and Brown), of alkylation (Brookes, Lawley, and Venitt), of ribosome mutants on phenotypic expression (Aspirion and Schlessinger), and of base analogs (Wacker and Chandra) on nucleic acids provides a basis for models of the mechanism of mutation. Furthermore, the demonstration of repair processes that are not artifacts of differential cell survival following mutagenesis has provided a promising approach for interpreting many of the data. The recovery of radiation-sensitive and recombinationless mutants, as well as the isolation of enzymes with the ability to excise radiation- and chemical-induced lesions (Grossman and Brown), promises to give a solid basis to the model.

While the black-box approach to mutation must be used with higher organisms, I suspect that the returns, in terms of basic insights into the mechanisms involved, will not be great. Obviously a great deal of information on the effects of radiation and chemicals on mutation frequencies is needed from a practical standpoint. However, for those like myself who are not directly involved in mutation research, I doubt that the book will provide a broad or penetrating insight into problems in mutation. For mutation experts, the papers probably are too short and lack detail. I found the book a rather dull recitation of how outputs can be modified without any exciting or novel approaches or results. This is another good book for the library to carry in the event some cross reference or specific piece of information is required.

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Macropodidae

Kangaroos. H. J. FRITH and J. H. CALABY. Hurst, London, and Humanities Press, New York, 1969. xvi + 212 pp. + plates. $16.

Kangaroos are controversial in Australia because of conflicts between them and the agricultural industry, the responses of conservationists to reports of their wholesale slaughter, and the apprehension of ecologists that extirpation or even extinction may be their fate unless knowledge and understanding of them are rapidly increased and implemented. Drawing heavily on the historical evidence concerning marsupials large and small, and on current results of investigations by the CSIRO Division of Wildlife Research, Frith and Calaby have produced a searching treatment of the great kangaroos. Because data are available in most abundance on the red kangaroo *Megaleia rufa*, it becomes the type animal and provides the core for the book. The authors are moderates in their views of evolution and classification, explaining satisfactorily that prominent deficiencies in current dogma can be traced to the probability that the living Macropodidae represent end products of not one, but several, lines of descent. Their tentative recommendation for classification of the beasts commonly called kangaroos, the red, the grays, and the euro-wallaroo group, is that these consist of the monotypic *Megaleia* and five species of *Macropus*. Outstanding among graphic materials are three superb color plates depicting 15 examples of subspecies, sexual dimorphism, and pelage patterns. The primitive but efficient reproductive biology of kangaroos is carefully reviewed, as are details of behavior and movements, to prepare the reader for discussions of populations. The points are made that for kangaroos drought is perhaps the most effective regulator of numbers, that serious disease is almost unknown among them, and that their only significant predator is modern man.

Had the aboriginal Australian, who possessed the dog, succeeded in domesticating and herding one or several of the kangaroos, his history and progress, and likely that of fragile arid-land habitats of the continent, would possibly have been more inspiring. However, Australia was destined to be recorded as yet another instance of conquest by an indiscriminate Western livestock agriculture. The authors face the reality of vast rangelands depleted or turned to stony desert through mismanagement, with sometimes severe effects on populations of kangaroos, including annihilation. They build their case for a new order of things on the systematic interpretation of kangaroo biology and ecology and of pastoral practices. The conclusion that preferences and abundance of food are the chief factors in ecological separation of species of kangaroos appears to be well founded. Development of grazing lands has had a variable effect on kangaroos in different regions of Australia, bringing to mind parallels in responses by other grassland herbivores to similar land use patterns in the western United States. In New South Wales herding of sheep on scrub lands and grazing of cattle on the tall-grass plains have resulted in increase of the red kangaroo; but in northwest Australia the red species was eliminated by sheep and the euros increased enormously, only to be blamed by landholders for deterioration of the range. Direct competition between cattle and kangaroos is minimal except in times of drought, when kangaroos suffer first for lack of green feed. The red kangaroo, especially, requires rich land in order to thrive. This means settled land, hence its prominence and critical position as a species in dire need of proper management if it is to be exploited for a sustained yield of hides and meat, and not eliminated as a pest. Market hunting of kangaroos is thoroughly examined, and a route is threaded through the problem of balancing the harvest with progress of the population. Frith and Calaby are cautious in their pronouncements and make a plea for a broader view by stockmen to include the kangaroo in their estimates of range carrying capacity, in favor of improving total productivity.

This volume is more than an excellent account of kangaroo biology and ecology, it is an appeal for the application of wisdom in the belated preservation and management of an irreplaceable biota; moreover, it outlines with purpose, using the kangaroos as examples where knowledge has been attained, how this can and must be done.

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Geological Process

Chemical Weathering of the Silicate Minerals. F. C. LOUGHNAN. Elsevier, New York, 1969. x + 154 pp., illus. $10.50.

W. D. Keller in the *Principles of Chemical Weathering* (Lucas, Columbia, Missouri) wrote, "Chemical weathering is, indeed, the geological process most important to man." Chemical weathering is the primary process involved in the formation and destruction of fertile soils. There is an optimum amount of chemical weathering that will produce and maintain a fertile soil under given conditions; further weathering will decrease fertility but may increase the economic value of the soil by developing concentrations of such substances as clay, iron, aluminum, manganese, uranium, and phosphates.

Loughnan's book is timely and should

be particularly useful to the nonspecialist. The book covers, but in more detail, the material on chemical weathering normally covered in a course in sedimentology or geochemistry. An introductory chapter on the structure and properties of silicate minerals makes the book reasonably self-containing. This is followed by chapters on chemical and environmental factors that influence weathering. The discussion on the inorganic chemistry of weathering is reasonably comprehensive, but there is insufficient coverage of the role of organic material. Though the role of primitive organisms in weathering is extremely interesting and of considerable importance it is not mentioned. There is one chapter, with numerous examples, on the effects of chemical weathering on the various rock types. The last chapter contains a discussion of soil formation and gives examples of the various soil types. The author is Australian, and quite naturally a large portion of the examples in the book are from Australia.

In view of current concern with chemical pollutants, a chapter on man-made chemical weathering would have been useful. But then Australia is not as polluted as the United States.

Loughnan has succeeded in compiling a short, easy-reading review covering most aspects of the chemical weathering of silicate rocks. In view of the lack of books on this subject it should be well received by graduate earth science students and scientists from related fields.

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Books Received

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