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 2017 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

Thursday, March 23rd

Day 1

8:00am Breakfast/Registration  Genentech Hall Auditorium

8:15  Introductions: HMTRC Director, Dr. Dan Vigneron

8:25  Dissolution DNP Methodology & HP 13C MR Acquisition Developments: Dr. Peder Larson, UCSF

8:40  Development of HP MR Molecular Imaging Probes and Cell & Tissue Culture Models: Drs. John Kurhanewicz & James Slater RPh, UCSF

9:15  Open Source Tools and Methods for Processing Hyperpolarized 13C MR Data: Dr. Sarah Nelson, UCSF

9:30-10:00 Coffee Break

10:00-12:30pm 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 in Genentech Hall N-114.

11:30-1:30pm Poster Session

12:30-1:30 Lunch & Poster Session (continued)

1:30-3:15 Hands-on Breakout Sessions with Coffee Break 3:15-3:30pm
AND 3:30-5:15 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 in Genentech Hall N-114.

Dinner Reception & Keynote Lectures

Sponsored by Millipore Sigma

5:30  Keynote Lecture by Dr. Ferdia Gallagher, University of Cambridge School of Clinical Medicine  - “Clinical Imaging of Hyperpolarized Pyruvate in Oncology and Neurology”

6:00  Keynote Lecture by Dr. Jan Henrik Ardenkjæer-Larsen PhD, Technical University of Denmark & General Electric Healthcare - “Technological Advances in Dissolution DNP”

6:30-8:00  Dinner Reception
Workshop Schedule
Day 2

Friday, March 24th

8:00am   Breakfast/Registration   Genentech Hall Auditorium

8:30     Drs. Rui Chen PhD, Senior Scientist, GE Global Research Center
         & Arnaud Comment PhD, Senior Scientist, GE Healthcare, UK
         “SPINlab™ Update”

9:00     Lecture by Dr. Pamela Munster MD, UCSF – “An Oncologist’s Perspective
         on Initial Human HP C-13 MR Study Results”

9:30-10:00   Coffee Break

10:00-12:00pm  Hands-on Breakout Sessions
Hands-on demos & discussions on five DNP Polarizers, MR Sequence and Acquisitions,
Bioreactors, Animal prep, Chemistry prep, 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 in Genentech Hall N-114

12:00-2:00pm    Lunch Reception & Poster Sessions

2:00-4:00pm    Hands-on Breakout Sessions (Continued)
Hands-on demos & discussions on five DNP Polarizers, MR Sequence and Acquisitions,
Bioreactors, Animal prep, Chemistry prep, 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 in Byers Hall 102G.
**HMTRC Workshop Faculty & Staff**

**Daniel B. Vigneron Ph.D.** is a Professor in the Departments of Radiology & Biomedical Imaging, Bioengineering & Therapeutic Sciences and Neurological Surgery 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 $^{13}$C 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 $^{13}$C 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 $^{13}$C metabolic imaging.

**Robert Bok M.D., Ph.D.** is a certified Urologic Oncologist and Associate 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 Associate 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 $^{13}$C applications and prostate $^{1}$H 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 $^{13}$C MR sequences.

**David Wilson M.D., Ph.D.** is an Associate 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 $^{13}$C 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.

**James Slater RPh., Ph.D.** is Director of UCSF Radiopharmaceutical Facility and Education and Special Projects for Isotope Imaging. His education and work experience involves a broad range and diverse experience in pharmaceutical development. His experience in FDA regulations cGMP laboratories, has lead him to writing several ANDAs and INDs. His research experience involved both academic and pharmaceutical industry. He has had extensive experience in the clinic working with patients and referring physicians as well as laboratory research projects. His expertise in radiopharmaceuticals has been used by several institutions and the pharmaceutical industry as a consultant. He has served on the faculty of a number of Schools of Pharmacy working on research projects and training students. He currently leads the terminal sterilization and testing aspects of the HP stable-isotope carbon-13 clinical research MR molecular imaging studies at UCSF.
**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 cBMP 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.

**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.

**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.

**Lucas Carvajal M.S.** is a highly experienced MRI 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 and optimization of specialized coils for a wide variety of applications.

**Jeremy Gordon Ph.D.** is a Senior Bioengineer working with Drs. Vigneron and Larson at UCSF on developing new $^{13}$C MR molecular imaging tools and techniques. He has extensive experience in pulse sequence programming and spectroscopic reconstruction for hyperpolarized MR applications. At UCSF, he leads the technical aspects of the DNP polarization and EPI sequence developments for HP C-13 MR human studies.

**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 developing a new, independent research program focused on renal HP MRI studies.

**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 $^{13}$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 and prepares samples for hyperpolarization for both preclinical and clinical research studies.
Location: The HMTRC Workshop will be held on Thursday, March 23 & Friday, March 24, 2017 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.
Posters


2) Title: Non-Cartesian Parallel Imaging Reconstruction of Undersampled IDEAL Spiral 13C CSI Data. Rie B. Hansen¹, Lars G Hanson¹, Jan H Ardenkjaer-Larsen¹,². ¹Department of Electrical Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark, ²GE Healthcare, Denmark

3) Title: Using a Local Low Rank plus Sparse Reconstruction to Accelerate High Resolution Hyperpolarized C-13 T2 Mapping. Eugene Milshteyn¹,², Galen D. Reed³, Cornelius von Morze¹, Zihan Zhu¹,², Jeremy W. Gordon¹, Daniel B. Vigneron¹,². ¹Radiology and Biomedical Imaging, University of California San Francisco, CA, United States, ²UC Berkeley-UCSF Graduate Program in Bioengineering, University of California San Francisco and University of California Berkeley, CA, USA, ³HeartVista Inc., Los Altos, CA, United States

4) Title: Bruker BioSpec 3T MRI-Superior Cryogen Free Magnet Technology. Doug Kelley and Jim Kempf. Bruker

5) Title: Hyperpolarized 13C Dynamic Breath-held Imaging: A Strategy for Liver Metastases Metabolic Assessment. Zihan Zhu¹,², Irene-Marco-Rius³, Michael A Ohliger¹, Lucas Carvajal¹, Jeremy W Gordon¹, Hsin-Yu¹,², Peng Cao¹, Eugene Milshteyn¹,², Cornelius von Morze¹, Marcus Ferrone¹, James B Slater¹, Zhen Wang¹, Peder E.Z. Larson¹, Rahul Aggarwal¹, Robert Bok¹, John Kurhanewicz¹, Pamela Munster¹, Daniel B Vigneron¹. ¹Department of Radiology and Biomedical Imaging, University of California San Francisco, CA, USA, ²UC Berkeley-UCSF Graduate Program in Bioengineering, CA, USA, ³University of Cambridge, Cambridge, UK

6) Title: Production of Filled Pharmacy Kits and Terminal Sterilization For Human Studies. James B. Slater¹, Jeremy Gordon¹, Mark VanCriekinge¹, Hsin-Yu Chen¹, Eugene Milshteyn¹, Jennifer Chow¹, Romelyna Delos Santos¹, Marcus Ferrone², John Kurhanewicz¹, Sarah Nelson¹, Dan Vigneron¹. Departments of Radiology and Biomedical Imaging¹ & Clinical Pharmacy², University of California San Francisco, CA, USA

7) Title: Probing lactate efflux in renal cell carcinomas using hyperpolarized 13C lactate apparent diffusion constant. Renuka Sriram, Jeremy Gordon, Celine Baligand, Justin DelosSantos, Hecong Qin, Robert Bok, Daniel B. Vigneron, Peder Larson, John Kurhanewicz, Zhen J. Wang. Department of Radiology & Biomedical Imaging, University of California San Francisco, CA, United States

8) Title: 13C Coils for Clinical Applications. Frank Resmer, Simon Quittek, Dominik Berthel, Matthias Muller, Carsten Kögler, Michael Sauer, Titus Lanz. Rapid Biomedical GmbH

9) Title: Simulation of Hyperpolarized Perfusion MRI with a Segmented Snapshot Acquisition. Keith A. Michel¹, Christopher M. Walker¹, Yunyun Chen², Jorge Delacerda¹, Stephan Lai², James A. Bankson¹. ¹Department of Imaging Physics, University of Texas MD Anderson Cancer Center, Houston, Texas, ²Department of Head & Neck Surgery, University of Texas MD Anderson Cancer Center, Houston, Texas

11) Title: MR metabolic imaging of neuroinflammation using HP $^{13}$C MR. Caroline Guglielmetti, Chloé Najac, Austin Chou, Annemie Van der Linden, Sabrina M. Ronen, Susanna Rosi, Myriam M. Chaumeil.