

## **FACILITIES/RESOURCES provided by the Diagnostic Imaging Science Center (DISC):**

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### **FACILITIES**



**Magnetic Resonance Imaging:** The MR research facilities have been configured with support capabilities for carrying out complex structural and functional imaging experiments. The Diagnostic Imaging Sciences Center (DISC, Director: Rane Levendovszky) houses the state-of-the-art, research-dedicated, FDA-approved wide-bore Philips 3T Ingenia-Elition. This recent upgrade provides D-stream digital connections that increase signal-to-noise ratio (SNR) by 10-40%. More importantly, it allows multiband functional imaging and compressed SENSE imaging that was previously unavailable at UW. The revolutionary gradient system that is unique to the Elition provides lesser distortions than the

current scanner. They also allow a 20-25% increase in temporal resolution compared to its predecessors, which is of considerable advantage to BOLD fMRI studies. Diffusion scans with ultra-high b-values of 10,000-15,000 s/mm<sup>2</sup> are achievable on the Elition allowing multi-compartment modeling studies using DTI.

Multiple coils are available to suit researcher needs and include a 32-channel Rx coil, 15-channel neurovascular coil, 8-channel knee coil for primate image, torso coils, extremity coils, wrist coils, surface coil for small animal imaging, and pediatric coils. DISC MRI services includes consultation with MRI physicist, development of sequence protocols, protocol testing as needed, technologists for scanning, research scientist/engineer for coil and phantom development needs as well as IT support for data storage.

#### **Ancillary Imaging Equipment:**

Extensive additional support equipment is available in the imaging labs for complex neuroimaging research studies in humans and non-human primates as well as other animal imaging. These include physiologic monitoring systems for:

- ECG signal monitoring
- Respiratory rate
- Non-Invasive blood pressure measurement
- Pulse oximetry
- End tidal CO<sub>2</sub>

Customized fMRI paradigm presentation and subject response hardware and software (E-Prime 2.0 Professional Suite, Psych Toolbox, Presentation, Inquisit, PsychoPy) are installed that provide high quality audio and visual presentation. Available fMRI stimulus equipment includes:

- A computer-controlled LCD projector with a long throw lens that projects onto a back-projection screen located within the bore of the magnet for visual stimulus presentation
- A pair of five button, two-hand fiber optically coupled response boxes
- A pair of single button, carbon wire response boxes for use with each hand
- Audio presentation is provided using a high performance tightly controlled amplifier (Crown D-75) with improved talkback system coupled with high dynamic range piezo-electric headphones
- A set of pneumatically driven audio headphones is also available for less critical audio use

- A phase canceling microphone that actively suppresses background noise from the MR gradients to better hear subject audio responses during an fMRI study
- Two different eye tracking systems (EyeLink 1000) are in place, each available for affiliate use, depending on their preference, to provide correlation of visual focus with fMRI acquisition
- MRI compatible eye-glasses with pre-made lenses of all diopters
- A specially developed hand writing system that enables fMRI testing of subject written responses while in the magnet bore
- Weighted blankets to reduce motion in small children
- A Pearl-Tec Crania is available for children and adults. It is a subject positioning aid made of air chambers filled with polypropylene pearls and adapts to the patient's head shape while minimizing motion artifacts, thereby improving image quality and reducing the number of exam repetitions.

## RESOURCES

DISC provides support for a wide range of imaging protocols, custom coils, and data storage facilities. DISC also provides MR physicist, technologist and IT support for optimal acquisition protocol and experimental design. Critical resources available to researchers are:

**Extensible Neuroimaging Archive Toolkit (XNAT).** XNAT is an open-source eXtensible Neuroimaging Archive Toolkit developed by the NRG at Washington University in Saint Louis. It provides secure storage and retrieval of experimental research data in this case, DICOM images or Philips PARREC data. XNAT is hosted on an HP ProLiant DL 380p Generation 8 server with 20TB of storage (12.7 TB RAID 6). The XNAT system used for all ongoing and new studies to store imaging data. These storage systems are periodically upgraded and maintained by the DISC computer system administrator.

**Subject Preparation Rooms.** DISC has access to 2 preparation rooms to wait, prepare for the scan and 1 room for neuropsychiatric testing.

**Mock Scanner:** A mock scanner is available to all DISC users for improving subject comfort. It includes scanner bore, cowling, and table geometry that is an exact replica of the current Philips scanner. It also incorporates a 32-element head coil shell procured from Philips, and hardware that emulates table vibration, gradient switching noise, and AV task presentation identical to the Philips 3T system. It contains a head motion tracking and training system that is especially valuable for reducing head motion in scans of children. It is sited adjacent to the DISC MR Lab allowing researchers to schedule mock scanner sessions shortly prior to their 3T scan experiment. A stimulus presentation computer running E-prime, Presentation, Inquisit, and PsychoPy paradigm presentation software and attached button boxes allow experimental tasks to be transacted in the mock scanner just as they are in the 3T. A trakSTAR tracker from Ascension Technology Corporation with a MoTrak console allows for continuous monitoring of head position and training to reduce head motion.

