Summer workshop: Application of NMR spectroscopy in biology and medicine

Instructors: Drs. Tapas Mal and Chunhua Yuan
Facilitators: Professors Michael Ibba and Venkat Gopalan
Course fee: $300 per trainee
Date and time: July 15 -19, 2013 (9:00 AM to 5:00 PM daily)
Location: To be determined

Nuclear Magnetic Resonance (NMR) spectroscopy is an important analytical technique that is widely used in biological research and medicine, and is constantly evolving in part due to rapid advances in information technology. NMR is routinely employed to: determine high-resolution, three-dimensional structures of biological macromolecules in solution, study biomolecular motions that are important for understanding their functions, characterize protein-protein, protein-DNA and protein-small molecule interactions, discover new and improved drugs for various diseases, evaluate newly synthesized small-molecules and isolated natural products, and unravel underlying molecular mechanisms of biological function.

The aim of this course is to provide graduate students and postdoctoral fellows with basic introductory training in state-of the-art NMR technology and its broad applications. Emphasis will be placed on how the technology is used in solving biological problems and facilitating drug discovery. The course will be offered through both lectures (one-third) and practical hands-on training (two-thirds) with NMR instruments. This will provide a unique opportunity for participants to gain knowledge and practical skills in a new technique, and to prepare themselves to be at the forefront of modern interdisciplinary research and education. The participants will learn to perform basic 1-D (one-dimensional) to 2-D and 3-D NMR experiments on biological macromolecules, and become acquainted with data processing necessary to interpret results from these experiments. Unlike regular NMR courses offered during the semester, **this workshop is designed for everyone; no prior knowledge or experience about NMR spectroscopy is required to attend this workshop**. Importantly, during this five-day workshop, participants will have an opportunity for direct hands-on experience with instruments and will also engage in data collection, conversion, processing, visualization and interpretation using several software platforms. Our main goal for this training course is to make participants comfortable with the use of NMR instruments with minimal help from staff (as they do when using other biophysical techniques for their work) and to design and setup experiments to tackle biological problems related to the current research interests of participants.

The course will cover the following topics in a step-by-step and interactive manner:

1) Lectures: provide basic information about NMR spectroscopy and its wide applications through examples and reports from primary literature. (PowerPoint presentations and copies of papers will be provided)

2) Hands-on training: participants will have direct hands-on training with instruments

- Experimental set-up - 1D and 2-D (3-D, if time permits)
- NMR data collection
- Data processing
- Data interpretation
- Software used for data analysis and visualization

This course will have an immense impact on the university's current biological research and education agenda. CCIC is the university's core NMR facility and its main mandate is to provide services to support research, education and training across all OSU campuses. This course will increase CCIC's visibility and increase the user-base, and will thus encourage interdisciplinary research collaborations within OSU. In addition, the training course augments the university's strategic vision towards building a strong structural biology research center at OSU. We believe that the course will have a transformative impact on the university's education and research communities, particularly in the area of biological sciences including RNA biology. The immediate impact of the training course will be evaluated through pre- and post-survey questionnaires. By the end of the course, we are confident that participants will be comfortable in the use of NMR spectroscopy and will have a better understanding of its applications, which they will attempt to apply to their current or future research programs.

To help defray expenses associated with course participation, a registration fee of $300 is required per participant.

Logistics and other information

- NMR protein samples: participants are encouraged to bring their own stably isotope labeled ($^{15}N/^{13}C$) protein samples
- Linux computers: Already arranged (courtesy: Dr. Sandy Shew, Director, Research and Computing; Colleges of Arts and Sciences)
- Number of participants: 12 per course
- Number of days: 5 days (breakfast, lunch and snacks will be provided)
- Experience/background: **No prior knowledge or experience of NMR required**
- Instruments: CCIC 600 and 800 MHz NMR instruments

For more information, please contact the facilitators Profs. Michael Ibba (ibba.1@osu.edu) and Venkat Gopalan (gopalan.5@osu.edu), and/or instructors Drs. Tapas Mal (mal.4@osu.edu) and Chunhua Yuan (cyuan@ccic.ohio-state.edu).

APPLICATION PROCEDURE: Apply by email to anthony.69@osu.edu with the subject header "2013 NMR Summer Workshop". Please include your name, the name of your PI, and a few sentences describing how attending this workshop will further your ongoing/future research objectives. Applications must be received by May 1, 2013.