Preface

Developing the second edition of *Neural Development and Stem Cells* was necessitated by the rapid increase in our knowledge of the development of the nervous system. It has become increasingly clear that stem cells are a heterogeneous population that changes extensively during development. Perhaps the most important advance in our understanding of stem cell behavior has been the realization that regionalization of stem cells occurs early in development and this bias toward differentiation in phenotypes of neurons or cells characteristic of a particular part of the brain appears to persist even after prolonged culture. We have therefore included additional chapters on olfactory epithelial stem cells and retinal stem cells, both of which differ in their properties from ventricular zone and subventricular zone–derived neural stem cells. It is also now clear from an analysis of mutants and transgenics where the death or self-renewal pathway is altered that cell death regulates stem cell number. As a consequence, this second edition includes a separate chapter on cell death that summarizes the important changes in the death pathway that occur as stem cells mature. The existing chapters in the book have also been extensively revised and updated by experts who have generously contributed their time and expertise.

The chapters have been organized along the lines of our understanding of how the nervous system develops (Fig.1, on p. vi). Stem cells are present early in development, well before the onset of neurogenesis and gliogenesis. Stem cells proliferate and respond to extrinsic cues to mature as adult stem cells, undergo cell death, enter a state of quiescence, or differentiate. Stem cells appear to become regionally specified and their differentiation potential depends on the region that they have been isolated from.

I thank the authors for their efforts in ensuring that their manuscripts are as up to date as possible, and we all hope that this second edition of *Neural Development and Stem Cells* will serve as a handy guide for a course on stem cell biology in the nervous system for the novice and expert alike.

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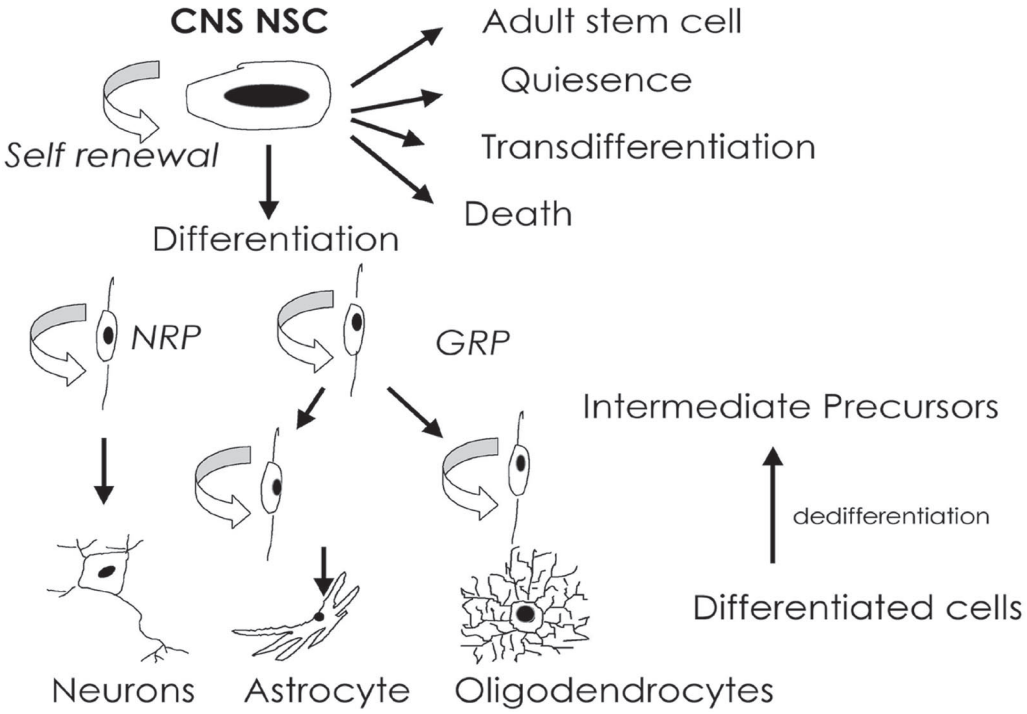

Fig. 1. Multipotent stem cells (NSC) can undergo self-renewal, enter a quiescent state, mature into adult stem cells, die, or respond to signals to differentiate. Differentiation appears to occur via a progressive set of fate choices that include the generation of dividing precursors with a restricted set of fate choices. These precursor cells present during development and, in the adult, mature to generate fully differentiated neurons, astrocytes, and oligodendrocytes. A limited set of data suggest that mature cells or intermediate precursors can dedifferentiate to reenter the cell cycle and acquire the characteristics of NSC.

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