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

is representative of only a fraction of the pentachlorophenol commercially produced today. The failure to provide answers to the valid questions raised in this section is a reflection of the current state of the art.

This book adequately serves two purposes: It provides data concerning the environmental consequences of the use of pentachlorophenol, and it describes another case in which nontarget effects have become the main issue in the assessment of the suitability of an environmental chemical.

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Climatic Misfortunes

North American Droughts. Papers from a AAAS meeting, Denver, Feb. 1977. NORMAN J. ROSENBERG, Ed. Published for the American Association for the Advancement of Science by Westview Press, Boulder, Colo., 1978. xxii, 178 pp., illus. $15. AAAS Selected Symposia Series, 15.

Nothing seems more constant than the variability of the weather, and in its range of variations occur many of the hazards to the safety, comfort, and economic welfare of the inhabitants of an area. Drought is one of the less dramatic of these variations, constituting, as is pointed out by several of the contributors to this symposium volume, a "nonevent," but J. Eugene Haas, in his contribution, ranks it third in economic cost among the "more than a dozen significant geophysical hazards faced by Americans." It is called a "nonevent" because, unlike a hurricane or a flood, it does not produce its damage in a well-defined time period in response to well-defined meteorological and hydrological phenomena. How deficient precipitation must be and for how long the deficiency must persist before it is clear that there is a drought depend on the effect the deficiency has and thus on the nature of human activities in the region and the way they are carried out.

As Rosenberg explains in his introduction, the present volume consists of papers presented at the height of the 1977 drought, but by the time the book was published natural weather variability had brought rains to many areas affected by the drought and together with governmental action had relieved the economic effects for much of the United States.

The fact that the 1977 drought has joined those reviewed by L. Dean Bark in chapter 1, "History of American droughts," as part of the past does not reduce the value of the book as a stimulus to the study of the nature of the effects of drought and the ways to ameliorate them. The short chapter "Strategies in the event of drought" by Haas is a particularly clear summary of possible ameliorative actions, the degree to which they have been employed, and their effectiveness. For the future Haas says that if "heavy emphasis and eventual success in developing long range climate prediction" took place "net benefits would be expected to be very positive and catastrophe potential would be drastically reduced."

From this standpoint the chapter by Stephen H. Schneider entitled "Forecasting future droughts: Is it possible?" is disappointing. Instead of focusing on the physical processes in the atmosphere that may be related to the occurrence of persistent deficiencies in the precipitation of particular areas, Schneider devotes most of the chapter to problems concerning the statistical detection of climatic anomalies and to the predictability of the effects of specific external influences, such as solar variability and the increase of the carbon dioxide in the atmosphere. While these matters are of interest, the fact is that there is no detection problem: droughts are all too conspicuous, and the "climate" variations they represent are of shorter period than the known variations of external forces, so that internal relationships in the atmosphere–ocean–solid-earth system are almost surely the ones that will provide the explanation of droughts, and thereby the way to forecast them.

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