Preface

Double fertilization is hailed as a unique event in the life cycle of flowering plants. Defined as the union of one sperm with the egg on the one hand, and of a second sperm with the diploid fusion nucleus on the other, double fertilization sets in motion the chain of events that result in the formation of the embryo and endosperm. Whereas recognition of the importance of these two fusion episodes in seed formation in flowering plants is as old as the discovery of double fertilization itself, their central role in the development of the embryo and endosperm in seeds and grains of crop plants used widely in human and animal nutrition came to be recognized only in later years.

The study of the development of the embryo and endosperm from their single-celled beginnings under the rubric of embryology has occupied an important position in the multifaceted investigations on the reproductive biology of flowering plants undertaken during most of the past century. In recent years, descriptive studies of embryo and endosperm development have been overshadowed by the increasing use of genetic and molecular approaches to study flowering plant embryology, led by the work in the model plant *Arabidopsis thaliana*. Although some of these studies have been reviewed periodically in multiauthored volumes, my objective in writing this book is to provide an overview of past accomplishments in the field, and a sense of the outstanding future problems as they relate to the products of double fertilization. Admittedly, molecular and genetic studies in conjunction with screening of mutants, isolation of genes, and identification of their protein products, are emphasized to some extent at the expense of structural and developmental studies. The main reason for this is that I have tried to write a book on investigations that reflect a rethinking of the way that we have viewed embryogenesis and endosperm development as the end product of a series of stereotypical divisions. In my opinion, these recent studies with molecular overtones have brought us close to an understanding of the critical details that control the transformation of these cellular domains of the ovule into mature tissues of the seed or grain.

The book begins with an account of the history of the discovery of double fertilization, which must surely find a place in a volume dealing with that topic. The details of how body plans of eudicot and monocot embryos are established occupy the next chapter, which sets the stage, in the following three chapters, for a discussion of notable advances made in the identification of the genetic and molecular factors that control the development of the embryo (Chaps. 3, 5) and suspensor (Chap. 4) during progressive embryogenesis. The last chapter to deal wholly with embryos (Chap. 6) describes their general strategies during quiescence or dormancy. The main body of the book concludes with accounts of the developmental, genetic, and molecular studies on the endosperm covered in Chaps. 7 and 8, and, in the final chapter, descriptions of apomixis, somatic embryogenesis, and pollen embryogenesis illustrating embryogenesis and partial endosperm development in the absence of double fertilization. The level of exposition of the topics in the different chapters is considered suitable for graduate students who want get a coherent view of the current perspectives on embryogenesis and endosperm development in flowering plants, and for researchers in the field who plan fresh attacks on unsolved problems on the topics covered.

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