Throughout the volume the keys are skillfully and evenly handled despite the number of different contributors. There are some unfortunate instances of the use of a negative rather than a truly opposing phrase in the second branch of a key dichotomy, but understandably these instances occur particularly in the "difficult" groups. One of the major tasks in preparation of Volume IV was the assembling of an appendix for all four volumes. This contains 1) a key to the families, 2) an index of common names, and 3) an index to scientific names. The family key gives not only the family numbers but also the volume and page on which each family is found, a very necessary aid in a work of this magnitude. The index to common names (there is a common name for every species treated in the four volumes) has the family names printed in small capitals and the genera in Roman type. The index to scientific names is much longer and more complicated than that to common names, having approximately 17,500 entries occupying 79 pages. It has the names of families and tribes printed in small capitals, the genera, species, subspecies, and varieties in Roman type, and the synonyms in italics, all appropriately indented. Because some groups have a great number of species as well as many generic and specific synonyms, the genera in the index to scientific names are not always easy to locate. Possibly greater indentation or perhaps the use of boldface type for generic names would have made them stand out more, although to do this would have necessitated a departure from the style of the previous volumes.

The Stanford University Press has achieved another outstanding accomplishment in typography, printing, and binding, and the volume contains a minimum of typographical and other mechanical errors.

Dr. Bacigalupi, curator of the Jepson Herbarium, has given me permission to quote from the unpublished field notebook of Willis Linn Jepson, whose entry for February 3, 1910, reads: "I am just receiving the first reviews of my Flora of California, Pts. 1 and 2. The critics mostly or even entirely confine themselves to verbal slips, not touching general principles. It is, to be sure, disconcerting enough to have such errors, but after all the main thing is this: 'Has the book got matter in it? Has it got stuff in it? Is it meaty? Not is it *faultless*. A faultless book is impossible. It is inevitable in the nature of the human mind that such slips will be made, mistakes and blunders. But is the job a big one, is it really worthwhile? So satisfied am I in the affirmative that it is a big task, to be done in a big way, without too much considering the danger of possible minor errors, that I go on, to finish up my job, just as other big jobs have been finished aforetime.' "

All will agree that Mrs. Ferris' job has got matter, stuff, and meat in it, that it was a big task, done in a big way.—HELEN K. SHARSMITH, Department of Botany, University of California, Berkeley.

Experimental Studies on the Nature of Species. IV. *Genetic Structure of Ecological Races.* By JENS CLAUSEN and W. M. HIESEY. Carnegie Institution of Washington Publication 615. Washington, D.C. Octavo, vii + 312 pp., 33 figs. 1958. Paper $4.25, cloth $4.75.

This is the fourth in the series of scholarly monographs based on the studies of plant evolution conducted by these authors over the past three decades. This newest volume expands the earlier work on the evolutionary importance of ecological races by considering in detail the genetics of the altitudinal races of *Potentilla glandulosa* and then reviewing examples from the literature on the genetic structure of ecological races.

The volume is organized into five chapters and although these are skillfully interrelated they are sufficiently distinct and different to require individual comment. Chapter I, *Ecological Races of P. glandulosa,* introduces the general topic of the volume by presenting what might be called the systematics of *P. glandulosa* as it occurs along the altitudinal transect across central California. This adroitly prepared chapter makes it possible to read the work without reviewing the previous publications by these authors on *P. glandulosa.* Chapter II, *Genetics of Ecological Races,*

comprises nearly one third of the entire work. The first portion describes the crosses made between selected plants of the various climatic races of *P. glandulosa* by giving in detail the characteristics of the parental plants and the segregation of these characteristics in the F_1, F_2 and F_3 generations. Of particular interest here is the use of punched cards for recording and analyzing the data on 14 different characteristics of each individual plant in these crosses. The inherent nature of the punched card system gave an index number series for each character and a summation of these gave an index value for each plant that proved useful in the general comparison of parents and their progenies. Frequency distribution of parent index values and hybrid index values are presented and give a picture of the spectrum seen in the segregation of the F_2 from the crosses between the contrasting ecological races. The second section of Chapter II presents analyses of the segregation ratios by proposing gene systems that could account for the complex ratios observed. These analyses are detailed to the point of proposing for each characteristic the number of loci involved, the number of alleles at each locus, and the action and interactions of the various genes. The significance of these proposed gene systems lies not in their accuracy as to details but rather lies in the fact that viewed collectively they demonstrate that the differences between the ecological races are controlled by units of segregation and recombination that can be described in terms of classical genetics. These points are clearly expressed in the concluding chapter.

Chapter III, *Response Patterns at Contrasting Altitudes,* analyzes the responses of cloned individuals of an F_2 between two ecological races to the different environments of the transplant stations. Studying such an F_2 under different natural environments leads the authors to estimate the evolutionary potential of segregating populations. They conclude this important chapter with the following: "The present races are the products of long-time selection, and have attained an equilibrium with their environments. Natural selection will therefore tend to favor the original racial combination as long as the over-all genetic structure and the habitats remain the same, although a certain amount of introgression may take place. Over long periods genes may gradually migrate across long distances from the original point of contact and may finally appear in combination where they have selective value."

Chapter IV, *Systems of Genes Controlling Characters and their Significance in Environmental Adaptation and Evolution,* is the longest chapter comprising over one third of the text material. It differs markedly from the previous three chapters in that it does not present new data but rather reviews a considerable segment of the genetic literature dealing with gene systems. The relevance of these reviews to the previous chapters lies in the fact that the gene systems discussed are of the same general sort as the gene system for *P. glandulosa*. Chapter V, *Concepts of the Genetic Structure of Ecological Races,* develops a general concept of the genetic structure and evolutionary importance of ecological races.

In the tradition of the previous volumes a vast amount of the original data are presented in a tabular form and the same precise, clear writing and excellent illustration are evident.

The strength of this book clearly lies in the work on *P. glandulosa*. Hybridization studies and the observation of the responses of cloned individuals to different natural environments are two of the powerful tools of evolutionists. In combining both of these approaches in the study of *P. glandulosa* the authors present a new dimension of information about natural populations. At this moment we cannot predict the amount of influence this publication will have on our understanding of evolution. We can be sure, however, that it will remain the classic work of its kind for many years because the time, facilities, and skills necessary for this type of study are available to few botanists.—Henry J. Thompson, Department of Botany, University of California, Los Angeles.