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# NUCLEAR ORGANIZATION IN DEVELOPMENT AND DISEASE

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The nuclear envelope is the boundary between a cell's nucleus and the surrounding cytoplasm, and consists of inner and outer membranes traversed by the nuclear pores. Underlying the inner nuclear membrane is a thin proteinaceous layer, the nuclear lamina, which comprises principally nuclear lamins – intermediate filament-type proteins. This envelope regulates several important processes: the traffic of molecules between the nucleus and the cytoplasm, nuclear morphology during the cell cycle, DNA synthesis and chromatin organization.

Nine human diseases have been linked to mutations in genes encoding components of the nuclear envelope, mostly in the lamin A gene (*LMNA*). These diseases include cardiac and skeletal myopathies (Emery-Dreifuss muscular dystrophy, dilated cardiomyopathy and limb girdle muscular dystrophy 1B); Dunnigan's partial lipodystrophy and mandibuloacral dysplasia; a peripheral neuropathy, Charcot-Marie-Tooth disorder type 2, that affects the myelin sheath; and, most recently, the premature ageing condition, Hutchinson-Gilford progeria. Another disease, Pelger-Huet anomaly, that affects nuclear morphology and skeletal development, is linked to an envelope-associated protein, the lamin B receptor. Furthermore, a recent study suggested that other diseases may be linked to many newly identified nuclear envelope-associated proteins.

This important book draws together contributions from scientists who are studying these diseases from different perspectives: cell and developmental biologists, structural biologists, geneticists and clinical scientists. Topics include how nuclear structure and location within a nucleus affect gene expression, chromatin organization and cell differentiation; the nature of the interactions between the nuclear envelope and the cytoskeleton; and the extent to which the cytoskeleton mediates communication between the cell membrane and nucleus in regulating gene expression, and whether disruption of such communication might underlie the disease processes.