
PREFACE

The nucleus is perhaps the most complex organelle of the cell. The wide range of functions of the cell nucleus and its molecular components include packaging and maintaining the integrity of the cellular genetic material, generating messages to the protein synthesis machinery of the cell, assembling ribosome precursors and delivering them to the cell cytoplasm, and many more. As a complex machine, the nucleus maintains a constant two-way flow of information with the surrounding cytoplasm, such as import and export of ions, small and large proteins and protein complexes, and ribonucleoprotein particles. These transport processes occur through the nuclear pore complexes which represent the selective gateways through the nuclear envelope, a major barrier that isolates the nucleus from the cytoplasm.

More than one hundred and seventy years have passed since Robert Brown discovered the cell nucleus using his simple light microscope, and, since then, remarkable progress has been made, both technically and conceptually, in studying and understanding the structure and function of the cell nucleus. In these days of modern cellular and molecular biology, we are capable of employing a vast array of sophisticated technologies and approaches to image the nucleus and its substructures, to isolate and functionally characterize its molecular components, and to modify the nuclear genetic material. With the resulting knowledge, we have come to appreciate the complexity of the nuclear structure and function. In particular, the ability of various types of molecules to be actively transported through the well-guarded nuclear pore complexes is extremely intriguing. The chapters of this book provide insights into the intricate mechanisms of nuclear import and export. To better understand these processes, one must first elucidate the organization of the physical gateways into the nucleus. Thus, we begin this book with a detailed description of the nuclear pore structure and composition. The signal sequences that specify nuclear import and export of proteins are discussed next followed by eight chapters, each dedicated to a specific aspect of the nuclear import and export in plant and animal cells. Among these, special chapters are dedicated to nuclear import of *Agrobacterium* T-DNA during plant genetic transformation, nuclear import and export of animal viruses, and nuclear intake of foreign DNA. A chapter on research methods to study nuclear transport concludes the book. The result is a compact book which we hope the readers will find useful as a guide and a reference source for diverse aspects of nuclear import and export in plant and animal systems.

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