The Hyperpolarized MRI Technology Resource Center (HMTRC) is a Biomedical Resource Technology Center whose mission is to develop new advances in dissolution DNP techniques & instrumentation, specialized data acquisition methodology, and analysis software for preclinical and clinical research.

http://www.radiology.ucsf.edu/research/labs/hyperpolarized-mri-tech

The March 2016 Hyperpolarized Carbon-13 MRI Technology Development Workshop includes hands-on training, lectures, and discussions on dissolution DNP methodology, polarizer instrumentation, MR Sequence and Acquisitions, Bioreactors, Animal Preps, Chemistry & sterile Pharmacy Preps, Clinical Translation, and Software.
Workshop Schedule

Day 1

Tuesday, March 29th

8:00am   Breakfast/Registration   Genentech Hall Auditorium
8:15     Introductions: HMTRC Director, Dr. Dan Vigneron
8:25     Dissolution DNP Methodology & HP $^{13}$C MR Acquisition
          Developments: Dr. Peder Larson, UCSF
8:40     Development of HP MR Molecular Imaging Probes and Cell & Tissue
          Culture Models: Dr. John Kurhanewicz & Marcus Ferrone PharmD, UCSF
9:00     Open Source Tools and Methods for Processing Hyperpolarized $^{13}$C
          MR Data: Dr. Sarah Nelson, UCSF
9:15-9:45 Coffee Break
9:45-12:30pm Hands-on Breakout Sessions
          Hands-on demos & discussions on five DNP Polarizers, MR Sequence and Acquisitions,
          Bioreactors, Animal preps, Chemistry preps, Research & Clinical Fluid Path Assembly will be
          held in the Surbeck Laboratory for Advanced Imaging and the UCSF Biomedical NMR Lab.
          Software hands on training and discussions will be held in Genentech Hall N-114.
12:30-1:30 Lunch & Poster Session
1:30-3:30 Two Hands-on Breakout Sessions
AND 3:30-5:30 Hands-on demos & discussions on five DNP Polarizers, MR Sequence and Acquisitions,
          Bioreactors, Animal preps, Chemistry preps, Research & Clinical Fluid Path Assembly will be
          held in the Surbeck Laboratory for Advanced Imaging and the UCSF Biomedical NMR Lab.
          Software hands on training and discussions will be held in Mission Hall MH-1407.
5:45     Keynote Lecture by Dr. Craig Malloy MD, University of Texas Southwestern
          Medical Center - “Perspectives on Clinical Research with Hyperpolarized Carbon-13 MRI”
6:15     Keynote Lecture by Dr. James A. Bankson PhD, University of Texas MD
          Anderson Cancer Center - “Modeling and analysis of HP signal evolution”
6:45-8:00 Dinner Reception
Workshop Schedule
Day 2

Wednesday, March 30th

8:30am   Breakfast/Registration   Genentech Hall Auditorium

9:00-11:30am   Hands-on Breakout Sessions
Hands-on demos & discussions on five DNP Polarizers, MR Sequence and Acquisitions, Bioreactors, Animal preps, Chemistry preps, Research & Clinical Fluid Path Assembly will be held in the Surbeck Laboratory for Advanced Imaging and the UCSF Biomedical NMR Lab. Software hands on training and discussions will be held in Mission Hall MH-1401.

11:00-1:00pm   Pharmacist Roundtable
Designed for pharmacists and other SpinLab personnel responsible for the sterile drug compounding/manufacturing and assembly of sterile fluid paths for clinical studies. Discussions during the roundtable will be focused on the development of facilities (clean rooms and/or compounding aseptic isolators), training of personnel, creation of master batch records and standard operation procedures, and the planning of collaborative stability studies that will further propel the global hyperpolarized research program forward. Discussions will be held in Mission Hall MH-1407.

11:30-2:30pm   Poster Sessions

12:30-1:30pm   Lunch Reception

1:30-3:00pm   Hands-on Breakout Sessions (Continued)
Hands-on demos & discussions on five DNP Polarizers, MR Sequence and Acquisitions, Bioreactors, Animal preps, Chemistry preps, Research & Clinical Fluid Path Assembly will be held in the Surbeck Laboratory for Advanced Imaging and the UCSF Biomedical NMR Lab. Software hands on training and discussions will be held in Mission Hall MH-1401.

Talks by industry and pharmacy colleagues related to Hyperpolarized Carbon-13 MRI will be held in the Genentech Hall Auditorium.

3:00-3:30pm   Lecture by Dr. Rui Chen PhD, Senior Scientist, GE Global Research Center - “Expanded C-13 Agent Status”

3:30-4:00pm   Lecture by Matthias Mueller PhD, Physicist, RAPID Biomedical GmbH - “RF Coils for Hyperpolarised $^{13}$C Studies: Towards Human Application”

4:15-4:45pm   Pharmacy Discussion with Feedback from Roundtable: Dr. Marcus Ferrone PharmD

4:45-5:00pm   Wrap-up
HMTRC Workshop Faculty & Staff

Daniel B. Vigneron Ph.D. is a Professor in the Departments of Radiology & Biomedical Imaging and Bioengineering & Therapeutic Sciences at UCSF and is a member of the UCSF Cancer Center and the UCSF/UCB Bioengineering Graduate Group. He is the director of the NIH-funded Hyperpolarized MRI Technology Resource Center (HMTRC) and the project leader for the development of specialized dissolution Dynamic Nuclear Polarization (DNP) methodology & HP 13C MR acquisition techniques. His research focuses on the development and translation of new MR techniques for morphologic, metabolic and functional imaging and has extensive expertise in hyperpolarized carbon-13 MR overseeing the polarizer instrumentation and MR technique development at UCSF for preclinical research and translation for patient clinical trials of carbon-13 pyruvate.

John Kurhanewicz Ph.D. is a Professor in the Departments of Radiology & Biomedical Imaging and Pharmaceutical Chemistry at UCSF, and is a member of the California Institute for Quantitative Biology, the UCSF Cancer Center, and the UCSF/UCB Bioengineering Graduate Group. He is the director of the UCSF Biomedical NMR lab that contains the 14T micro-imaging spectrometer, 11.7 HMR spectrometer and two adjacent DNP polarizers with extensive experience in NMR and MRI research for prostate cancer and other applications. He leads the HMTRC development of novel NMR-compatible cell & tissue culture bioreactors, new & optimized hyperpolarized molecular probes, and correlative pathological & molecular biomarker assays for preclinical hyperpolarized MR research.

Sarah J. Nelson Ph.D. is a Professor in the Departments of Radiology & Biomedical Imaging and Bioengineering & Therapeutic Sciences at UCSF. She has extensive experience in mathematical modeling, computation and MRSI data analysis. She has led the development of novel algorithms and techniques for the processing and display of MR spectroscopy and imaging data with a focus on brain tumor research. Dr. Nelson has worked closely with Drs. Vigneron and Kurhanewicz on the analysis of hyperpolarized 13C MR data for a wide variety of research projects. Dr. Nelson leads the HMTRC development of new analysis procedures and free open-source software specialized for hyperpolarized 13C metabolic imaging.

Robert Bok M.D., Ph.D. is a certified Urologic Oncologist and Assistant Professor in the Department of Radiology & Biomedical Imaging working in the UCSF Cancer Imaging Program. He received a Ph.D. in Biochemistry as well as an M.D. with specialized training in Internal Medicine and Hematology/Oncology. He has extensive experience in preclinical and clinical MR imaging research and oversees the animal facilities in the Surbeck Laboratory for Advanced Imaging and Biomedical NMR lab. Dr. Bok led the animal model aspects for numerous prior preclinical hyperpolarized MR studies and oversees the biological and animal care aspects for HMTRC preclinical research projects.

Peder Larson Ph.D. is an Assistant Professor in the Department of Radiology & Biomedical Imaging at UCSF. Dr. Larson’s graduate work in the Department of Electrical Engineering at Stanford University provided extensive training in technical MRI pulse sequence development. During his post-graduate research at UCSF, he continued to pursue technical MRI improvements, with a focus on hyperpolarized 13C applications and prostate 1H MRSI. He is the PI of an NIH R00 grant titled Hyperpolarized C-13 MR Pulse Sequence Developments for Novel Contrast and an expert in HP 13C MR sequences.

David Wilson M.D., Ph.D. is an Assistant Professor in the Department of Radiology & Biomedical Imaging. He received his Ph.D. in Chemistry and is currently faculty in the UCSF Neuroradiology section. Dr. Wilson’s research is focused on the development of new agents for molecular imaging using hyperpolarized 13C MR and positron emission tomography combining both his strong chemistry background and medical training. He has been highly successful in developing new hyperpolarized molecular probes and with Prof. Kurhanewicz is working on HMTRC projects in optimizing hyperpolarized probe preparations and probe polarization procedures.
Mark Van Criekinge M.S. is a highly experienced Engineer with outstanding expertise in DNP (dynamic nuclear polarization) process engineering, high field magnet systems, low-temperature cryo-inserts, polarizer electronics and dissolution fluid path design and construction. He has extensive industrial experience having worked as a lead systems engineer with Varian Inc. for 20 years and with the DNP polarizer, having worked with Oxford instruments on the development of the commercial HyperSense DNP polarizer product. He leads HMTRC polarizer instrumentation developments.

Subramaniam Sukumar Ph.D. has extensive experience in MR sequence development having formerly worked at GE and Varian and oversees the MR technique development on the 14T imaging-spectrometer in the Biochemical NMR Lab. He has, under the direction of Drs. Kurhanewicz and Vigneron, developed high resolution MR and novel hyperpolarized \textsuperscript{13}C sequences for high field 14 T MR animal studies. For HMTRC projects, Dr. Sukumar develops new MR sequences optimized for the needs of collaborative projects.

Lynn Delos Santos is a highly experienced staff research scientist specializing in pathology, immunohistochemistry and biochemical arrays. She oversees Dr. Kurhanewicz’s pathology and molecular biology lab in which tissue pathologic and biochemical analysis is done for HMTRC studies.

Jason Crane Ph.D. is the Software Manager in the Surbeck Laboratory at UCSF. Under the direction of Prof. Sarah Nelson, he leads key aspects of the development of the free open-source analysis tools for hyperpolarized carbon-13 MR. He is the primary author and designer of the SIVIC package and has extensive experience in integrating the software developed by the research staff with the MR scanner and other third party packages. For the HMTRC, he is expanding the capabilities of the SIVIC package for Hyperpolarized MR, implementing the algorithms needed for reconstructing and interpreting the data and designing modules to address the needs of the HP research projects. Dr. Crane also trains students and both intra- and extra-mural investigators in the use of these specialized HP MR analysis tools.

Lucas Carvajal M.S. is a highly experienced Mechanical and RF Engineer at UCSF. He has extensive experience in coil construction, computer modeling of coil reception profiles, and MRI/MRSI data analysis. He has been very involved in the construction of specialized coils for a wide variety of applications.

Cornelius von Morze Ph.D. is a Senior Bioengineer scientist in the Department of Radiology & Biomedical Imaging at UCSF with extensive experience in preclinical applications for imaging hyperpolarized carbon-13 contrast agents for investigations of metabolism, perfusion, and transport. He is also developing a new research program focused on renal HP MRI studies.

Marcus Ferrone Pharm.D. is an Associate Professor in the Department of Clinical Pharmacy at UCSF. He served as the Director of the Drug Products Services Laboratory (DPSL), a clinical service, teaching, and research facility operated within the Department of Clinical Pharmacy. Under his direction, the DPSL maintained state and federal licenses to operate as both a pharmacy and a manufacturing center that prepared sterile products as well as oral and topical dosage forms under cGMP conditions. Thus, he has extensive expertise in the area of pharmaceutical formulation design and development strategy to ensure the delivery of a stable, high quality drug product in addition to navigating the investigational medicinal product through the rigorous regulatory process. After transitioning from Director of DPSL, he now leads the research pharmacy program at UCSF developing hyperpolarized molecular imaging agents for clinical research studies. His current research focus is to develop and formulate hyperpolarized drug products for administration to patients undergoing MR imaging studies.
**Location:** The HMTRC Workshop will be held on Tuesday, March 29 & Wednesday, March 30, 2016 on the UCSF Mission Bay Campus starting in the Genentech Hall Auditorium. Your name badge and workshop program will be available for pick up at the registration counter located outside the Genentech Hall Auditorium.

Registration desk is located in the East Corridor of Genentech Hall entrance, outside the Auditorium on the 1st Floor.
1) Title: Detection of MDSC function using hyperpolarized [6-13C]-arginine magnetic resonance spectroscopy
Chloe Najac, Myriam M. Chaumeil, Gary Kohanbash, Caroline Guglielmetti, Jeremy Gordon, Hideho Okada, Sabrina M. Ronen
Department of Radiology & Biomedical Imaging, University of California San Francisco

2) Title: Pyruvate to lactate metabolic changes during neurodevelopment measured dynamically using hyperpolarized 13C imaging in juvenile murine brain
Yiran Chen, Hosung Kim, Robert Bok, Subramaniam Sukumar, Xin Mu, R Ann Sheldon, A James Barkovich, Donna M Ferriero, Duan Xu
Department of Radiology & Biomedical Imaging, University of California San Francisco
Department of Pediatrics, University of California San Francisco

3) Title: Developing a Safe and Effective Compounding Method for Hyperpolarized [1-13C] Pyruvate to be Used in the Clinical Evaluation of MR Molecular Imaging in Cancer Patients
Department of Clinical Pharmacy, University of California San Francisco
Department of Radiology & Biomedical Imaging, University of California San Francisco
General Electric Healthcare

4) Title: Dynamic Nuclear Polarization of Biocompatible 13C-Labeled Carbonates for pH Imaging
Dave E. Korenchan, Robert Flavell, Celine Baligand, Renuka Sriram, Kiel Neumann, Subramaniam Sukumar, Henry VanBrocklin, David M. Wilson, John Kurhanewicz
Department of Radiology & Biomedical Imaging, University of California San Francisco

5) Title: Hyperpolarized Lactate Production Correlates with Gleason Grade in Patient-Derived Tissues of Prostate Cancer
Renuka Sriram, Mark van Criekeinge, Justin DeLos Santos, Donna M Peehl, Kayvan R. Keshari, John Kurhanewicz
Department of Radiology & Biomedical Imaging, University of California San Francisco
Memorial Sloan Kettering Cancer Center, New York
Stanford University, Palo Alto

6) Tools for multimodal and multiscale measurement of metabolism in breast cancer, both in vitro and in vivo

7) Quantitative methods for clinical imaging with hyperpolarized 13C-pyruvate
Charlie J Daniels, Mary A McLean, Rolf F Schulte, Fraser J Robb, Andrew B Gill, Nicholas McGlashan, Martin J Graves, Markus Schwaiger, David J Lomas, Kevin M Brindle, Ferdia A Gallagher

8) High Bandwidth MR Spectroscopic imaging and 1H-13C Independently Tuned RF Surface Coil Applied for In vivo Hyperpolarized MRI
Department of Radiology & Biomedical Imaging, University of California San Francisco

9) Laser Plastic Welding of Spinlab Vials
Ulrich Gubler, Andrew Geiger
Leister Technologies
10) Development of High Resolution 1.5 mm Isotropic Volumetric Hyperpolarized $^{13}$C Imaging Techniques
Department of Radiology & Biomedical Imaging, University of California San Francisco
HeartVista, Menlo Park
Department of Cell and Tissue Biology, University of California San Francisco

11) Development of a 3D Dynamic Compressed-sensing (CS) EPSI Sequence for Human Prostate Cancer Studies
Department of Radiology & Biomedical Imaging, University of California San Francisco
Department of Clinical Pharmacy, University of California San Francisco
Department of Medicine, University of California San Francisco

12) MR metabolic Imaging of Neuroinflammation using Hyperpolarized $^{13}$C MR
Caroline Guglielmetti, Chloe Najac, Austin Chou, Annemie Van der Linden, Sabrina M. Ronen, Susanna Rosi, Myriam M. Chaumeil
Department of Radiology & Biomedical Imaging, University of California San Francisco

13) Use of Hyperpolarized C-13 Imaging for Detecting HIFU-Sensitized Hyperthermic Region in Prostate Cancer
Jessie Lee, Christian J. Diederich, Vasant A. Salgaonkar, Robert Bok, Andrew G. Taylor, John Kurhanewicz
Department of Radiology & Biomedical Imaging, University of California San Francisco
Department of Radiation Oncology, University of California San Francisco