Editorial

Darón I. Freedberg¹ · Lewis E. Kay²

Published online: 17 August 2019
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This special issue of the Journal of Biomolecular NMR is dedicated to Dennis Torchia on the occasion of his 80th birthday. In the pages that follow, we present a collection of ten manuscripts that span a wide range of topics illustrating modern applications of both solution and solid-state NMR spectroscopy written by Dennis's friends and colleagues in his honor. This breadth is not a surprise as Dennis was extremely well versed in both facets of NMR and contributed extensively to each, focusing on both experiment and theory. His careful, analytical and quantitative approach to characterizing and analyzing biomolecules, first in the solid-state and later in solution, laid the groundwork for understanding the complexities of these fascinating molecules.

A Ph.D. in particle physics at Yale prepared Dennis well for the quantitative side of his research endeavors. But after his doctorate Dennis decided to nurture his nascent interest in biology with a post-doctoral stint in Professor Elkan Blout's laboratory at Harvard University. There, he began to study peptide conformations using solution NMR spectroscopy, observing and characterizing cis-peptide bonds in polypeptides of glycine and proline. Starting in the 1970s Dennis was one of the first to recognize the potential of solid-state NMR as a tool to characterize biomolecules and in particular biomolecular dynamics. While others focused on lipid and membrane structure, Dennis developed and used this new technology to characterize proteins in the solid-state. He studied the structure and dynamics of collagen and elastin in detail and developed powerful tools for extraction of motional parameters. These studies naturally led to innovations in stable isotope labeling of proteins for solid-state NMR studies. Using such labeled proteins elegant studies quantifying protein dynamics in the solid state were presented by employing a combination of ^{13}C , ^{15}N , and ^2H

NMR that continue to be the basis for studies of molecular flexibility today.

In the 1980s Dennis was among the first of a group of spectroscopists to recognize that the molecular biology of the day could be exploited to generate NMR samples that would be useful for both solid and solution-state studies of proteins. Forming a collaboration with Ad Bax, the two began to work on *Staphylococcal nuclease* labeled specifically with ^{13}C and/or ^{15}N at key positions and ultimately with ^{15}N at all nitrogen positions in the molecule. New two- and three-dimensional experiments were developed by the Torchia/Bax groups that truly revolutionized the field, forming the basis of many of the pulse schemes used in solution state NMR studies of protein molecules today. Equally important were contributions that focused on site-specific protein dynamics using heteroatoms such as ^{15}N or ^{13}C , with clever experimental design to ensure high sensitivity and resolution. Subsequent experiments proposed by Dennis and his colleagues focused on milli- to micro-second time-scale dynamics, and elegant applications to medically important proteins such as the HIV protease were published.

It is one thing to be an exceptional scientist; yet another to be a great teacher. Dennis is both. His deep understanding of physics enables him to explain complex concepts on a variety of different levels, from simple vector pictures to Redfield Theory to spherical tensor operators to describe specific transitions in a complex spin system. He is patient and kind. Those of us who have had the pleasure of learning from him—and that includes all of the authors of manuscripts in this edition—and many other scientists around the world are truly very lucky to have been 'touched' by a great scientist, mentor and person.

✉ Lewis E. Kay
kay@pound.med.utoronto.ca

¹ CBER/FDA, Silver Spring, USA

² The University of Toronto, Toronto, Canada