Preface

If you are a cell biologist, you will have noticed the change in emphasis in our field. At one time, cell biology papers were—in the main—qualitative. Micrographs were of "representative cells," western blots were from a "typical experiment," etc. This descriptive style has given way to approaches that are more quantitative. Qualitative observations that were once taken at face value must now be measured and objectively assessed. More recently, as technology has advanced, computing power has increased, and data sets have become more complex, we have seen larger-scale analysis, modeling, and automation begin to take center stage. This is digital cell biology.

This change encompasses several approaches, which include (in no particular order):

- Statistical analysis
- Image analysis
- Coding
- Automation allowing analysis at scale
- Reproducibility
- Version control
- Data storage, archiving, and accessibility
- Electronic lab notebooks

These approaches are not new to biology. In fact, some fields have used them extensively for years. Perhaps most obviously, groups that identified themselves as "systems biologists" or "computational biologists" and those working on large-scale cell biology projects were early adopters. But these approaches have now permeated mainstream cell biology to such an extent that any research group wanting to do cell biology in the future must be well-versed in them in order to progress. The shift is changing the skill set that we look for when recruiting scientists now, and it will shape the cell biologists of the future. Fields such as biophysics and neuroscience are further through the change, whereas others have yet to begin. It is happening to all of biology, and it is an exciting time to be involved in research.

The aim of this book is to equip cell biologists for this change: to become digital cell biologists. Maybe you are a new student starting your first cell biology project.

This book is designed to help you. Perhaps you are working in cell biology already but you have not had much previous exposure to computer science, mathematics, and statistics. This book will get you started. Maybe you are a seasoned cell biologist. You read the latest papers and wonder how you could apply those quantitative approaches in your lab. You may even have digital cell biologists in your group already and want to know how they think and how you can best support them. There is something for you in these pages. Let's get digital.