

PREFACE

The Austrian monk, Gregor Mendel's memoir on plant hybridization, in year 1865, led to the origin of first genetics theory of inheritance, based on his experimental work with pea plants, which is commonly called the inheritance by segregation. The science of heredity was non-existent before Mendel's theory, but the word 'genetics' was only coined in 1906. Based on his pea plant cross studies, Mendel founded the theory that the inheritance traits are always controlled by single genes. Mendelian approach is a general 'science of heredity', whereas the modern studies have revealed that most traits in humans are controlled by multiple genes and the gene is basis of transmission, recombination, and mutation. The complex science of molecular biology evolved with the discovery of DNA and chromosome, with the convergence of the concept of genotype and phenotype. The human genome project and sequencing of genomes of other model organisms has revealed that there are many more functional units than those protein-coding genes. This makes chromosomal DNA as a dynamic polymer that is not only responds to changes in DNA sequence, but is also under control of the regulatory proteins and is influenced by the environmental changes, which is the also the topic of this book—Epigenetics.

Epigenetics literally means "in addition to changes in genetic sequence" and will include any process that brings about changes in gene activity without changing the DNA sequence. Some of the epigenetics processes are —methylation, phosphorylation, chromatin modifications, sumoylation and ubiquitylation. These epigenetic processes are essential for the functioning and survival of the organisms and any alterations in these processes can cause the development of disease state. Understanding the epigenetic control can give understanding of the various cellular processes, including but not limited to tumorigenesis, regeneration and aging. This book elicits the key studies on the epigenetics of human diseases and development, as well as yeast and plant epigenetics.