Preface

More food and feed have to be grown on less land. At the same time, agronomy and agrochemistry have reached a level where further progress is neutral in relation to yield. Scientific progress helps environmental needs. Genetics alone may close the yield gap by a combined application of classical techniques and molecular knowledge. Large-scale genome analysis and related technologies provide access to a refined understanding of the genome. Fortunately, molecular markers are a genetic tool accepted by the public which often judges gene technology critically. There is even a tendency for classical combination breeding, together with marker-assisted selection, to be more effective in achieving complex breeding goals.

We are grateful to the authors of this book, who contributed new information about molecular marker collections and molecular gene maps, elucidating the usefulness of these tools: such as higher efficiency in parent selection; controlled combination of heterotic parents; uncovering a rare, but desired genotype in a large segregating population; or pyramiding single traits to result in more complex characters, e.g., durable resistance. We restricted the selection of topics to functioning marker approaches rather than to all possible strategies. Nevertheless, the spectrum of crop plants and trees covered is quite broad with a close connection to application.

Successful breeders need to have green fingers and this hopefully might in future be confirmed by molecular markers. Soon, it will seem unbelievable that breeders have been successful without using such a technique. We would like to dedicate this book to one such breeding artist, Prof. Dr. Dr. h.c. Gerhard Fischbeck. He has bred wheat varieties giving optimal quality under suboptimal European climatic conditions and has found numerous new resistance genes for powdery mildew in cereals. He held the Chair of Agronomy and Plant Breeding at the Technical University in Munich, Germany, and, although he is approaching his 80th birthday, he is still very active and curious to discover the secrets of nature and always full of life and spirit. In 1989, he started a project in barley genomics, thereby giving an impressive example of moving from classical to molecular breeding.

Even most sophisticated new marker techniques will not replace a sharp eye, green fingers, or a bright mind – and certainly not the field experiment. Nevertheless, such techniques do allow more reproducible and faster development of new and better cultivars. Today, a breeder has to know how such tools work and how to use them in an intelligent manner. Hopefully, this book will help to transform most recent marker theories into many superior varieties of crops.

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