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Editorial

# Chemical Neurobiology—Introduction

Neuroscience is currently undergoing dramatic changes due to an improved understanding of neural activity at the molecular level and the emergence of new techniques for monitoring the structure and dynamics of nervous systems. For instance, the interactions of neurotransmitters with their receptors can now be interpreted in light of detailed crystal structures and new agonists and antagonists have been designed based on these insights. Modern imaging techniques have allowed scientists to observe higher cognitive functions, such as reward and addiction, in non-invasive ways that can be readily applied to humans. Neurodegenerative diseases can now be investigated with superior imaging methods and hopefully soon be tackled with new pharmacological tools.

All of this requires the synthesis of new functional molecules. These can be optical or radiochemical probes used to *monitor* activity and change in the nervous system at various timescales and with different levels of spatial resolution (e.g., with fluorescent probes or PET tracers). Increasingly, however, synthetic molecules are also being used to *control* neural activity with unprecedented precision, often through their responsiveness to light. Molecules of this type include caged compounds (e.g., caged neurotransmitters) or molecular photoswitches. Of course, classical pharmacological tools, that is, highly-selective ligands for specific receptors, still continue to play a very important role in the dissection and manipulation of neural activity.

The present collection of original articles and reviews on chemical neuroscience features most, if not all, of these molecular types. Koert and Essen (p 7716) present an article on the structural and functional characterization of a channel protein that has been synthetically modified to change its conductance and selectivity. Chang et al. (p 7724) introduce a new class of stilbene derivatives as potential imaging agents for amyloid plaques. Chambers (p 7731) discusses another type of photoactive molecule, namely photochromic ligands, as a tool for the control of GABA-channel activity. Hooker et al. (p 7739) evaluate [$^{11}$C]-labeled metergoline as a PET radiotracer for primates, underscoring the importance of new techniques for the synthesis of radioisotopes. Woolley (p 7746) presents new caged compounds for probing the role of local translation in neurobiology. Goeldner and Mourot (p 7753) review two-photon cages in neuroscience and discuss design criteria for the further development of these important photochemical probes. Finally, we present an overview of the structural biology of ionotropic glutamate receptors as seen from the perspective of their ligands, that is, agonists, antagonists and neuromodulators.

We hope that this collection of original articles and reviews on chemical neuroscience will provide useful information and enjoyable reading time for medicinal chemists, chemical biologists, and neurobiologists alike and inspire other colleagues to enter this rapidly expanding field.

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