BOOK REVIEWS


In its infancy, the 20th century gave witness to the rediscovery of Mendel’s principles, Johannsen’s insightful dissection of phenotype into its genetic and environmental components. Shull’s brilliant but premature conception of single cross maize hybrids, and the birth of scientific plant breeding. Darwin’s bombshell still reverberated as these scientists struggled to connect abstract, inferential concepts of particulate units of inheritance with empirical observations of heritable variation. In the current era of “single nucleotide polymorphisms,” “expressed sequence tags,” and “functional genomics.” it is all too easy to forget that for the majority of this century the organization and even existence of plant genes were inferred from phenotype, not the other way around. Likewise, the incredible flood of DNA sequence information from defined genes, plus the profound value of an increasing number of transgenes enables a myopia that ignores the chaotic complexity of plant genomes and populations. We will soon have practicing plant breeders who are trained in a central paradigm that is upside down to that which prevailed in the era of the Green Revolution, the commercialization of single-cross maize, the conversion of sorghum and rice from pure line to hybrid varieties, and the creation of triticale (× Triticosecale rimpaut Wittm.). We now have the luxury of teaching genetics in a linear manner that starts with cause (DNA) and ends with effect (phenotype), not the other way around. Of course our DNA-based world is extraordinarily exciting and bodes well for our ability to feed the additional three billion (and growing) mouths that have been added to the earth since Allard published his first edition of Principles of Plant Breeding. But we can ill afford to allow the seductively “clean” attributes of a minority of genes to blind our students to the much more pervasive but messy reality of the multitude of minor genes that generate genetic variation in plants.

Which brings me to the matter at hand, the near simultaneous publication of second editions of both R. Allard’s Principles of Plant Breeding, and N.W. Simmonds’s Principles of Crop Improvement, (this time coauthored with J. Smartt). The depth and breadth of experience these authors bring to bear is extraordinary. The publication of these volumes now, at the onset of the molecular breeding revolution, greatly increases their longevity compared with a publication date only 5 yr earlier. Neither book attempts to completely assimilate the full spectrum of DNA-based knowledge and techniques. On the other hand, each addresses the role these techniques had and will have in shaping current and future knowledge of crop evolution, genetics, and breeding.

In both volumes, the authors do much more than merely compile established facts. Instead, the reader is treated to syntheses of the concepts that seem solid today, liberally sprinkled with insightful and personal summaries of issues less well resolved. In fact, this refreshingly candid, first-person style is a hallmark of both books. Each provides a personalized perspective on the authors’ views of the state of the art of plant improvement in the final years of the millennium.

Both books begin with marvelously informative summations of the origins of domesticated crops and evolution in general. In those chapters and elsewhere, Simmonds and Smartt make liberal use of remarkably valuable tables and figures. Allard often treats the reader to extensive explanations of key seminal papers. That approach is particularly valuable and instructive in this era where the viewing of an abstract on a desktop computer may represent the sum total of one’s exposure to an important new paper.

Simmonds and Smartt declare their audience to be the well-informed and newly anointed post-graduate student. Allard does not declare his targeted audience, but his book will fit the same group that can profit from the Simmonds and Smartt volume. If my own experience is any guide, established plant breeders also have much to gain from both books. Allard’s treatise places greater emphasis on explication of the phenomenon of genetic variation as it applies to plant breeding vs. the mechanics of the plant breeding process. The opposite is true of the Principles of Crop Improvement, although I do not want to give the impression that either volume is deficient in either the biological or the practical aspects of plant breeding. Principles of Plant Breeding is organized into three main parts that address introductory topics (evolution, domestication, mating systems), biological foundations of plant breeding (genetic consequences of hybridization, heredity and environment, biometrical genetics), and modern breeding plans. This last part is organized along the lines of primary mode of reproduction: selfing, out-crossing, or clonal propagation. Allard also included a chapter on that crossover situation in which hybrid varieties are developed for self-pollinated crops like rice and sorghum.

Principles of Crop Improvement moves from an initial chapter on the evolution of crops into a series of chapters that flow very nicely as a primer on how to develop and disseminate crop varieties. Supporting biological principles are introduced within the overall theme of results-oriented plant breeding. An early chapter on the objectives of plant breeding illustrates the practical aspects of this text. In that chapter and elsewhere, the authors do a sterling job of including examples from the full spectrum of agricultural plants. A chapter on populations and selection is a remarkably clear and concise condensation of quantitative genetics in the context of practical plant breeding. The chapter on breeding plans is organized along the lines of the means of propagating the targeted variety: inbred line, hybrid variety, open-pollinated variety, or clone. I applaud this sensible approach since it implicitly recognizes that a crop’s in-field mode of reproduction does not necessarily dictate the means of fixing and deploying superior genotypes. The abundant diagrams depicting decision processes or the flow of material from one stage of development to the next will prove extremely useful to instructors and students alike. Both experimental and idealized data are employed with great effect as tables and figures throughout the book. The chapters on disease resistance and biotechnology will provide readers with a solid foundation and exposure to a large array of true-to-life examples or applications. As an instructor, I also very much appreciate the clear summaries at the end of each chap-