Varian Inova-500	Probe Type: 5 mm broadband with Z-gradient Probe Tuning: automatic tune/match Shimming: Gradient Shim or manual shimming Variable Tempearture: -80 to + 130 ^{o}C Additional Probes: 1) 5 mm dual broadband probe with z-gradient (-80 to +150 ^{o}C, manual tune) 2) 5 mm HCN inverse probe with z-gradient (-20 to +80 ^{o}C, manual tune) 3) 10 mm broadband probe (±150 ^{o}C, manual tune)
Varian VNMRS-500 please contact for solid-state NMR inquiries njaren@uoregon.edu	The VNMRS is primarily a solid-state NMR spectrometer, but can also perform high-resolution solution-state NMR. Solids Probe: 1.6 mm HXY CP-MAS probe, capable of spinning up to 40 kHz MAS Liquids Probe: 5 mm broadband probe with Z-gradient (manual tuning)
Bruker AV-500	Probe Type: 5 mm broadband Prodigy Cryoprobe with z-gradient Probe Tuning: automatic tune/match (ATMA) Shimming: gradient shimming with TopShim or manual shimming Variable Temperature: 0 to 80 ^{o}C Additional Probe: 1) 5 mm broadband probe with Z-gradient, capable of ^{1}H-^{19}F decoupling and correlation experiments Notes: has automated Sample Changer (requires training)
Bruker AV-600	Liquids Probes: 1) 5 mm broadband Prodigy Cryoprobe with z-gradient (-40 to +80 ^{o}C) 2) 5 mm broadband (^{15}N to ^{19}F) probe with Z-gradient, capable of ^{1}H-^{19}F decoupling and correlation experiments (routine range ±120 ^{o}C) Probe Tuning: automatic tune/match (ATMA) Shimming: gradient shimming with TopShim or manual shimming Notes: has automated Sample Changer (requires training) Solid-State Probes: 1) 4 mm broadband CP-MAS probe (^{1}H/^{19}F and ^{15}N to ^{31}P)

PROBE TYPES: In an NMR spectrometer, the sample sits inside the probe, which is located inside the magnet. The probe contains radiofrequency (rf) circuitry that is used to both excite and detect the NMR signal. The appropriate frequency depends on both the magnetic field strength as well as the gyromagnetic ratio of a given nucleus.

1) A **broadband** probe has an rf coil that can be tuned to many different (lower frequency) nuclei. These nuclei will differ from ^{1}H and ^{19}F, because the frequencies of proton and fluorine are much higher than the others, requiring separate hardware than lower frequency nuclei. These lower frequency nuclei are often referred to as X-nuclei. The broadband is the inner coil (see below). Broadband probes also have an outer coil that is tuned to the ^{1}H frequency. For historical reasons, a probe that has ^{1}H on the inner coil and the X-nucleus on the outer coil is called an **inverse broadband** probe.

2) A **dual channel** or **dual** probe has an X-channel and a ^{1}H channel. Dual probes are optimized for maximum sensitivity of a single nucleus. Similarly, a **quadruple nucleus probe** has a coil that can be tuned to three different nuclei and a coil that is tuned to proton.

3) On most probes, the ^{1}H channel is double-tuned to include ^{2}H. The ^{2}H channel is frequently used for the NMR lock, but it can also be used for direct observation of deuterium ^{2}H with the lock turned off.

4) **Cryoprobes** have rf coils and preamplifiers cooled by cryogenic liquids such as liquid helium (~10 K) or liquid nitrogen (~80 K). The sample is still at room temperature. The advantage of a cryoprobe is a substantial increase in sensitivity. The signal to noise ratio (SNR) is increased by the reduction of electronic noise at low temperatures. Cryoprobes can be configured in many ways.
    a. A cryoprobe requires a large support system. It is a very expensive probe to operate, and difficult to service.

    b. You must take special care to avoid damaging the cryoprobe. Please use only high-quality, clean NMR tubes.

I. INNER COILS VS. OUTER COILS: the terms "inner coil" and "outer coil" refer to the fact that most probes have two different coils, one of which is wound inside the other. All things equal, an inner coil is more sensitive for observation of a given nucleus because the inner coil is more tightly coupled to the sample. The sensitivity difference is approximately a factor of 2, which requires a 4x the scan time to regain the original sensitivity. Whenever sensitivity is an issue, you should always use a probe that has an inner coil tuned to the frequency of the nucleus you wish to observe.

1) To observe ^{13}C, use a probe with an inner coil tunable to ^{13}C, and an outer coil tuned to ^{1}H for decoupling. Because the NMR sensitivity to 1H is much higher than ^{13}C, if the sample is concentrated enough to observe a ^{13}C spectrum, you will be able to observe ^{1}H in the outer coil. In this case, you sacrifice ^{1}H sensitivity for the convenience of not running another NMR experiment using a different probe.

2) If your sample has poor ^{1}H sensitivity, use a probe with an inner coil tuned to ^{1}H (e.g., the HCN inverse probe on the Inova-500) or one of the Prodigy Cryoprobes. If there is an outer coil tunable to ^{13}C, you can obtain a 2-D NMR such as an HSCQ (a ^{1}H observe experiment that provides ^{1}H-^{13}C connectivity and multiplicity information with a better SNR than the direct observation ^{13}C experiment).