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Principles of Molecular Neurosurgery
Progress in Neurological Surgery

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Series Editor

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Principles of Molecular Neurosurgery

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This book is dedicated to the memory of Drs. Ernst and Elisabeth Freese, brilliant scientists and wonderful parents who deciphered the chemical basis of mutagenesis, the engine of evolution and God’s way of making us better.

We also dedicate the section on functional and restorative molecular neurosurgery to the memory of Anne Janson, a victim of Alzheimer’s Disease, and all the other patients who suffer from this terrible disease which robs the mind of its memories and dignity, as well as all children affected by neurodegenerative diseases – for those who have died, they are not forgotten; and for those who are living, may they soon have the promise of a cure.

The section on Oncology is dedicated to the memory of Jack Geary, a victim of cancer. Finally, we dedicate the section on the spine and spinal cord to the memory of Anthony Simeone, M.D., whose devotion to his patients and family will always be remembered.

The Editors
Andrew Freese
Frederick A. Simeone
Paola Leone
Christopher Janson
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Otto Freese produced the front cover illustration, for which we are grateful as well.

The Editors
Andrew Freese
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Christopher Janson
Series Editor’s Note

Changing the Paradigm of Neurosurgery

During the last decade of the 20th century and the first years of the 21st century, neurosurgery has been part of an enormous paradigm shift. While we previously concentrated on dealing with the removal or management of structural masses (blood clots, aneurysms, brain tumors, spinal bone spurs, ruptured discs), the future of neurosurgery lies in the application of a wide variety of new knowledge. Loosely termed ‘molecular’, this new knowledge can be applied widely to the diagnosis, management, and possible prevention of serious neurological illness. As such, we practitioners and surgeons must embrace this new knowledge and attempt to implement it in the current practice of neurosurgery. The future of neurosurgery is molecular, minimally invasive, and multidisciplinary. For the first time, we will be bringing the emerging data from the laboratory and beginning to apply it to clinical problems, rather than the reverse, the old paradigm of trying something in the operating room and then going back to the laboratory to see why it did or didn’t work. Volume 18 of Progress in Neurological Surgery is an elegant compilation of current and emerging knowledge related to the influence of molecular neurosurgery on both the present and the future. Drs. Freese, Simeone, Leone, and Janson have accumulated a wealth of information which can be applied to the spinal column and spinal cord disorders, functional and restorative brain surgery, neurovascular disorders and neuro-oncology. The author list is impressive, and the story that is presented should entice the reader to glimpse the
future of neurosurgery, which is rapidly descending on us. I congratulate the current authors for their excellent collaboration, and believe the readership will enjoy this new volume which does, indeed, represent progress in neurological surgery.

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There are not many advantages to becoming ‘senior’, an euphemism for being an old man. But there are a few, and two of them are exemplified for me by this volume. The first is in seeing how scientific/medical progress can mushroom over a span of decades. As I think back on my training, in the 1950s and early 1960s, and then look through this fascinating book, I am in awe at the progress. Yes, I have been intimately involved in gene therapy and the genetic basis of disease my whole career, but the laying out of the application of these technologies to the single field of neurosurgery leaves me in wonder. Using gene therapy to treat malignant gliomas is revolutionary enough, but scanning the chapters herein reveals the use of gene therapy and genetic approaches for degenerative disc disease, for spinal cord injuries, for epilepsy, for Parkinson’s and other neurodegenerative diseases, for the treatment of pain, for stroke as well as for malignancies. And not just genetic approaches: neurosurgery now embraces protein therapy, cell therapy, oncolytic viral therapy, immunotherapy, stem cell transplantation, and xeno-neurotransplantation. Truly a glorious story of scientific/medical progress!

The second advantage of growing old is seeing the successes of the many young physician investigators that one has trained. Everywhere that I travel, there seems to be someone who had passed through my laboratory over the past 40 years. The joy of hearing the stories of successful, productive careers is wonderful. But this book brings an added touch. Andrew Freese is the son of one of the men that played a significant role in my career. When I interviewed at NIH in 1963 for a position of Research Associate (following my medical
training), I narrowed my choices to two: Marshall Nirenberg (who was in the middle of deciphering the genetic code) and Ernst Freese, who was doing fascinating work in genetic model systems. This was one of the toughest decisions of my career. I found Dr. Freese (I still cannot call him by his first name although he has asked me to for years!) to be a brilliant scientist and marvelous human being. So much so that, although I joined Marshall Nirenberg and helped in the final genetic code decipherment, I maintained a long and fruitful friendship and scientific mentorship with Dr. Freese.

Thus, it was with extraordinary pleasure that I received a letter from Dr. Freese’s son, Andrew, to write the Foreword for this book. As I think back to all the advice and knowledge that I received from Dr. Freese over so many years, I am honored and humbled to add my name to a volume that is dedicated to his memory by his son.

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