NARRATIVE BIOGRAPHICAL SKETCH OF MICHAEL F. BROWN

Michael Brown, Professor of Chemistry at the University of Arizona, was born in Los Angeles in 1948. He received the A.B. degree in 1970 from the University of California at Santa Cruz, as a member of the first graduating class of the newly founded campus. While an undergraduate, he conducted research in nuclear magnetic resonance (NMR) spectroscopy at the Laboratory of Chemical Biodynamics at Berkeley. He opted to stay at Santa Cruz for his doctorate, while continuing his research at Berkeley. Upon receiving the Ph.D. degree in 1975, he was awarded a postdoctoral fellowship from the U.S. National Institutes Health (NIH) to conduct research in Europe. He spent three years working with his mentor Joachim Seelig at the Biozentrum of the University of Basel in Switzerland, and with Ulrich Häberlen at the Max Planck Institute in Heidelberg, Germany.

Thereafter, he returned to the United States, where he joined the laboratory of Wayne Hubbell in the Department of Chemistry of the University of California at Berkeley. He soon began his academic career in 1980 as an Assistant Professor at the University of Virginia. He received a Sloan Fellowship and a NIH Research Career Development Award, and was promoted to Associate Professor with early tenure in 1985. In 1987 he joined the faculty of the University of Arizona as Full Professor. Michael Brown's primary appointment is in the Department of Chemistry and Biochemistry, and he holds a joint appointment in the Department of Physics. He is a member of the Committee on Neuroscience and the Applied Mathematics Program. He has been a Visiting Professor at the University of Lund, Sweden, the University of Würzburg, Germany, the University of Florence, Italy, and Osaka University, Japan.

Brown's general area of research entails biophysical chemistry—the use of principles and concepts of chemistry, physics, and mathematics to understand biological systems. He is devising and applying novel approaches involving solid-state NMR spectroscopy. Biomolecular structure and dynamics are investigated through static and time-dependent magnetic and electrical interactions. Brown and collaborators pioneered the use of deuterium NMR spectroscopy for measuring the order parameters and relaxation times of membrane proteins and lipids. His experimental measurements of the magnetic field dependence of NMR relaxation rates of liquid-crystalline systems have been crucial for validating force fields used for molecular dynamics (MD) simulations of membrane lipids and proteins. Moreover, he extended these concepts to illuminate actions of polyunsaturated lipids at the membrane level.

One of Brown's long-standing interests entails studying the visual system to unveil how membrane structure and dynamics involving G protein-coupled receptors (GPCRs) are related to their functional mechanisms. Using solid-state NMR, he established how local motions of bound cofactors initiate the activation of membrane receptors. Brown showed for the first time how light-induced changes in the local dynamics of retinal yield large-scale activating fluctuations of rhodopsin. He introduced the seminal concept of an ensemble activation model. His work continues to illuminate how the properties of biomembranes underlie key cellular functions, with potential implications for drug discovery and human medicine.

Notably, in his biophysical applications to membrane proteins, Brown was the first to put forth a new Flexible Surface Model (FSM) that supersedes the standard fluid mosaic model found in many textbooks. Two-way coupling of lipids and proteins explains membrane function by nonspecific material properties of lipid bilayers. The spontaneous monolayer curvature of the lipid leaflets competes with the solvation energy of the proteolipid interface, and underlies lipid modulation of the conformational energetics of membrane proteins. In this way, the membrane curvature stress field is linked to key biomembrane functions involving conformational changes of GPCRs and ion channels.

Michael Brown's accomplishments have been recognized through the award of Fellowships from the Alfred P. Sloan Foundation, the Japanese Foundation for the Promotion of Science, the Fulbright Program, the American Physical Society (APS), the Biophysical Society, the Galileo Circle, and the American Association for the Advancement of Science (AAAS). Most recently he received the Avanti Award in Lipids from the Biophysical Society. He is highly regarded for his creative and innovative scientific approach, for his engaging lecturing style, and his ability to communicate scientifically, both written and verbally.