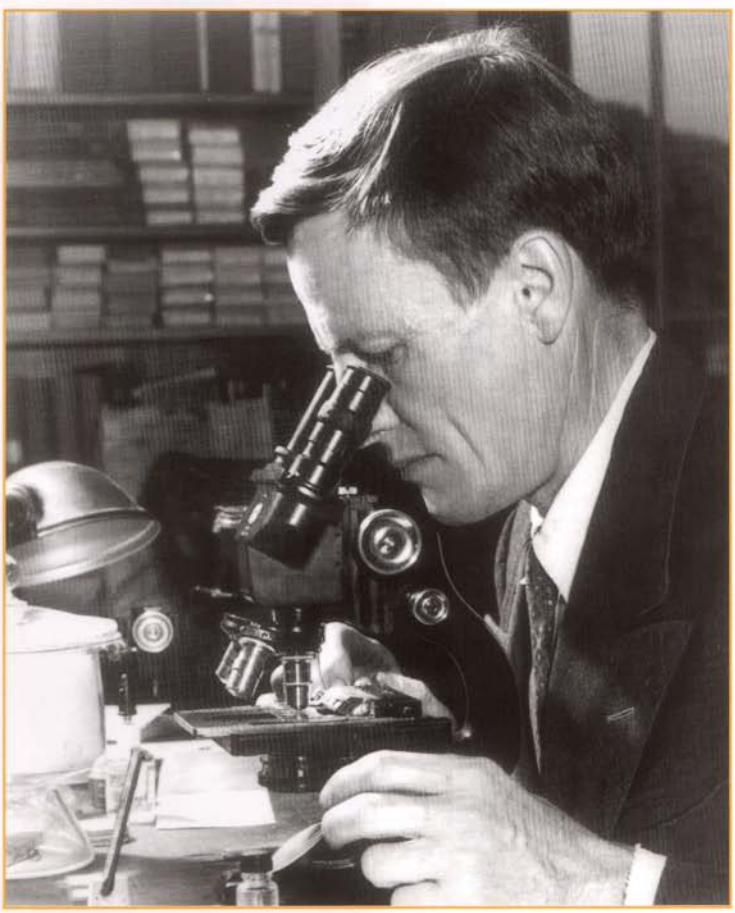
Daniel J. Crawford and Vassiliki Betty Smocovitis

THE SCIENTIFIC PAPERS OF G. LEDYARD STEBBINS (1929–2000)



Crawford & Smocovitis • THE SCIENTIFIC PAPERS OF G. L. STEBBINS

THE SCIENTIFIC PAPERS OF G. LEDYARD STEBBINS (1929–2000)

edited by

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PREFACE

On January 19, 2000, G. Ledyard Stebbins, one of the foremost botanists of the modern age, quietly passed away in his home in Davis, California, as a result of cancer. Born on January 6, 1906, in Lawrence, New York, his life—and scientific career—spanned most of the twentieth century. Stebbins is known for his contributions to varied biological fields, but especially botany, genetics, and evolutionary biology, broadly construed. His publication career, which began in 1929, continued until the very end of his life; he left behind him nearly 300 publications, most of which were scientific in nature, and no less than six books. One of these, *Variation and Evolution in Plants*, is generally regarded as the single most important book in twentieth century plant evolutionary biology. The book, which synthesized perspectives on plant evolution from a range of disciplines including plant genetics, systematics, population biology, paleobotany, and plant geography is generally regarded as the synthetic work which brought varied botanical fields into the intellectual event called the evolutionary synthesis. In addition to earning him the status of botanical "architect" of the evolutionary synthesis, the epochal event of twentieth century biology that accommodated Mendelian genetics within the framework of Darwinian evolution, it also launched the new areas of research known as plant evolutionary biology.

In the second half of the century, a period which saw an unsurpassed growth in biological science, Stebbins emerged as a leader—and shaper—of much of evolutionary biology. He wrote popular textbooks that influenced an entire generation of younger biologists, served as tireless organizer and promoter of evolutionary science on an international scale, and helped guide the educational reform movements of the 1960s that saw evolution become the central science of the new unified biological sciences. In his scientific work, he rapidly accommodated to new insights and techniques, contributing significantly to even newer areas of biology. Every inch a "synthesizer," Stebbins was one of the few notable biologists in the late twentieth century able to bridge the widening chasm between molecular genetics and developmental biology on the hand, and conservation biology and biodiversity studies on the other.

As historians and scientists of the new century look back on twentieth century science, G. Ledyard Stebbins is rapidly emerging as a notable—and unique—figure. To the historian, Stebbins is significant not only for his own considerable contributions, but also for representing a body of scientific work that reflected critical junctures in the recent history of science. His leadership role in the evolutionary synthesis alone ranks him alongside other major figures like Theodosius Dobzhansky, George Gaylord Simpson, and Ernst Mayr. To the scientist, Stebbins' scientific work has not only historical significance, but continues to speak to practicing scientist's concerns. His insights into the importance of hybridization in evolution, for instance, has taken on special significance as biologists recognize the widespread applicabili-

ty of this process. His long-held search to find a meaningful definition of species continues to elude many practicing biologists.

Because his work continues to speak to both scientists and historians, the editors of this volume, a scientist and historian, decided to select some of the more significant papers from Stebbins' corpus of scientific publications beginning in 1929 in order to make them more readily available to the general reader. We have divided Stebbins' scientific work into five component parts that we think represent dominant themes in his research: genetic variation and speciation in plants; hybridization; chromosomes and polyploidy; general and plant evolution; and rare species and conservation. Each part is introduced by an analytical essay that we hope draws attention to specific points, or explains the significance of the paper historically and scientifically. We have added a historical introduction to the volume as a way of locating the scientific work within a general historical context and to introduce readers to Stebbins himself. We have tried to enhance the reader's understanding of the papers with our own commentary, but believe strongly that the papers should ultimately be read—and stand—on their own. That they can do so, speaks to their scientific durability. Readers should also note that the papers selected are just a small sample of a long list of publications (including significant book-length monographs), which we provide in the appendix for future reference. Our goals are to introduce a younger generation of scholars to the insights of an important historical figure by showcasing some of his scientific research and to demonstrate that many of the current problems in botany, genetics and evolution have occupied the thoughts of a preceding generation of biologists. Historians have much to learn from the study of science, but so too scientists can learn much from study of their history.

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Part I: Genetic Variation and Speciation in Plants

Paper I: Stebbins, G. L. 1957. Self fertilization and population variability in the higher plants. *Amer. Naturalist* 91: 337–354.
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Paper II: Stebbins, G. L. 1965. Colonizing species of the native California flora. Pp. 173–191 in: Baker, H. G. & Stebbins, G. L. (eds.), *The Genetics of Colonizing Species*. Academic Press, New York
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Paper III: Stebbins, G. L. 1982. Plant speciation. Pp. 21–39 in: Barigozzi, C. (ed.), *Mechanisms of Speciation*. Alan R. Liss, Inc., New York.
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Paper IV: Stebbins, G. L. 1989. Plant speciation and the founder principle. Pp. 113–125 in: Giddings, L. V., Kaneshiro, K. Y. & Anderson, W. W. (eds.), *Genetics, Speciation, and the Founder Principle*. Oxford University Press, New York.
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Part II: Hybridization

Paper I: Anderson, E. & Stebbins, G. L., Jr. 1954. Hybridization as an evolutionary stimulus. *Evolution* 8: 378–388.
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Paper II: Stebbins, G. L. 1957. The hybrid origin of microspecies in the *Elymus glaucus* complex. *Cytologia. Proc. Int. Genet. Symp.*, 1956, pp. 336–340.
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Paper III: Stebbins, G. L. 1959. The role of hybridization in evolution. *Proc. Amer. Philos. Soc.* 103: 231–251.
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Part III: Chromosomes and Polyploidy

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Paper III: Stebbins, G. L. 1980. Polyploidy in plants: unsolved problems and prospects. Pp. 495–518 in: Lewis, W. (ed.), *Polyploidy, Biological Relevance*. Plenum Press, New York.
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Part IV: General and Plant Evolution

Paper I: Babcock, E. B., Stebbins, G. L., Jr. & Jenkins, J. A. 1942. Genetic evolutionary processes in *Crepis*. *Amer. Naturalist* 76: 337–363.
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Part V: Rare Species and Conservation

Paper I: Stebbins, G. L., Jr. 1942. The genetic approach to problems of rare and endemic species. *Madroño* 6: 241–258.
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Paper II: Stebbins, G. L. 1979. Rare species as examples of plant evolution. *Great Basin Naturalist Mem.* 3: 113–117.
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Paper III: Stebbins, G. L. 1980. Rarity of plant species: a synthetic viewpoint. *Rhodora* 82: 77–86.
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This project owes much to Emanuel Rudolph, a botanist and historian at Ohio State. Its origins date to 1978–79 when Ledyard Stebbins was a Distinguished Professor at Ohio State. Both were good friends and it was "Rudy's" wish to see the present project through to completion. We are grateful to Rudy's friendship, his inspiration, and his assistance in selecting the papers. His sudden—and untimely—death in 1992 has been a serious loss. This volume is therefore dedicated to the memory of our colleague and friend, Emanuel Rudolph (1927–1992).

This book would not have been published without the efforts of Tod Stuessy; the authors are most grateful for his encouragement and assistance. Veronika Mayer provided expert editorial assistance, and was very helpful and patient during the editing and publication of the volume.