Room 113C: Sunday, February 11

10:30 AM – 12:00 PM
Bruker

Applications of Electron Paramagnetic Resonance (EPR) and Nuclear Magnetic Resonance (NMR) in Biophysical Research

Paramagnetic species and free electrons are common in biological systems, and Electron Paramagnetic Resonance (EPR) is the best method for detecting metals and free radicals in biological samples. EPR provides information on the physical and electronic structure around a paramagnetic center and can be performed in both continuous wave (CW) and Pulse formats. CW EPR provides general information on the spin center and its surroundings, while Pulse EPR offers detailed knowledge of primary to quaternary structure. Hyperfine Spectroscopies, such as Pulse-ENDOR and HYSCORE, provide information on the hyperfine interaction and can map enzyme active sites, binding interactions, and local changes during catalysis. Site-Directed Spin Labeling (SDSL) introduces unpaired spins into proteins, enzymes, or nucleotides, and Pulsed Dipolar Spectroscopy (PDS) measures the dipolar coupling between two spins to gain dynamic information on a larger scale. PDS can yield distance distributions, providing information on the dynamics of regions of interest and temporal resolution of the ensemble. Shaped pulses using Arbitrary Waveform Generator (AWG) technology have opened new avenues for researchers to improve existing experiments and design new schemes for PDS.

Nuclear Magnetic Resonance (NMR) is another powerful technique for biophysical research, and Bruker BioSpin has introduced novel products to facilitate research. Bruker BioSpin continues to drive the evolution of ultra high field NMR magnets, with the completion of the first installation of a 1.2 GHz spectrometer on the North American continent at Ohio State University and the installation of 1.1 GHz instruments at the University of Wisconsin at Madison and the University of Georgia. Bruker BioSpin has also introduced the HelioSmart series of Helium recovery and liquification systems to reduce helium consumption for ultra-high field magnets. On the data processing and analysis end, Bruker BioSpin has introduced deep learning-based modules in their software for better data processing and peak analysis and is collaborating with academic labs on the implementation of AI and machine learning in the analysis of NMR data. The current status of these collaborations will be presented.

In summary, both EPR and NMR are powerful techniques for biophysical research, and Bruker BioSpin is at the forefront of developing and introducing novel products to facilitate research. From ultra-high field NMR magnets and helium recovery systems to deep learning-based modules in their software, Bruker BioSpin is committed to advancing the field of biophysical research.

Speakers
Clemens Anklin, Vice President, NMR Applications & Training, Bruker BioSpin
Alvaro Montoya, EPR Application Scientist, Bruker BioSpin