

MRI FACILITY DIRECTORY

Name of Institution: **The University of Iowa**
Institution's Address: 375 Newton Road
L169 MERE
Iowa City, IA 52242

Web Site Address: <https://mri.radiology.uiowa.edu>

Can accommodate both Pre-Clinical and Clinical research projects.

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Below is a brief narrative of the institution's MRI capabilities. The following information was provided by the institution. BioPAL has compiled the MRI facility directory to aid researchers access MRI services. The listing is not an endorsement by BioPAL.

About Our Center

The University of Iowa MR Research Center was established in August of 2004 with the acquisition of a 3T Siemens Trio scanner, shared between research and clinical usage. While the Center is within the Department of Radiology, it is run as a Core University facility. The facility is managed on a daily basis by a Director, Vincent Magnotta, PhD and two co-directors, Alan Stolpen, MD, PhD and Dan Thedens, PhD, with oversight provided by a Research Advisory committee that reviews new project proposals and equipment acquisitions. Since its inception, the equipment managed by the Research Center has expanded. In 2006, a research dedicated 1.5 T Siemens Avanto scanner was loaned to the University by Siemens Medical Solutions to support research studies. Then, in 2007 an NIH/NCRR High End Instrumentation grant supported the acquisition of a research dedicated 3T Siemens TIM Trio scanner.

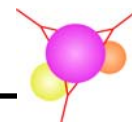
The Research Center is comprised of two distinct locations. The shared clinical/research 3T scanner and the research Avanto scanner are housed in the lower level of The University of Iowa Hospitals and Clinics while the research dedicated 3T scanner is located in the College of Medicine. While the primary users of the research facility are Departments from the College of Medicine (Psychiatry, Neurosurgery, Radiology, Neurology), projects from other Colleges including Public Health and Engineering have been supported. In addition, projects from outside the University have also been conducted.

Standard operating hours for the two research dedicated scanners are from 8:00am to 4:30pm, Monday through Friday. During this time, technologists are provided to run the scanners. The shared research/clinical scanner is available all day Tuesday (8-4:30) and Thursday afternoon (1-4:30) for research studies. The scanners are also available after-hours if technologist coverage is available, or if the user is certified to conduct MR studies on his/her own.

MRI Suite – 0400 JCP

The research dedicated Siemens 1.5T Avanto and the shared research/clinical Siemens 3T TIM Trio are located in the Clinical MRI Imaging Center on the lower level of John Colloton Pavilion in the University of Iowa Hospitals and Clinics. The state-of-the-art, 8,000 square foot MR facility houses five offices for scientific staff and contains a conference room. Siting the scanners centrally within the hospital gives researchers the opportunity to schedule appointments for subjects who are inpatients and also for subjects requiring gadolinium contrast. The facility supports the scanner and equipment rooms for these systems, and houses the computer data storage system for the center.

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Research 1.5T Avanto

The Siemens 1.5T Avanto scanner is equipped with the SQ gradient engine, 18 channel RF receiver chain, and multi-nuclear capability. The system is outfitted with 11 coils including: 12 channel head, spine array, body, extremity, wrist, peripheral array, small and large flex, shoulder, endorectal and breast. The Avanto is also outfitted with the following packages: Echo-planar Imaging, 3D Dynamic Motion Correction, Diffusion Tensor/HARDI Imaging, BOLD Imaging, AutoAlign, Cardiac Imaging Package, Single Voxel Spectroscopy, and Chemical Shift Imaging. The scanner room is furnished with the Avotec Silent Scan System, rear projection screen, LCD projector, Presentation computer/DVD player, Invivo Physiologic monitoring system, MEDRAD Power injector and an optical to TTL Converter for scanner synchronization with stimulus computer.

Shared Research/Clinical 3T Trio

The Siemens 3T TIM Trio scanner is outfitted with the TQ gradient engine and an 18 channel receiver chain. The scanner has 7 coils: CP-head, 8-channel head, 12 channel-head, spine-array, body array, extremity and wrist. The shared 3T is outfitted with the following packages: Echo-planar Imaging, BOLD Imaging, Diffusion Imaging, Single Voxel Spectroscopy, Chemical Shift Imaging, PEPSI and EPSI Spectroscopy. Functional MRI equipment available includes Avotec Silent Scan System, a stimulus computer (E-Prime and Presentation), a rear-projection screen, LCD Projector, MIND Input Device, Invivo Physiologic Monitoring, MEDRAD Injector and an optical to TTL Converter for scanner synchronization with stimulus computer.

MR Research Suite – L169 MERF

The MERF facility is comprised of 1,500 square feet of space that houses the research 3T scanner, equipment room, electronics shop, patient waiting room, specimen preparation / wet lab, control room, image processing lab, and personal lockers. The image processing laboratory contains 13 cubical workspaces that are utilized by staff, graduate students, and investigators. The facility contains ten research workstations and multiple general-use computers available with Windows, Linux and Macintosh operating systems. The systems contain a number of image analysis tools including FSL, AFNI, Slicer3, ImageJ and BRAINS. In addition, one workstation is outfitted with the Siemens IDEA/ICE pulse programming and image reconstruction environments.

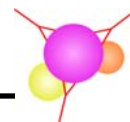
Across from the scanner suite is a subject waiting room complete with cable TV. Joined to the waiting room is a private dressing room and locker area supplied with linens, gowns and pants. Down the hall from the subject waiting room is a specimen preparation laboratory, accessible only by University ID card access. Available to researchers is 250 square feet of work space, a mobile industrial prep table, wash station, narcotics lockbox, adjustable overhead lighting, and private lockers to store valuables.

Research 3T TIM Trio

The Research 3T is equipped with the TQ gradient engine, multi-nuclear capability, and 18 RF receiver channels. The scanner contains the following packages: Echo-planar Imaging, BOLD Imaging, Advanced Functional Neuro, Diffusion Tensor/HARDI Imaging, Arterial Spin Labeling, Single Voxel Spectroscopy, Chemical Shift Imaging and Cardiac Imaging Package. Several research sequences including T1-rho, EPSI, and PEPSI are being evaluated for research projects. The scanner is outfitted with the 6 coils: head, spine, body, extremity, wrist and endorectal. The room contains the BIOPAC physiological monitoring and recording system capable of capturing respiratory, photoplethysmograph (PPG), galvanic skin response (GSR), O2 and CO2 modules that can be used to perform real-time oxygen and carbon dioxide concentration monitoring in humans and small animals.

Several tools exist for supporting fMRI experiments, including a rear-projection DA-LITE screen, 3500 lumen DLP projector, Avotec Silent Scan and voice recorder, Avotec goggles, Real Eye Imaging System, fMRI compatible MediGoggles, FOMRI II Dual Channel fiber optic microphone, Optical to TTL converter for synchronization and a

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Stimulus computer complete with E-Prime, Presentation, and Neuroagnostics fMRI Workflow software. The system also contains the MIND Input Device to record user responses to audio and visual stimuli.

Computer Facilities

The Research Center currently maintains a research PACS system based on the CTN software that is used to archive and share data with investigators. This system is supported by a 4 terabyte Linux sever. We are currently working with the College of Medicine to purchase and install the Bioscribe system from Vivalog to replace our existing PACS system. A second 4TB RAID system is used as a central file server for the Center. We have recently contracted with the College of Engineering Computer Support Services to manage our computer infrastructure.

Personnel

Presently the Research Center employs the following personnel:

- 1 MR Technologist, 100% effort – 3T Trio scanner – Marla Kleingartner, RTR MR
- 1.5 MR Technologists, 100% & 50% effort – 1.5T scanner / shared 3T scanner – clinical technologist Pool
- 1 Program Assisstant, 100% effort – Joe Ekdahl, BA
- 1 Radiologist, 10% effort – Alan Stolpen, MD, PhD
- 1 Computer Administrator, 10% effort – College of Engineering

Research Projects

The Research Center currently supports more than 40 research projects from ten different departments within the University of Iowa. The primary utilization of the equipment has been for neuroimaging studies. This includes several large studies from the Departments of Psychiatry, Neurology, Anesthesia, and Radiology. The majority of these studies have acquired anatomical brain scans for brain morphology studies. A smaller number of studies have utilized fMRI and diffusion tensor imaging. Other research projects have utilized MR imaging to study cardiac function, assess cartilage, liver fat content, and have evaluated subcutaneous facial implants.

Research Avanto Usage (0400 JCP) – FY 2007

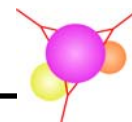
Last year, a total of 673 hours were scheduled on the Research Center's Research Avanto, for an average of 56 scheduled hours per month. For the Avanto, the busiest month of fiscal year 2007 was February, with a total of 91.5 scheduled hours. The Avanto spent all of last year as a shared machine between clinical and research users as a result of MR Center renovations. Since the completion of the Phase II renovations within the MR Center, the scanner has been utilized as a research dedicated scanner. Slots not filled 12 hours prior to an open timeslot are utilized for clinical scans to handle emergency and same day add-on scans to the clinical schedule. The percentage of time allocated to clinical scans is regularly compiled, and the hospital covers the equivalent percentage of the Service Contract and technologist time.

A total of 696 scans were scheduled on the Research Avanto in fiscal year 2007. Psychiatry scheduled the most scans with a total of 238. All of these scans were collected to study brain morphology in a number of disorders. Since it came online in January of 2006, the Avanto has gradually been utilized by more investigators for more projects.

Some projects currently using the Research Avanto include:

- Group Study to Evaluate Low Doses of the MTP-Inhibitor Aegr-733 on Hepatic Fat Accumulation as Measured by MRI
- Epidemiology of Diabetes Interventions and Complications
- Marijuana Use: Structural MR Component
- Structural Imaging in Huntington's Disease
- Structural Imaging In Schizophrenia
- Highly Automated Analysis of 4-D Cardiovascular MR Data
- Hyperpolarized Helium Lung Imaging

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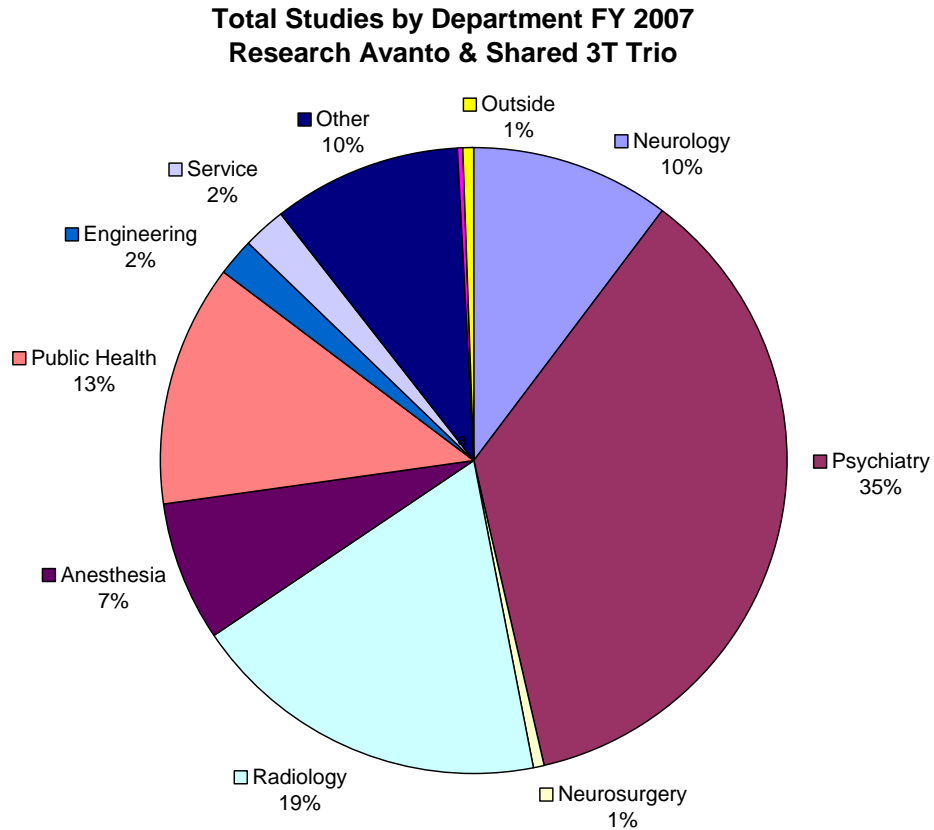
Shared 3T Trio Usage (0400 JCP) – FY 2007

A total of 867 hours were scheduled on the Shared 3T Trio scanner in fiscal year 2007, for an average of 72.25 scheduled hours per month. The busiest month of the year for the shared 3T was April, with a total of 105 scheduled hours. June had the least scheduled hours at 50.5. Due to the addition of the new completely research dedicated 3T, weekly availability for the shared 3T has been reduced to two days per week, and is tentatively scheduled to be bought out by the hospital for clinical imaging within a year.

There are currently only two protocols that are still utilizing this equipment on a regular basis:

- Preterm Transfusions: Brain Structure/Function Outcomes
- Brain Development of Adolescent Marijuana Users

The following graph displays departmental usage for the Research Avanto and Shared 3T Trio for fiscal year 2007.



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Research 3T Trio Usage (L169 MERF)

Since it came online in August of 2007, the research 3T Trio in the College of Medicine's Medical Educational Research Facility has steadily been used for more and more projects. Initially, convincing some researchers to utilize the research 3T instead of the shared 3T generated some opposition and logistical questions. In general, researchers were excited about the new space, but apprehensive to move their operations from the hospital, where they had become comfortable with the environment and equipment. In August, an open house was held in an attempt to generate exposure for the research 3T and to demonstrate the available facilities and services the new suite could offer. By holding the open house and actively reaching out to researchers, nearly all researchers began scheduling projects on the new scanner.

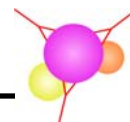
Over the six-month period that the research 3T has been in use, it has averaged a total of 36 scheduled studies per month. With 51 scheduled scans, February has been the busiest month, and December the slowest, generating only 33 scheduled scans. This was due in part to several snow storms that resulted in rescheduling or canceling many studies. With the exception of December, every month has generated more business than the last.

Some projects currently utilizing the research 3T include:

- Neural Systems Underlying Sign Language Production
- Anatomical Substrates of Complex Behavior
- Cognitive and Functional Brain Changes in Preclinical Huntington's Disease
- Elderly Cancer Survivors: Cognitive Outcomes & Markers of Neurodegeneration
- Evaluation of Schizophrenia First Degree Relatives
- Assessment of Cartilage Health and Surgical Repair Following Articular Trauma
- Effects of Delirium on Cerebral Integrity in Older Cancer Patients
- Facial Emotion Processing

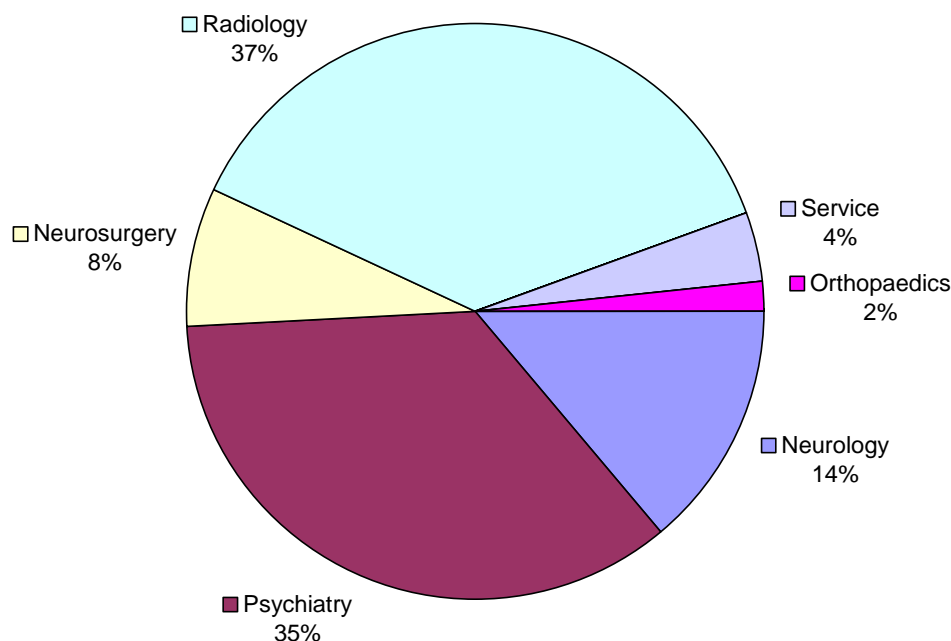
Departmental usage for the Research 3T is outlined in the graph below.

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Research 3T Total Studies by Department Since Inception



Development

The MR Research Center aims to maintain equipment as state-of the art. This requires an investment in both the hardware and software that compose our center's mainstay, and also an investment in recruiting and maintaining exceptional personnel. To that end, we have been actively pursuing development in the following areas to advance our research at the university:

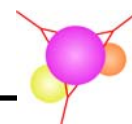
Diffusion Tensor Imaging (DTI) – This is of interest mainly for evaluation of brain morphology changes associated with neurological and psychiatric disorders. We have been working on novel schemes for rotating the diffusion tensor and multi-shot approaches for high resolution Diffusion Tensor Imaging. We are also working on tools for fiber tracking. These tools are currently available through the Neuroimaging Informatics Tools and Resources Clearinghouse (www.nitrc.org).

T1rho Imaging – The primary application of this technique is to assess and quantify pathologic cartilage matrix changes that are not detectable with standard morphological MRI. Initial work has focused on the knee joint in an ACL injury population to determine the suitability of T1rho as an imaging biomarker for early detection of osteoarthritis. Broader application to the ankle and hip joints are also being explored. We are also evaluating the utilization of this method to study pH changes that may result from stress including Post Traumatic Stress Disorder and depression.

Arterial Spin Labeling – Using the Siemens ASL WIP for VB13, we have started to evaluate this technique for functional brain activation studies. To date we have successfully generated reproducible measurements within the occipital cortex and are starting to evaluate higher order cognitive activation studies.

MR Spectroscopy – We have been working on tools for partial volume correction of brain MR spectroscopy studies and have been able to obtain the PEPSI sequence from Stefan Posse. Various pilot studies are currently being conducted

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using 1H-MRS, and at least one research group has voiced interest in evaluating treatment trials in Huntington's disease using 1H-MRS.

Magnetic Source Imaging – Dr. Xiong is currently working on assessing the validity and reliability of magnetic source imaging. This is a potentially powerful tool to understand brain function at a high temporal and spatial resolution.

Future

Presently, the MR physicists associated with our Research Center are nearly 100% committed to projects within the center. In order to continue our growth to include projects such as the development of pulse sequences, T1rho or Amide proton transfer for the evaluation of pH changes, additional staff in the form of a post doctoral fellow or research engineer will be needed.

An area of weakness within the MR Research Center is in spectroscopy. Investigators interested in applying spectroscopic imaging techniques to their studies could be greatly aided by a faculty member who is a spectroscopist by training. Presently, we are working with a Neuroradiology fellow, Andres Cappazino, who has a background in MR spectroscopy and is collaborating with the University of New Mexico, to enhance our ability to perform 1H-MRS studies. We also have the ability at both 1.5T and 3T to acquire data from nuclei other than 1H.

The University of Iowa Colleges of Medicine and Engineering recently formed the collaborative imaging initiative, Iowa Institute of Biomedical Imaging (IIBI). This institute is being lead by Milan Sonka from the College of Engineering and Geoffrey McLennan from the College of Medicine. We are working closely with this group to advertise our Center and services to other groups throughout the University. The College of Medicine is currently in the design and development stages for a new research building on the medical campus known as the Iowa Institute of Biomedical Discovery. The building will house the IIBI core team and will provide space for three additional scanning bays for state-of-the-art imaging equipment. We are envisioning one of these bays supporting a 7T scanner. Work will need to be done to support the acquisition of such a system.

The current Trio system could be enhanced with a 32 channel RF subsystem, 32 channel head array coil, and extremity array coil. These items are under consideration for future upgrades of the system. To support the upgrade of the scanner we are considering grant avenues such as the NIH shared equipment grant mechanism as well as private foundations.

Finally, we are working to continue to develop additional interest in using MR imaging to assess disease pathology, develop imaging biomarkers, and evaluate treatment response. In this effort, we will participate in an Iowa Obesity Conference on April 8 where the use of imaging to study obesity will be discussed. This conference is being jointly sponsored by the Institute for Clinical and Translational Science & Iowa Institute for Biological Imaging. The research center is also working with the Department of Neurosurgery to expand their use of fMRI and diffusion tensor imaging in the study of temporal lobe epilepsy. We anticipate a significant increase in the utilization by this department within the next two years. Finally, we are working with Neuroagnostics to discuss potential research projects that would be funded by this corporate sponsor to assess the utility of the fMRI Workflow software for clinical applications.

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