Preface

There has always been some tension between proponents of hypothesis-driven and discovery-driven research in the broad field of life sciences. Academic research has been primarily focused on hypothesis-driven research. However, the success of the human genome project, a discovery-driven research approach, has opened the door to adding other types of discovery-driven research to a continuum of research approaches.

In contrast, drug discovery research in the pharmaceutical industry has embraced discovery-driven research for many years. A good example has been the discovery of active compounds from large chemical libraries, through screening campaigns.

The success of the human genome project has also demonstrated the need for both academic researchers and industrial researchers to now understand the functions of genes and gene products. The cell is the basic unit of life and it has been at the cellular level where function can be demonstrated most cost-effectively and rapidly. High content screening (HCS) was developed by Cellomics Inc. in the mid-1990s to address the need for a platform that could be used in the discovery-driven research and development required to understand the functions of genes and gene products at the level of the cell.

It is important to understand that HCS evolved from light microscope imaging methods, used extensively in hypothesis-driven research for more than a decade before the introduction of HCS. The automation and informatics of HCS added the capability of discovery-driven research and development on cells to the existing strengths of the manual and semi-automated imaging light microscopy methods already applied to hypothesis-driven research. It is predicted that both hypothesis-driven research using advanced imaging microscopic methods and discovery-driven research and development (R&D) using HCS will continue to be used as a continuum of approaches. In fact, the continued evolution of HCS is expected to include the incorporation of new optical modules that come from the basic research activities of investigators from both academia and industry. However, HCS will always give up some flexibility relative to the imaging microscopy systems in favor of speed.

This volume was assembled to assist both existing users of HCS, as well as investigators considering the addition of a discovery-driven platform to their R&D activities. We assembled a team of authors that include the innovators of HCS, academic researchers that are at the forefront in applications of HCS to basic research, and experts from industry that are driving the evolution of HCS reagents, informatics and applications for drug discovery. The chapters have been organized into sections that highlight the importance of integrating instrumentation, application software, reagents and informatics. In addition, there are a combination of pure review chapters on key topics and specific methods chapters.

The editors would like to thank the authors for taking part in this project and hope that this volume will serve as a valuable resource as the use of HCS continues to grow and evolve.

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