Nuclear Magnetic Resonance Facility

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The Nuclear Magnetic Resonance, or NMR, Facility enables researchers to identify and determine the molecular structure of chemical compounds. The NMR Facility’s instrumentation includes superconducting magnets, radio transmitters, and radio receivers. The NMR Facility has five instruments, two with magnet strengths of 9.4 Tesla, one with 11.7, and two with 14.1. In 2017, the Facility will be installing two more instruments, with magnet strengths of 14.1 and 18.8 Tesla. For comparison, the Earth’s magnetic field is 0.00005 Tesla, and most clinical MRI magnets are 1.5 Tesla. The total cost of these instruments is about $6 million. The Facility researchers use instruments directly, so most of the research is hands-on.

NMR is a technique for determining the structure of organic molecules and biomolecules in solution. Both the covalent structure (what atoms are bonded to what) and the conformation (secondary and tertiary structure) are available by techniques that measure direct distances between hydrogens and bond dihedral angles. Specific NMR radio signals can be identified and assigned to each hydrogen in the molecule. Because of the magnetic properties of each atom’s nucleus, information is sent in the radio signal about the immediate environment around that atom: the presence of electronegative atoms, double bonds, and other hydrogen atoms within the molecular structure.

Research in the NMR Facility is focused primarily on potential new medicines, biological molecules, and new materials. The NMR Facility regularly works with researchers in the UA’s Colleges of Science, Agriculture and Life Sciences, Pharmacy, Medicine and Engineering, as well as industry partners dedicated to the research and development of pharmaceuticals, diagnostics, and materials. Researchers in the NMR Facility are currently identifying new anti-cancer compounds from a Pakistani plant, and have recently identified metabolites from an important diabetes drug.

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