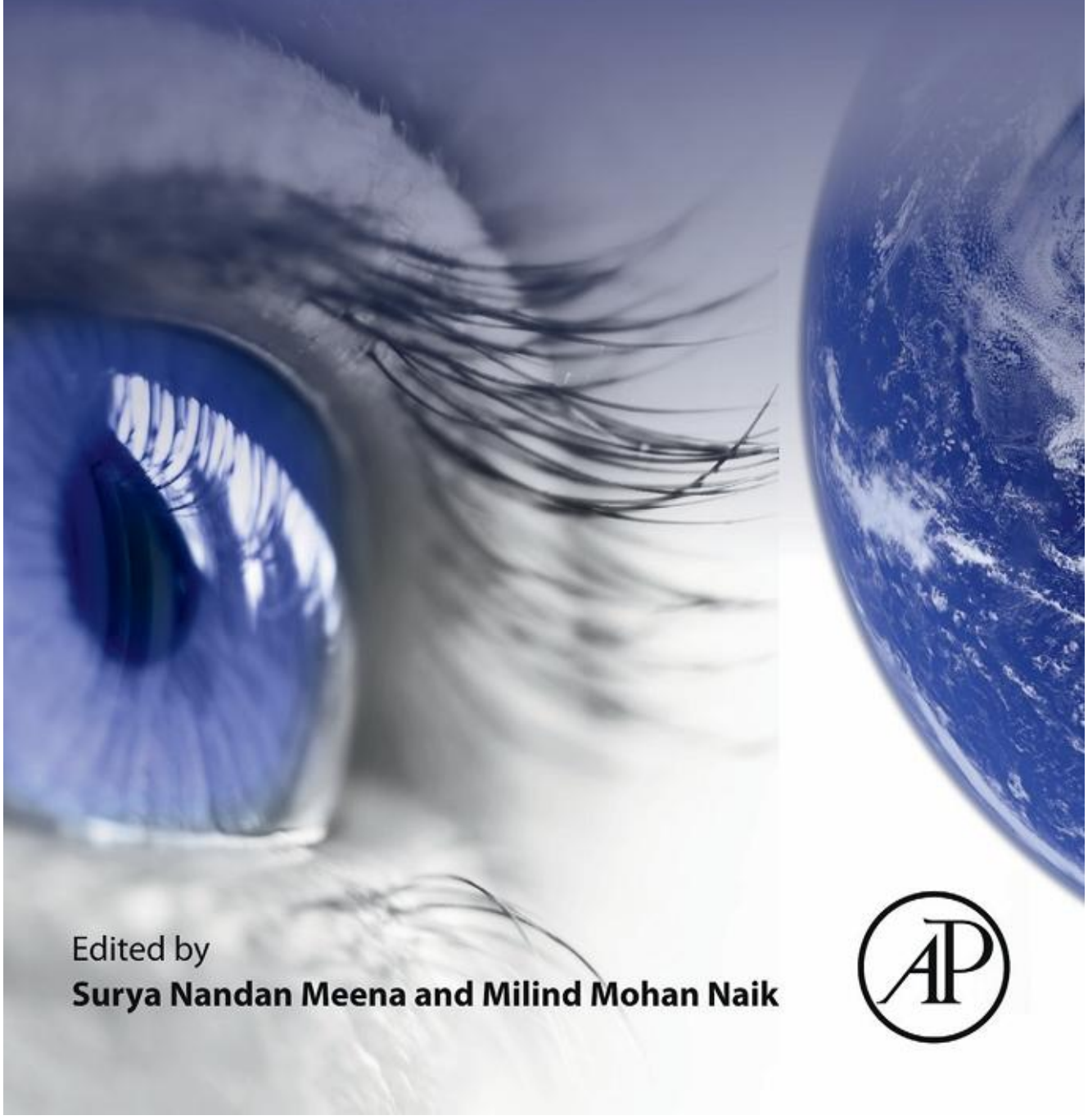
Advances in Biological Science Research

A Practical Approach



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Contents

Chapter 23

Frontiers in developmental neurogenesis

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23.1 Introduction to neurogenesis

Neurogenesis is the formation of new neurons in the brain. It is a crucial phenomenon during embryonic development and also tends to continue in certain brain regions after birth and throughout our lifespan. Neurogenesis is broadly categorized into two types, developmental neurogenesis and adult neurogenesis.

23.1.1 Developmental neurogenesis

Developmental neurogenesis is defined as formation of neurogenic cells, their proliferation, migration, and differentiation into neurons that covers prenatal (germinal, embryonic, and fetal) as well as postnatal (neonatal, infancy, childhood, and adolescence) development (Fig. 23.1). Remaining neurogenic events that form part of postnatal development during adult phase form adult neurogenesis.

Discovery of stem cells in parts of adult brain in the 1990s has changed the misconception about incapability of the central nervous system, including brain, to undergo neurogenesis and regeneration. The changeover of proliferative and multipotent neuronal stem cells (NSCs) to fully differentiated neurons and glia denotes neurogenesis and gliogenesis, respectively. Developmental neurogenesis involves generation of neurons from early embryonic development until early postnatal stages, with only a few neurogenic zones remaining active in the adult, representing adult neurogenesis [1]. Developmental gliogenesis starts during late embryogenesis and continues in postnatal stages, with low but widespread production of both astrocytes and oligodendrocytes also occurring throughout the adult brain, representing adult gliogenesis [2]. Regulated neurogenesis during embryonic development marks the incredible diversity of neurons in the brain. During developmental neurogenesis, neural progenitor cells (NPCs) initially proliferate symmetrically to

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