

Editor's Note: Technological Advances and a Molecular Understanding of Pharmacology

The tremendous technological advances witnessed during the last few decades have transformed virtually all aspects of modern life, including our understanding and study of biology, the rationale and approach underlying the treatment of diseases, and the delivery of health-care. With recognition that the pace of technological development and acquisition of knowledge will almost certainly accelerate in the coming decade, let us consider what these advances might hold for *Molecular Pharmacology*, both the discipline and the journal. Pharmacology has always been a field of study straddling biochemistry, chemistry, physiology, clinical medicine, mathematics, and engineering. That is, pharmacology seeks to discover and validate new therapeutic strategies to improve human health from ideas and innovation drawn from consideration of multiple fields of study. In this manner, pharmacology is unique within biomedical research in that it has always required cross-cutting thinking, long before the value of this concept had become widely recognized. Given the reliance of pharmacology on multiple disciplines, technological advances have often had a synergistic and profound impact on design and discovery of new drugs. For example, our enhanced understanding of the genome and gene regulation has uncovered new therapeutic targets. Understanding the relentless diversification and expansion of gene families across the species has allowed identification of ever more specific targets that can be considered for pharmacological manipulation, both in the basic research arena and in clinical development. At the same time, advances in synthetic chemistry have led to an exponential increase in available chemical libraries, and advances in computerization and robotics have created a means by which to catalog and assess the potential biological actions of compounds within these libraries. Advances in structural biology that allow visualization of atomic contacts between pharmacological probes and their protein targets provide a means to both enhance design of new ligands and better appreciate their molecular mechanisms, accelerating the discovery cycle. At the same time, the evaluation of multicellular systems through the use of molecular approaches promises to reveal deeper insight into processes of both life and disease, creating opportunities for innovation and discovery. The concepts of individualized medicine, context-dependent drugs, and biased signaling pathways all reflect relatively new advances in pharmacology with unusually broad implications for human health. Thus, technological advances have invigorated pharmacological sciences, radically enhancing insight into drug action.

How can *Molecular Pharmacology* best serve both the discipline of pharmacology and the larger biomedical research community in the coming years? *Molecular Pharmacology* has continuously served biological scientists for more than 45 years by catalyzing discovery on many fronts while setting a high standard for pharmacological research, a posture that has made it a leading venue for publication of careful and insightful experimental results. Prospective authors have come to expect serious, objective reviews of their manuscripts. With this in mind, *Molecular Pharmacology* will remain committed to publishing the very highest quality experimental results exploring the pharmacological principles and mechanisms underlying drug action and disposition. The journal will embrace not only traditional receptor-linked signaling studies and molecular details of drug-target interactions, but also a wide range of integrated disciplines that involve a molecular perspective coupled with an understanding of physiological and disease processes. This involves discovery of novel pharmacological probes, elucidation of their mechanisms of action, utilization of such probes to understand the function of complex systems in tissue or in vivo, and evaluation of the structural basis of selectivity and action of pharmacological agents. *Molecular Pharmacology* will also be a venue for theoretical treatment of new analytical approaches that are necessary to evaluate complex phenomena, as well as a home for cogent reviews that consider new, important results within the broad area of pharmacological sciences. In this respect, *Molecular Pharmacology*

will continue to publish the highly successful *Minireview* series that provides timely review of the most exciting new advances in pharmacology. All of these efforts will collectively advance the field by leveraging the historical interdisciplinary nature of pharmacology to publish experimental results that often transcend multiple fields to establish new precedents.

Advances in pharmacology necessarily involve familiarity with and a willingness to embrace multiple disciplines. This idea, coupled with the application of new technology and new concepts to complex problems renders pharmacology, at its best, a critical epicenter within biomedical research, able to catalyze conversion of disparate and sometimes dissimilar data-sets from a variety of fields into tangible advances in understanding health-related issues. Since its inception in 1965, *Molecular Pharmacology* has been at the forefront of publishing innovative approaches that test new ideas and draw on advances in many disciplines. The prescient name *Molecular Pharmacology* predated a detailed understanding of the molecular basis of drug action by nearly a decade and has served the biomedical research with publication of the highest quality science as the molecular age unfolded, as gene sequences were unraveled, as protein structures were revealed, as technology afforded new ways to assess the biochemistry of cells, as the molecular basis of cell-cell interactions was appreciated, as understanding of drug metabolism expanded, and as our assault on understanding complex systems biology has advanced. I would argue that the explosive pace of biomedical research and the doubling rate of biomedical knowledge has in part been driven by pharmacological advances, which can provide the tools with which to test molecular hypotheses, a means to quantify biological phenomenon, and drugs with which to evaluate treatment of disease. Toward this end, I believe *Molecular Pharmacology* will continue to be an important catalyst of advances in the biological science in the coming decade. On behalf of the Editors, let me say that we all look forward to working together with you in these exciting times.

Stephen F. Traynelis
Editor