standardized measures for use in later studies.

Clausen focuses on the studies of drug use in the high school and provides an excellent review and critique of the papers by Kandel *et al.*, Jessor and Jessor, Smith and Fogg, and Josephson and Rosen, with some practical and useful suggestions. Riley and Waring discuss the problem of separating age and cohort effects, relevant to all the studies though not given much attention in these reports. Also included is a historical review of panel analysis begun by Paul Lazarsfeld and completed after his death by Neil Henry. Finally, Bentler has a concluding chapter on theory, methodology, and data. This begins with a general, abstract discussion of the relations between theory and research and moves into a review of statistical techniques that mentions every technique this reviewer has ever heard of. The purpose is unclear. The discussion is so brief and so condensed that only an expert in each technique can fully follow what Bentler has to say.

Two years is not an unusually long time between a conference and the publication of its proceedings, but the delay in this case was unfortunate. The paper by Jessor and Jessor has been overtaken by the publication of their book, *Problem Behavior and Psychosocial Development*. A variant of the paper by Johnston *et al.* has been published as a chapter in *Adolescence to Adulthood* by Bachman, O'Malley, and Johnston, and no fewer than five of the papers in this volume have been presented, in roughly similar form, in the NIDA monograph *Predicting Adolescent Drug Abuse*. Still, much of the substantive content is new, and the critiques and discussions of methodology are both fresh and valuable. This is not a book for the general reader, whose interest is likely to be in the more visible and more costly kinds of drug use. It will be of interest to anyone whose work involves drug abuse as a practical problem and essential to researchers in drug abuse, alcoholism, and other types of deviant behavior.

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Primate Behavior

Ecological and Sociological Studies of Gelada Baboons. MASAO KAWAI, Ed. Kodansha, Tokyo, and Karger, Basel, 1978. xxiv, 344 pp., illus. Paper, $96.50. Contributions to Primatology, vol. 16.

This monograph presents the results of seven months' research on gelada baboons (*Theropithecus gelada*) in the Simien National Park, north central Ethiopia. Four scientists, Iwamoto, Kawai, Mori, and Ohsawa, contribute in varying degrees to sections on population dynamics, social behavior, and ecology. The monograph will be of interest to those engaged in teaching or research on nonhuman primates, and it will inevitably be compared with similarly organized monographs by Kummer on hamadryas baboons (*Social Organization of Hamadryas Baboons*, 1968) and by Dunbar and Dunbar on gelada baboons in a slightly different habitat (*Social Dynamics of Gelada Baboons*, 1975). Surprisingly, the authors of the present volume make no reference to the Dunbars' monograph, even though the two volumes are part of the same series and reference is made to journal articles published after the Dunbars' monograph.

The gelada baboon is not, strictly speaking, a baboon, but apparently the last surviving member of the once-successful genus *Theropithecus* (C. J. Jolly, *Bull. Br. Mus. (Nat. Hist.) Geol.* **22**, 1 [1966]). Geladas are of particular interest to ethologists because of their multilevel social structure, and data on geladas are often cited in theoretical discussions of the evolution of mammalian social systems.

The basic social unit of the gelada is the one-male unit, or harem, which typically contains one fully adult male, three to four females, and their offspring. According to Ohsawa and Mori, these units, together with all-male groups of approximately 15 individuals, congregate into "herds," and such herds, while generally occupying separate ranges, occasionally join to form a "multiherd." Within herds each one-male unit remains spatially distinct from all others (p. 85); however, there is also a tendency for certain units to be found in spatial association with certain others. Unit leaders maintain spatial separation between units by "rallying" their females whenever the females approach "too close" to another unit or all-male group. Mori (p. 95) describes rallying as "not so aggressive, but . . . based on a complex affinitive behavior with vocalization including solicitation, reassurance, sooth-

ing, and even defensive expressions." (No quantitative data are given.) Rallying is unlike any behavior described by Dunbar and Dunbar and seems markedly unlike the aggressive herding and neckbiting of hamadryas male unit leaders.

The picture of gelada social organization presented in this monograph differs in a number of respects from that given by Dunbar and Dunbar. The differences are important because they concern both the mechanisms by which units are maintained and the precise nature of gelada social organization above the unit level. Dunbar and Dunbar, for example, found that units were "inextricably mingled" within herds (p. 17 of their monograph), with males occasionally herding females aggressively but more often allowing them to stray considerable distances. The Dunbars hypothesize that units are maintained not by male herding, as Ohsawa and Mori suggest, but by social bonds among the adult females of each unit (p. 44). The Dunbars also hypothesize that units range together in "bands" and that membership in a band implies a certain set of social relations and degrees of relatedness among band members. Bands occasionally come together to form herds, a term used by the Dunbars to mean an aggregation with no particular structure or relationship among members.

The present monograph suffers from a number of defects that may prevent readers from accepting the authors' views of geladas. All of the authors generally, and Mori in particular, present numerous conclusions about behavior without any supporting quantitative data. This is particularly frustrating given Mori's otherwise interesting descriptions of female-female competition, male-female bonds, and agonistic alliances between males of different units. Iwamoto asserts, in a paper on feeding behavior, that social interactions influence an individual's feeding rate, and Mori, in a paper on social behavior, states that social interactions are affected by feeding. The two authors never get together, however, and the reader is left to imagine exactly which types of feeding interact with which social behaviors to produce a given result. Second, terms like "social structure," "spatial association," and "preferred" food or social partners appear frequently without definition. "Social structure," for example, appears in reference to age-sex composition, patterns of dispersal, and patterns of social interaction. Third, like many other volumes in this series, the monograph appears not to have been edited and is frequently verbose. Since the authors do not attempt to test a particular hypothesis or analyze a specific research problem in detail, the reader is left with a mass of descriptive information and no theoretical framework within which to order the few quantitative data that are presented.

At present it is difficult to establish whether differences between the present volume and that of the Dunbars go beyond simple terminology. The two monographs agree that the complex social organization of geladas has not evolved simply through adaptation to a seasonally dry habitat, as was originally hypothesized by Crook (*Symp. Zool. Soc. London* **18**, 237 [1966]). Neither, however, addresses this issue in detail, and they leave unanswered important questions about the ways in which ecological factors may influence nonhuman primate social organization. In addition, the monographs disagree on a second point of fundamental interest: whether gelada society, superficially so similar to that of the hamadryas baboon, has evolved and is maintained through similar selection pressures and behavioral mechanisms. It seems clear that an understanding of gelada social organization will continue to be one of the major challenges facing primate ethologists.

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A Pesticide

Pentachlorophenol. Chemistry, Pharmacology, and Environmental Toxicology. Proceedings of a symposium, Pensacola, Fla., June 1977. K. RANGA RAO, Ed. Plenum, New York, 1978. xiv, 402 pp., illus. $37.50. Environmental Science Research, vol. 12.

Pentachlorophenol, or PCP, is the second most widely used pesticide in the United States (an estimated 80 million pounds were produced in 1977). The major use of pentachlorophenol is in wood preservation, but it is also used in adhesives, leather, photographic solutions, petroleum drilling mud, rope, burlap, and sealing gaskets, in water cooling towers, and in secondary oil recovery.

The effectiveness of pentachlorophenol as a biocide is acknowledged, but concern exists about its persistence in the environment; about its effect, as a nonspecific biocide, on nontarget biota; about the effects of widespread human exposure (an estimated 85 percent of all humans excrete pentachlorophenol in their urine); and about the toxicity of the chemical contaminants, chlorinated dibenzodioxins and chlorinated dibenzofurans, that it contains. This collection of papers provides information on these matters.

The first section of the book describes the degradation of pentachlorophenol by photochemical and microbiological processes. The impurities in commercial pentachlorophenol markedly decrease its degradability by microbial metabolism in waste water, and pentachlorophenol accumulates in fish and other aquatic biota.

Pharmacologic studies discussed in the second section of the book indicate that typical phenolic detoxication mechanisms are used in the excretion of pentachlorophenol. Major excretion products are conjugates, with bronchial and biliary routes dominant in fish and urine the major route in rats. These data contradict earlier reports that pentachlorophenol is excreted only in unchanged form. Koss and Koransky, in their chapter, underscore the fact that the presence of pentachlorophenol in mammalian excretions is not in itself evidence of exposure. They report that two environmental chemicals, hexachlorobenzene and pentachlorobenzene, are metabolized and excreted as pentachlorophenol or its metabolites.

The toxicity levels of pentachlorophenol are reported for a variety of aquatic and estuarine species, particularly crustaceans. A variety of toxic manifestations are reported, including variations in shell thickness, inhibition of limb regeneration, and reduction of biomass. Toxicity to mollusks is reaffirmed, and pentachlorophenol has in fact been used as a molluskicide in the control of schistosomiasis.

The final section of the book discusses human exposure, chemical contaminants, and the impact of environmental exposure. It does not provide an adequate presentation of the issues. Two chapters describe the impurities in pentachlorophenol, speculate on their toxic potential, and propose methods of analysis. The presence in pentachlorophenol of chlorinated dibenzodioxins (and diphenyl ethers that may form additional dibenzodioxins), which remain toxic in the body for long periods, has led to concern about the effects of chronic exposure on health. A two-year rat study presented in this section does not bear on the contaminant issue, for the study utilized pentachlorophenol with reduced quantities of impurities; the product used