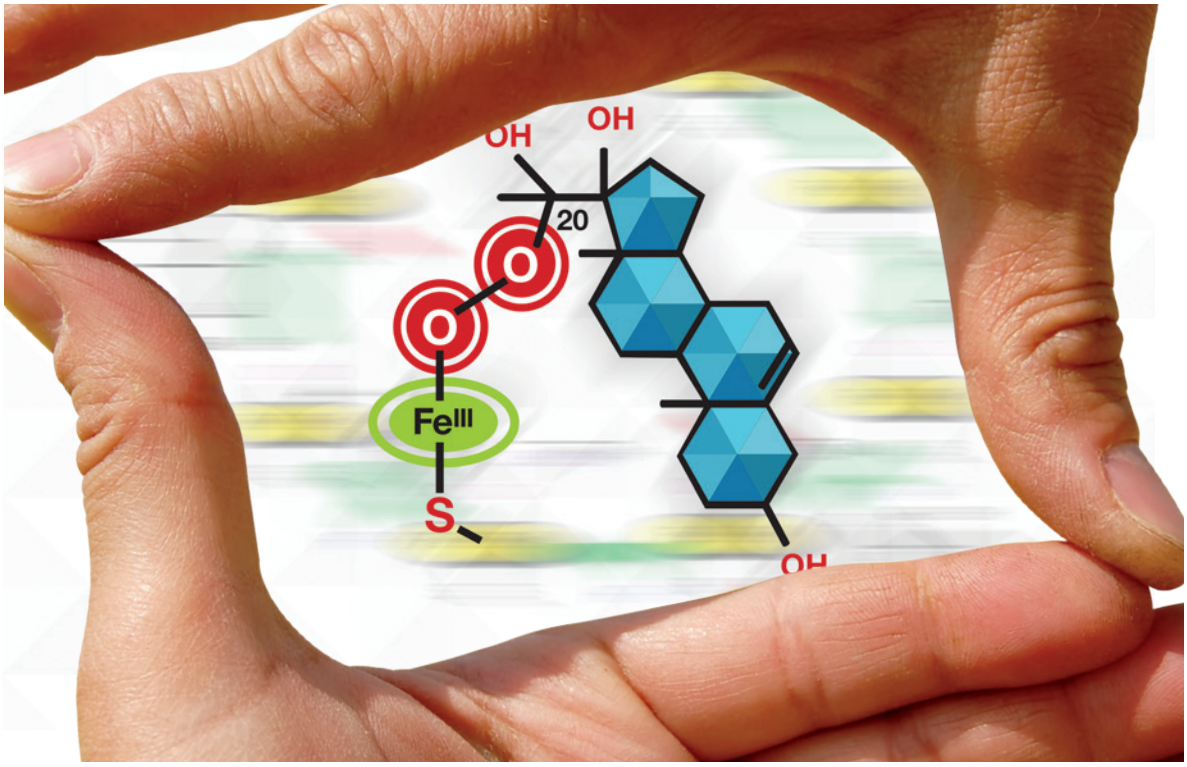

FREEZE-FRAME SNAPSHOTS OF FLEETING INTERMEDIATES

Dr. James Kincaid uses Resonance Raman Spectroscopy to reveal the inner workings of important enzymes.

When Dr. James Kincaid was a graduate student in chemistry at Marquette in the 1970s, working alongside renowned professor Dr. Kazuo Nakamoto, he heard of a powerful technique that was beginning to be used to structurally characterize simple molecules. He could hardly sleep, thinking of important problems that could be attacked with this tool, Resonance Raman Spectroscopy.

After completing early work with RR spectroscopy at Marquette while earning his doctorate, he worked with the world's leading expert in the technique during a postdoctoral fellowship at Princeton University. There, he came to realize that, using pulsed lasers and rapid mixing devices, the technique could provide exquisite structural definition even for reaction intermediates that exist for only a millionth of a second. (Intermediates are chemical species that fleetingly arise and disappear during the progress of a reaction cycle.)

Kincaid's research group spent the next quarter century divided into two distinct teams. One studied reactive heme enzyme intermediates, which perform many crucial roles in human physiology. The other group used RR and other methods to study solar photochemistry and solar energy conversion, including the molecular structures of photoactive molecules inside tiny inorganic particles known as zeolites.

"It was tough because it couldn't have been two more different things," he says, reflecting on the two research projects sustained through a 30-year string of grants — about $6.5 million all told — from the National Institutes of Health, the U.S. Department of Energy and the National Science Foundation.

These days, Kincaid, a Lawrence Haggerty Faculty Award for Research Excellence winner whose work has been cited approximately 4,500 times, focuses on one topic: sorting out how heme enzymes actually perform their remarkable functions. A few enzymes being actively studied by the group, with funding from the NIH, are targets for anti-cancer drug development. The studies being conducted by Kincaid's group and others may support such efforts by providing useful insights on relevant enzymatic mechanisms.

A former Wehr Professor and Way-Klingler Fellow, and current Habermann Chair, Kincaid also will be tackling his first reviews this spring as a roster member of the Molecular Structure and Function review panel of the NIH. "It's certainly not a trivial task," he says. "Each of the two sessions per year will likely entail about four or five weeks of full-time effort."

JOE DIGIOVANNI

RESEARCHER Dr. James Kincaid Professor, Chemistry, and Pfletschinger Habermann Chair