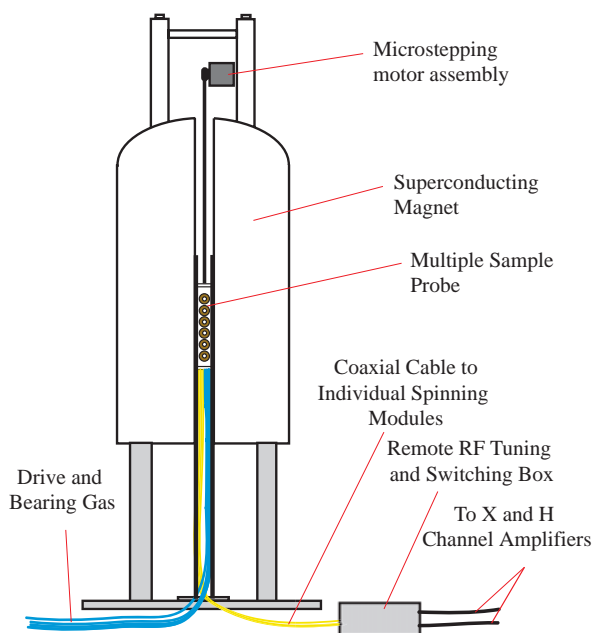


**Solid-State NMR Studies of Pharmaceuticals** (*Prof. Eric J. Munson*). We are primarily interested in developing and applying solid-state NMR spectroscopy to solve important problems involving pharmaceutically relevant compounds. The emphasis is on solid-state NMR, although we rely on other analytical techniques such as solution NMR and powder X-ray diffraction.

Different crystalline forms of the drug often display significant differences in solubility, bioavailability, processability, and physical/chemical stability. For many drugs, multiple crystalline forms exist whose crystal structures are not known. We use solid-state  $^{13}\text{C}$  magic-angle spinning (MAS) NMR spectroscopy to determine the degree of crystallinity, to study the dynamics



Multiple-sample solid-state NMR probe designed to increase throughput in solid-state NMR spectroscopy by a factor of five or more (Nelson *et al.*)

of molecules via relaxation measurements, and to understand the molecular structure based on the chemical shift of the resonances.

We also study both the bulk drug and the drug after it has been formulated for use. In bulk drugs, we are interested in determining the strengths and weaknesses of solid-state NMR spectroscopy for the analysis of polymorphism and as compared to other analytical techniques such as powder X-ray diffraction and infrared spectroscopy. We are also interested in characterizing solid-state reactions that result in a change in form (amorphous to crystalline, crystalline to crystalline, or solvation) or a change in molecular structure (intramolecular and intermolecular reactions). In formulations, we are interested in studying the physical and chemical changes undergone by drugs and excipients upon formulation. These can include drug/drug interactions, drug/excipient interactions, and phase changes within a drug. We are also investigating the release characteristics of drugs from a formulation matrix,

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