

PREFACE

The general process of conducting scientific research involves the comparison of experimental results with hypothesis-driven predictions of the experimental results. Traditionally, these hypothesis-driven predictions were commonly based upon "back of the envelope" calculations and "hand waving" predictions. Fortunately, these traditional methods have been replaced with more rigorous mathematical and computational approaches.

The use of computers and computational methods has become ubiquitous in biological and biomedical research. This has been driven by numerous factors, a few of which follow: One primary reason is the emphasis being placed on computers and computational methods within the National Institutes of Health (NIH) Roadmap; another factor is the increased level of mathematical and computational sophistication among researchers, particularly amongst junior scientists, students, journal reviewers, and Study Section members; another is the rapid advances in computer hardware and software which make these methods far more accessible to the rank and file research community.

A common perception is that the only applications of computers and computer methods in biological and biomedical research are either basic statistical analysis or the searching of DNA sequence databases. While these are obviously important applications, they only scratch the surface of the current and potential applications of computers and computer methods in biomedical research. The various chapters within this volume include a wide variety of applications that extend well beyond this limited perception.

The training of the majority of senior MDs and Ph.Ds in clinical or basic disciplines at academic research and medical centers commonly does not include advanced coursework in mathematics, numerical analysis, statistics, or computer science. Thus, the chapters within this volume, and our previous volumes, have been written in order to be accessible to this target audience.

MICHAEL L. JOHNSON AND LUDWIG BRAND