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

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

The March 2014 Hyperpolarized Carbon-13 MRI Technology Development Workshop focuses on hands-on training and discussions on dissolution DNP methodology, polarizer instrumentation, C-13 MR Sequence and Acquisitions, Bioreactors, Animal Preps, Chemistry Preps and Software.

HMTRC is funded by NIBIB, NIH Grant P41EB013598
Workshop Schedule
Day 1

Tuesday, March 11th

8:00am  Breakfast/Registration  Genentech Hall Auditorium

8:20  Introductions

8:30  Dissolution DNP Methodology & HP $^{13}$C MR Acquisition
Developments: Dr. Dan Vigneron, UCSF & Dr. Peder Larson, UCSF

9:00  Development of HP MR Molecular Imaging Probes and Cell & Tissue
Culture Models: Dr. John Kurhanewicz, UCSF

9:30  Open Source Tools and Methods for Processing Hyperpolarized $^{13}$C
MR Data: Dr. Sarah Nelson, UCSF

10:00-10:30  Coffee Break

10:30-12:30pm  Hands-on Breakout Sessions
Hands-on demos & discussions on four DNP Polarizers, MR Sequence and Acquisitions, Bioreactors, Animal preps, and Chemistry preps 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 Byers Hall Suite 215 and 102G.

12:30-2:00  Lunch & Poster Session

2:00-5:30  Hands-on Breakout Sessions (Continued)
Hands-on demos & discussions on four DNP Polarizers, MR Sequence and Acquisitions, Bioreactors, Animal preps, and Chemistry preps 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 Byers Hall Suite 215 and 102G.

KEYNOTE LECTURES – Welcome by Dr. Ronald Arenson MD, Chairman of Radiology & Biomedical Imaging, UCSF

5:30  Keynote Lecture by Dr. Charles Cunningham PhD, U. Toronto
“Technology Developments for Clinical Translation of Hyperpolarized C-13 MRI”

6:00  Keynote Lecture by Dr. Craig Malloy MD, UTSW
“Clinical Motivation and Requirements for Hyperpolarized MRI Technology Development”

6:30-8:00  Dinner Reception & Keynote Lectures
Sponsored by 

GOLD SPONSORS: General Electric & SIGMA-ALDRICH® Stable Isotopes
Workshop Schedule
Day 2

Wednesday, March 12th

8:30am  Breakfast/Registration  Genentech Hall Auditorium

9:00-11:30  Hands-on Breakout Sessions
Hands-on demos & discussions on the DNP Polarizers, MR Sequence and Acquisitions, Bioreactors, and Chemistry preps 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 Byers Hall Suite 212.

11:30 – 2:30 pm  Poster Sessions

12:00-2:30pm  Lunch Reception

PLENARY LECTURES

2:30  Plenary Lecture by Dr. Marcus Ferrone PharmD, UCSF
“Clinical Pharmacy Considerations for Hyperpolarized MRI”

3:00  Plenary Lecture by Dr. Andrew M. Leach PhD, GE Global Research
“Polarizer for Sterile Use”

3:30  Plenary Lecture by Dr. Rahul Aggarwal MD, UCSF
“A Medical Oncology Perspective on Designing Clinical Trials of Hyperpolarized Carbon-13 MRI”

4:00  Plenary Lectures by Dr. Rolf Schulte PhD, GE Global Research & Dr. Albert Chen PhD, GE Healthcare
“MNS Research Pack” and “13C Coils and Phantoms”

4:30-5:00  Discussion and Wrap-up
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 $^{13}$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 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 $^{13}$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 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 $^{13}$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.
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 $^{13}$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.

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.

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.

Keynote & Plenary Speakers

This workshop includes keynote & plenary lectures focused on Hyperpolarized MR technology development and future clinical translation given by:

- Dr. Charles Cunningham PhD from the University of Toronto Sunnybrook on “Technology Developments for Clinical Translation of Hyperpolarized C-13 MRI”

- Dr. Craig Malloy MD from the University of Texas Southwestern on “Clinical Motivation and Requirements for Hyperpolarized MRI Technology Development”

- Dr. Marcus Ferrone PharmD from the University of California San Francisco on “Clinical Pharmacy Considerations for Hyperpolarized MRI”

- Dr. Andrew M. Leach PhD from GE Global Research on “Polarizer for Sterile Use”

- Dr. Rahul Aggarwal MD from the University of California San Francisco on “A Medical Oncology Perspective on Designing Clinical Trials of Hyperpolarized Carbon-13 MRI”

- Dr. Rolf Schulte PhD from GE Global Research & Dr. Albert Chen PhD from GE Healthcare on “MNS Research Pack” and “$^{13}$C Coils and Phantoms”
Location: The HMTRC Workshop will be held on Tuesday, March 11 & Wednesday, March 12, 2014 on the UCSF Mission Bay Campus 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: Reduced Warburg effect in cancer cells undergoing autophagy: steady-state 1H-MRS and real-time hyperpolarized 13C-MRS studies
Gigin Lin1,2, Gabriela Andrejeva2, Anne-Christine Wong Te Fong2, Deborah K. Hill2, Matthew R. Orton2, Harry G. Parkes2, Dow-Mu Koh2, Simon P. Robinson2, Martin O. Leach2, Thomas R. Eykyn2,3, Yuen-Li Chung2
1 Department of Medical Imaging and Intervention, Chang Gung Memorial Hospital at Linkou, College of Medicine, Chang Gung University, Taoyuan 333, Taiwan.
2 CR-UK and EPSRC Cancer Imaging Centre, Division of Radiotherapy and Imaging, The Institute of Cancer Research and Royal Marsden Hospital, Sutton, Surrey, SM2 5PT, UK.
3 Division of Imaging Sciences and Biomedical Engineering, Kings College London, The Rayne Institute, St Thomas Hospital, London SE1 7EH, UK.

2) Title: Reproducibility and effect of spatial resolution on diffusion kurtosis imaging in a phantom of isotropic diffusion with two compartments when controlled signal to noise ratio
Jiun-Jie Wang PhD, Yu-Chun Lin MSc and Sung-Han Lin MSc
Department of Medical Imaging and Radiological Sciences, Chang Gung University, Taiwan

3) Title: Multimodal functional MR imaging in detecting microenvironmental changes of radiotherapy in transgenic adenocarcinoma of the mouse prostate (TRAMP)-C1 tumor model
Yu-Chun Lin1,2, Chun-Chieh Wang3 Gigin Lin1 Jiun-Jie Wang2
1 Department of Medical Imaging and Intervention, Chang Gung Memorial Hospital, Linkou, Taiwan
2 Departments of Medical Imaging and Radiological Sciences, Chang Gung University, Taiwan
3 Departments of Radiation Oncology, Chang Gung Memorial Hospital, Linkou, Taiwan

4) Title: SIVIC: Open-Source, Standards Based Software for DICOM MR Spectroscopy Workflows
Marram P. Olson, Jason C. Crane, Sarah J. Nelson
Department of Radiology & Biomedical Imaging, University of California San Francisco

5) Title: Development of a Novel 2DRF Pulse Sequence to Achieve an Improved Localization of Hyperpolarized 13C Imaging
Department of Radiology & Biomedical Imaging, University of California San Francisco

6) Title: Magnetic Carrier for Hyperpolarized 13C Sample Transfer from DNP Polarizer to MR Scanner
1 Department of Radiology & Biomedical Imaging, University of California San Francisco
2 General Electric

7) Title: Hyperpolarized 13C imaging of metabolism and perfusion in preclinical model of prostate cancer
Department of Radiology & Biomedical Imaging, University of California San Francisco

8) Title: Patient-Derived Tissue Culture Model Systems of Renal Cell Carcinoma for development of Clinically Translatable Metabolic Biomarkers
Renuka Šriram, Kayvan R Keshari, Mark van Criekinge, David M Wilson, Donna M Peehl, Robert Bok, John Kurhanewicz, Zhen J Wang
Department of Radiology & Biomedical Imaging, University of California San Francisco
9) Title: 1-$^{13}$C-pyruvate hyperpolarized MRI reveals early metabolic tumor changes and distinct features of liver cancers driven by H-RAS$^{V12}$, Myc or H-RAS$^{V12}$ + MYC
Klaus Kruttwig, Christine Leon Swisher, Chantal Brueggemann, Robert Bok, Asha Balakrishnan, Simon Hu, Daniel Vigneron, Andrei Goga
1 Department of Cell & Tissue Biology, University of California San Francisco
2 Department of Radiology & Biomedical Imaging, University of California San Francisco

10) Title: Development of an Early Biomarker of MGMT Activity and Response to Temozolomide Treatment using Hyperpolarized $^{13}$C MR Metabolic Imaging
Ilwoo Park
Department of Radiology & Biomedical Imaging, University of California San Francisco

11) Title: Complete Separation of Extra- and Intracellular Hyperpolarized $^{13}$C Metabolite Signal with Diffusion MR
Bertram Koelsch, Kayvan Keshari, Peder Larson, David Wilson, John Kurhanewicz
Department of Radiology & Biomedical Imaging, University of California San Francisco

12) Title: Detecting Early Tumor Response of Prostate Cancer to Radiation Therapy Using Multi-Parametric 14T $^1$H and Hyperpolarized $^{13}$C MR Imaging
V. Y. Zhang, R. Bok, J. Lee, S. Sukumar, A. Cunha, I-C. Hsu, J. Pouliot, D. Vigneron, J. Kurhanewicz
1 Department of Radiology & Biomedical Imaging, University of California San Francisco
2 Department of Radiation Oncology, University of California San Francisco

13) Title: Hyperpolarized $^{13}$C Magnetic Resonance Spectroscopic Imaging: Probing Enzymatic Activity, Cellular Transport, and Oncogene Activation
1 Department of Radiology & Biomedical Imaging, University of California San Francisco
2 Department of Cell & Tissue Biology, University of California San Francisco

14) Title: Non-invasive assessment of IDH1 mutational status and associated metabolic reprogramming in glioma using hyperpolarized [1-$^{13}$C] $\alpha$-ketoglutarate
Myriam M. Chaumeil$^1$, Peder E.Z. Larson$^1$, Sarah M. Woods$^1$, Hikari A.I. Yoshihara$^1$, Olivia M. Danforth$^1$, Larry Cai$^1$, Pia Eriksson$^1$, Aaron E. Robinson$^{2,3,4}$, Janine M. Lupo$^1$, Daniel B. Vigneron$^1$, Sarah J. Nelson$^1$, Russell O. Pieper$^{3,4}$, Joanna J. Phillips$^{2,3,4}$, Sabrina M. Ronen$^{1,4}$
1 Department of Radiology and Biomedical Imaging, University of California San Francisco, 1700 4th Street San Francisco 94158, CA, USA
2 Department of Pathology, University of California San Francisco, San Francisco, CA 94143, CA, USA
3 Department of Neurological Surgery, Helen Diller Research center, University of California San Francisco, San Francisco, CA 94143, CA, USA
4 Brain Tumor Research Center, University of California San Francisco, San Francisco, CA 94143, CA, USA