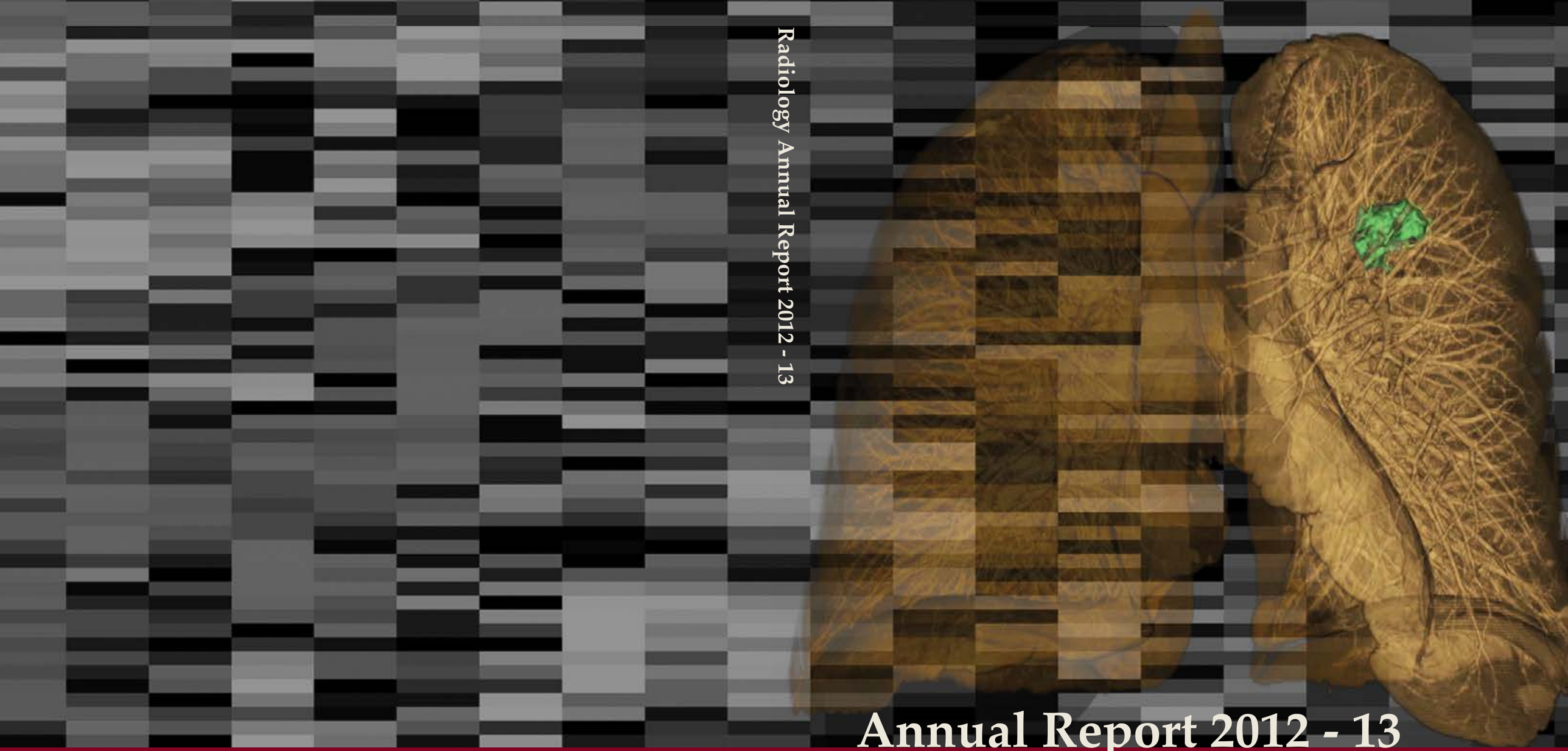


Radiology Annual Report 2012 - 13

Annual Report 2012 - 13

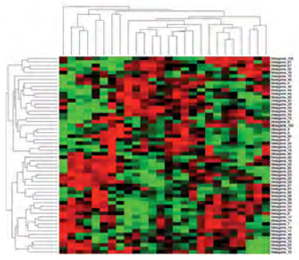
STANFORD
SCHOOL OF MEDICINE
Stanford University Medical Center

Department of Radiology
Stanford University School of Medicine

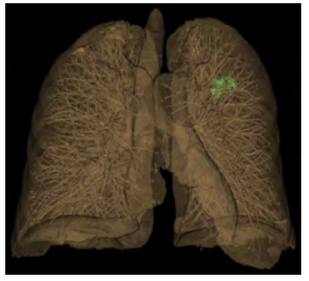
Annual Report 2012 - 13

Department of Radiology
Stanford University School of Medicine

Cover Image:



The green/red matrix represents a database of patients (rows) with lung cancer and the expression of a multitude of genes (columns) from their tumors.



A volumetric CT reconstruction is provided showing a lung cancer tumor (green) within the lungs (brown).

Artistically rendered together, these images illustrate the idea of building integrated databases of image, clinical outcomes, and advanced tissue analysis data, within which individual patients can be compared to others for decision support, biological discovery, and prediction of outcome in response to therapy.

Contents

Ribbon-cutting for Stanford Hospital MRI (3T)

2012 VA Radiology Technologist of the Year, Julie Loero, with Chief of VA Nuclear Medicine, George Segall

2012 Stanford Hospital Radiology Technologist of the Year, Paolo Castaneda, with Co-Chiefs Andy Quon and Andrei Iagaru

2012 Canary Challenge

Front entrance of our new Porter Drive location

Norbert Pelc and Sam Gambhir at a celebration honoring Dr. Pelc's induction into the National Academy of Engineering, 2012

2012 LPCH Radiology Technologist of the Year, Gerald Encinias, with Radiologist-In- Chief, Richard Barth

2012 Radiology Residents Graduation ceremony

2012 Staff member of the Year, Susie Spielman, and Faculty of the Year, Ann Leung with Dominik Fleischmann

Dr. Terry Desser, Radiology residency program director with Dr. Jared Narvid, 2012 residency graduate.

A Message from the Chair

2012 - 2013

It has been a terrific 18 months of learning and personal growth in my new role as Chair of the Department of Radiology. I can hardly believe how much has happened in such a short time - thanks to the hard efforts of so many wonderful faculty colleagues and staff. The Stanford School of Medicine is in a great growth phase and the Department of Radiology is poised for continued growth with multiple new areas of clinical and research expansion.

With a truly outstanding faculty and staff, we continue to push the boundaries of what Radiology as a field will become in the years to come. “Science without borders” will be one of the key themes during my chairmanship. This will be accomplished through creating significant bridges to scientific and clinical activities throughout the medical school, affiliated hospitals, and across the Stanford campus.

Several new departmental cultural changes have been initiated that I hope become traditions in the years ahead. These include: (i) Honoring our retiring faculty and emeriti. We all rest on the shoulders of these great giants; we will continue to honor them in different ways in the years to come. (ii) Honoring promotions and advancements of our existing faculty by recognizing their accomplishments at faculty meetings and other events. (iii) Providing our junior faculty opportunities for formal leadership training and providing them leadership opportunities that yield significant career growth. (iv) Building better bi-directional relationships between faculty and staff by providing proven tools from our business school so that, together, we all succeed. (v) Valuing all aspects of our enterprise including patient care, basic/translational/clinical research, education, and administrative efforts by investing in each area. (vi) Enhancing transparency in all of our activities so that everyone has a chance to weigh in on major decisions within a culture that respects an open process. (vii) Providing faculty with expert advice for their intellectual property and potential startup ventures from consulting faculty with expertise in entrepreneurship. (viii) Building a culture where our residents have a chance for greater interaction with other residents in the Department. Additionally, encouraging residents to do research and providing them with opportunities and funding to do so. (ix) Improving the quality of the care we deliver to our patients by changing the Department culture of quality and safety through greater education and investment. (x) Developing a regular CME grand rounds in order to bring faculty and trainees together on a monthly basis to listen to the best our field has to offer from physicians and scientists around the world. (xi) Investing in research using Departmental funds by allowing a fair and competitive process such as the new “Angel Funds” to seed and nurture innovative pilot research.

With the opening of many new facilities, our growth in space for both clinical and research facilities is tremendous. In clinical space, faculty and staff are working hard on both the pediatric and adult hospital expansions that will open in 2017 and 2018 respectively. We will also open three new imaging facilities in 2014-2015: 1) a south bay radiology facility as part of the Cancer Center expansion, 2) a new Neuroradiology Imaging Center in Hoover 2 to complement the expansion in clinical neurology/neurosurgery, and 3) the Breast Imaging Clinic in the Cancer Center will also undergo

A Message from the Chair

"...new research space on Porter Avenue...part of the Technology & Innovation Park where we have over 36,000 net square feet of new dry and wet research space scheduled to open summer, 2013"

a much needed expansion. In research space, we recently completed renovations in the Lucas Center to upgrade existing MR equipment and make way for our first PET-MR. Renovations of the Grant basement and the SHC Film Library will begin in the next few months with plans for completion in 2014. On the research front, we have nearly completed construction of new research space on Porter Avenue as part of the Technology & Innovation Park where we have over 36,000 net square feet of new dry and wet research space scheduled to open summer, 2013. This facility will include state-of-art chemistry space and a new small animal imaging facility. This growth is the largest research space expansion in the history of our Department. The Department of Genetics will also be housed there and this will lead to many new exciting opportunities combining the best of genomics and imaging.

The growth in our faculty has been driven by spectacular recent recruits. These include basic scientists such as Dr. Jennifer McNabb (Assistant Professor, RSL) recruited from MGH, physician-scientist Dr. Tarik Massoud (Professor, Neuroradiology/MIPS) recruited from the University of Cambridge, Dr. Pejman Ghanouni (Assistant Professor, Body MRI), recruited from our NCI training program, Dr. Geoffrey Riley (Clinical Associate Professor, MSK) recruited from private practice in the Bay Area, Dr. Ajit Singh (Consulting Faculty), Dr. Vivek Paul (Consulting Faculty), Mr. Don Listwin (Consulting Faculty), Mr. Klaus Hambuchen (Consulting Faculty), Dr. Ananth Srinivisan (Consulting Faculty), and Drs. Bao Do (Clinical Instructor (Affiliated), Palo Alto VA), Henry Guo (Clinical Instructor, Thoracic/Nuc Med), Linda Morimoto (Clinical Instructor, Abdominal Imaging), and David Rex (Clinical Instructor, Neuroradiology).

Several new leadership transitions have occurred: (i) Dr. Garry Gold is the new Associate Chair for Research taking over for Dr. Norbert Pelc who became the new Chair of Bioengineering, (ii) Dr. Juergen Willmann, new section chief of abdominal imaging taking over for Dr. Brooke Jeffrey who remains Vice Chair and Associate Chair of Academic Affairs, (iii) Dr. Nancy Fischbein as acting section chief of neuroradiology taking over for Dr. Scott Atlas who served as section chief from 1998-2012 and has transitioned full time to the Stanford Hoover Institution, (iv) Dr. Payam Massaband as acting chief of Radiology Service at the Palo Alto VA taking over for Dr. Eric Olcott who served as chief from 2006-2012, (v) Drs. Andy Quon and Andrei Iagaru, Acting Co-section Chiefs of Nuclear Medicine and Molecular Imaging replacing me in the role where I served as Chief from 2003-2012, (vi) Dr. Joe Wu, faculty in both Radiology and Medicine, has been appointed as Co-Director of the Cardiovascular Institute (CVI), (vii) Dr. Fred Chin, was appointed as faculty and will continue to expand the Radiochemistry/Cyclotron facility.

Several faculty searches are currently in progress and include the Chief of Neuroradiology, Chief of VA Palo Alto Radiology Service, Pediatric Radiology, Pediatric Imaging Scientist, Cardiovascular Imaging, and multiple basic and translational science recruitments. A search for an Associate Chair of Quality Assurance (QA) has recently concluded with the recruitment of Dr. David Larson (Associate Professor, Pediatric Radiology, and Associate Chair of Performance Improvement, Department of Radiology), recruited from Cincinnati Children's Hospital.

We also had major changes in staff leadership with hiring a new DFA (Yun-Ting Yeh) and a new assistant DFA (Lin Ng). We are very fortunate to have them heading our entire administration with their significant prior experience in leading and managing large groups. In addition, we have made multiple staff position changes based on programmatic needs that will lead to continued improvement in administrative efficiency in the Department.

Research has been on a tremendous trajectory as well. We continue to receive new NIH funding and according to the most recent data published by the Academy of Radiology Research in 2011, we are the second highest NIH-funded Radiology Department in the country and the highest NIH-funded per capita of all Radiology Departments in the USA. Industrial collaborations continue to grow with new research funding from Sanofi-Aventis and others. Drs. Zhen Cheng and Fred Chin also recently obtained funding from the Department of Energy for PET based molecular imaging. The NCI training grant (T32) has also been renewed under the leadership of Drs. Sandy Napel and Graham Sommer. Multiple RO1s were also renewed in this difficult funding environment. Although the NIH funding environment has become very tough and will likely get even tougher, we are relatively well positioned to be highly competitive and weather the storms ahead. In addition, through help from several foundations including the Canary Foundation, Ben and Catherine Ivy Foundation, and the Sir Peter Michael Foundation we have raised in excess of $20 million for research, the highest gift funding in the history of the Department.

We have also been working hard with the Canary Foundation to build bridges with the community and had the Canary bike ride in 2012 and will do so again in September 2013 (see page 202). This activity brings together our entire Department for a great cause and raises research funding for our Department and for the Cancer Center.

It was my honor to serve as Co-chair of the search committee along with Provost John Etchemendy that helped to recruit Dean Lloyd Minor (previously Provost at Johns Hopkins) to become the new Dean of the Stanford School of Medicine. This is an important part of the new growth phase for Stanford Medicine and also a great learning experience for me personally.

All of the great progress in our Department is due to the commitment of our highly dedicated faculty and staff. I especially want to thank all of our section chiefs and vice/associate chairs for their tremendous efforts and their continued support. It is my pleasure to learn from them each day and to benefit from their great collective wisdom, enthusiasm and support.

"All of the great progress in our Department is due to the commitment of our highly dedicated faculty and staff. I especially want to thank all of our section chiefs and vice/associate chairs for their tremendous efforts and their continued support. It is my pleasure to learn from them each day and to benefit from their great collective wisdom, enthusiasm and support."

Sanjiv Sam Gambhir M.D., Ph.D.

Virginia and D. K. Ludwig Professor of Cancer Research
Chair, Department of Radiology

Faculty

Department Chair and Associate Chairs

Sanjiv Sam Gambhir, MD, PhD
Chair, Department of Radiology

R. Brooke Jeffrey, MD
Vice Chairman
Associate Chair, Academic Affairs

Richard Barth, MD
Associate Chair, Radiology
Radiologist-in-Chief, LPCH

Michael Federle, MD
Associate Chair, Education

Garry Gold, MD
Associate Chair, Research

Robert Herfkens, MD
Associate Chair, Clinical Technology

Ann Leung, MD
Associate Chair, Clinical Affairs

Section Chiefs

Richard Barth, MD
Pediatric Imaging

Christopher Beaulieu, MD, PhD
Musculoskeletal Imaging

Nancy Fischbein, MD
Neuroradiology

Dominik Fleischmann, MD
Cardiovascular Imaging

Sanjiv Sam Gambhir, MD, PhD
Molecular Imaging Program at Stanford Canary Center at Stanford for Cancer Early Detection

Gary Glover, PhD
Radiological Sciences Laboratory

Lawrence "Rusty" Hofmann, MD
Interventional Radiology

Andrei Iagaru, MD
Nuclear Medicine and Molecular Imaging

Debra Ikeda, MD
Breast Imaging

Ann Leung, MD
Thoracic Imaging

Payam Massaband, MD
VA Palo Alto

Sandy Napel, PhD
Information Sciences in Imaging at Stanford

Sylvia Plevritis, PhD
Information Sciences in Imaging at Stanford

Andrew Quon, MD
Nuclear Medicine and Molecular Imaging

George Segall, MD
Nuclear Medicine, VA Palo Alto

Shreyas Vasanawala, MD, PhD
Body MRI

Juergen Willmann, MD
Abdominal Imaging

Frederick Chin, PhD – Molecular Imaging Program at Stanford

Dr. Frederick Chin began his new faculty position as Assistant Professor of Radiology (Research) in the Molecular Imaging Program at Stanford (MIPS) section on February 1, 2013. Dr. Chin received his undergraduate degree in Chemistry with honors from Indiana University in 1991, and his PhD degree in Organic Chemistry with emphasis on PET Radiochemistry in 2000 from Purdue University. From 2000-2001, he was a postdoctoral research associate in the Department of Chemistry at Purdue University, followed by a visiting postdoctoral fellowship at Lawrence Berkeley National Laboratory at UC Berkeley from 2001-2002. He spent 3 years at the National Institute of Mental Health (NIMH) from 2002-2005 as a postdoctoral research fellow. Dr. Chin was an Instructor in the Radiology department and, since 2005, has been Head of the Cyclotron Radiochemistry group in the Molecular Imaging Program at Stanford (MIPS). Dr. Chin has expertise in radiochemistry and synthetic organic chemistry. His research focus is on development of novel radiotracers for PET with an emphasis of 18F and 11C radiochemistry and an emphasis on neuroligands.

Pejman Ghanouni, MD, PhD – Body MRI

Dr. Pejman Ghanouni joined the Department as Assistant Professor of Radiology in the Body MRI section on January 1, 2012. Following completion of his undergraduate training at Harvard, Dr. Ghanouni acquired his MD and PhD in the Medical Scientist Training Program (MSTP) at Stanford in 2005. For his PhD research he used biophysical techniques to investigate the mechanism of activation of the beta-2 adrenergic receptor, a model G protein coupled receptor. Dr. Ghanouni served as chief resident while at Stanford, and was awarded a Radiological Society of North America (RSNA) Trainee Prize in 2009 for his research using MRI to monitor the role of macrophages in the development of chronic pain behavior. Also prior to his faculty appointment, Dr. Ghanouni, as a National Cancer Institute (NCI) fellow, studied clinical and preclinical applications of MR-guided focused ultrasound surgery. Dr. Ghanouni is co-Principal Investigator on two human clinical trials using focused ultrasound to palliate painful bone metastases.

Henry Guo, MD, PhD – Thoracic Imaging and Nuclear Medicine Sections

Dr. Henry Guo joined the Department of Radiology as a Clinical Instructor in the Thoracic and Nuclear Medicine sections on July 1, 2012. He completed his undergraduate degree in Molecular Biology at MIT, after which he obtained his PhD in Molecular Pathology (2004) and his MD (2006) at University of Washington. For his PhD thesis, Dr. Guo conducted research on DNA repair mechanisms, mutations in cancer, and directed molecular evolution under the mentorship of Lawrence A. Loeb, MD, PhD. Following completion of his MD and PhD training, Dr. Guo completed an internship in internal medicine, surgery, and pediatrics at the Scripps Mercy Hospital San Diego, CA. He completed his radiology residency training and a one-year fellowship in Nuclear Medicine (general nuclear medicine, therapy, and PET-CT), followed by dedicated training in chest imaging, at Stanford. He is involved in clinical service, teaching, and applying molecular imaging tools to further enhance anatomic imaging, particularly in the chest.

Tarik Massoud, MD, PhD – Neuroradiology and MIPS Sections

Dr. Tarik Massoud joined the Department February 1, 2013, as a Professor of Radiology in the Neuroradiology and MIPS sections. He completed his medical training at the Medical School of the Royal College of Surgeons in Ireland and in Radiology at Oxford (UK), UCLA, and the University of Michigan. He is a Fellow of the Royal College of Radiologists in London and holds a research MD degree in experimental neuroimaging (National University of Ireland) and a PhD in molecular imaging (Cambridge). Dr. Massoud is a member of the Cambridge Cancer Centre and Cambridge Neuroscience, was formerly an Associate Professor of Radiology at UCLA, and has also held visiting Associate Professorships at Columbia and Milwaukee. Dr. Massoud was most recently a University Lecturer and Honorary Consultant in Neuroradiology and Molecular Imaging at the University of Cambridge and Addenbrooke's Hospital in Cambridge, UK. His current interests include molecular imaging using reporter genes, experimental aspects of neuroimaging, clinical neuroradiology, radiological anatomy, and research education and academic training of radiologists.

Jennifer McNab, PhD – Radiological Sciences Laboratory

Dr. Jennifer A. McNab joined the Department as Assistant Professor of Radiology (Research) in the Radiological Sciences Laboratory (RSL) section on October 11, 2012. She was a Research Fellow at the Martinos Center for Biomedical Imaging at Harvard Medical School and Massachusetts General Hospital. She received her BS degree from the Department of Physics and Astronomy at the University of British Columbia (Canada) in 2003, her MS degree from Department of Medical Biophysics at University of Western Ontario in 2005, and her PhD degree from Department of Clinical Neurology at University of Oxford (UK) in 2009. Dr. McNab has a strong background in diffusion imaging and pulse sequence development. She has made scientific contributions on complex diffusion imaging projects. Along with Dr. Brian Rutt, Professor of Radiology, she will play an important role in the building of Stanford's high field MRI program.

Linda Morimoto, MD – Abdominal Imaging Section

Dr. Linda Morimoto joined the Department of Radiololgy as a Clinical Instructor in the Abdominal Imaging section on July 1, 2012. She completed her BA in Molecular and Cell Biology at the UC Berkeley in 2001 and received her MD from University of Southern California, Keck School of Medicine, in 2006. Dr. Morimoto was Chief Resident from 2009-10 and completed her residency in diagnostic radiology (2011) at Santa Clara Valley Medical Center, and followed up with a fellowship in body imaging at Stanford in June 2012. Dr. Morimoto is providing clinical service in body imaging and teaching radiology residents, fellows, and medical students during clinical service.

David Rex, MD, PhD – Neuroradiology Section

Dr. David Rex joined the Department of Radiology as a Clinical Instructor in the Neuroradiology section on July 1, 2012. He graduated, summa cum laude, from UC Berkeley in 1996 with a bachelor's degree in Computer Science and subsequently entered the Medical Scientist Training Program at UCLA School of Medicine where he received his PhD degree in Neuroscience in 2005 and his MD degree in 2006. He completed his residency in Radiology in 2011 and his fellowship in Neuroradiology in June 2012, both at Stanford. Dr. Rex is providing clinical service in Neuroradiology and involved in case conferences and didactic lectures to trainees. He is also teaching residents and fellows during clinical service.

Geoffrey Riley, MD – Musculoskeletal Section

Dr. Riley joined the Department of Radiology as a Clinical Associate Professor December 1, 2012. He received his BA from UC Santa Barbara and his MD from Creighton University School of Medicine. In 1997, Dr. Riley completed his residency in diagnostic radiology, and in 1998, completed fellowship training in MRI/MSK imaging, both at UC Davis. From 1998 to 2003, he worked at Kaiser in Walnut Creek, holding various associate chief positions. Since 2003, he was the president and partner at Imaging Partners Medical Group, covering three imaging centers in San Ramon, Hayward, and San Francisco. Dr. Riley also held adjunct associate clinical professor positions at UCSF and UC Davis, and is the current president of the San Francisco Bay Radiological Society.

Roland Bammer, PhD
Pediatric Imaging
RSL

Patrick Barnes, MD
Neuroradiology
Pediatric Imaging

Sandip Biswal, MD
Musculoskeletal Imaging
MIPS

Francis Blankenberg, MD
Pediatric Imaging
MIPS

Frandics Chan, MD, PhD
Cardiovascular Imaging
Pediatric Imaging

Zhen Cheng, PhD
Canary Center
MIPS

Anne Chin, MD
Cardiovascular Imaging
Thoracic Imaging

Frederick Chin, PhD
MIPS

Heike Daldrup-Link, MD
Pediatric Imaging
MIPS

Bruce Daniel, MD
Abdominal Imaging
Body MRI
Breast Imaging

Terry Desser, MD
Abdominal Imaging

Bao Do, MD
Musculoskeletal Imaging, VA Palo Alto

Huy Do, MD
Neuroradiology

Robert Dodd, MD, PhD
Neuroradiology

Rebecca Fahrig, PhD
RSL

Pejman Ghanouni, MD, PhD
Body MRI

Henry Guo, MD, PhD
Nuclear Medicine & Molecular Imaging
Thoracic Imaging

Brian Hargreaves, PhD
RSL

Howard Harvin, MD
Abdominal Imaging

David Hovsepian, MD
Interventional Radiology

Stefan Hura, MD
Musculoskeletal Imaging

Gloria Hwang, MD
Interventional Radiology

Aya Kamaya, MD
Abdominal Imaging

Peter Kane, MD
Pediatric Imaging

Jennifer Kao, MD
Breast Imaging

Christine Keeling, MBBS
Nuclear Medicine, VA Palo Alto

Sirisha Komakula, MBBS
Neuroradiology, VA Palo Alto

Nishita Kothary, MD
Interventional Radiology

William Kuo, MD
Interventional Radiology

Ralph Lachman, MD
Pediatric Imaging

Martin Laufik, MD
Diagnostic Radiology, VA Palo Alto

Ed Lebowitz, MD
Pediatric Imaging

Craig Levin, PhD
MIPS
Nuclear Medicine & Molecular Imaging

Jafi Lipson, MD
Breast Imaging

John Louie, MD
Interventional Radiology

Amelie Lutz, MD
Musculoskeletal Imaging

Parag Mallick, PhD
Canary Center
MIPS

Michael Marks, MD
Neuroradiology

Tarik Massoud, MD, PhD
Neuroradiology
MIPS

Jennifer McNab, PhD
RSL

Erik Mittra, MD, PhD
Nuclear Medicine & Molecular Imaging

Linda Morimoto, MD
Abdominal Imaging

Michael Moseley, PhD
RSL
MIPS

Beverley Newman, MBBCh
Pediatric Imaging

Matilde Nino-Murcia, MD
Diagnostic Radiology, VA Palo Alto

Eric Olcott, MD
Diagnostic Radiology, VA Palo Alto

David Paik, PhD
ISIS
MIPS

Sunita Pal, MD
Breast Imaging

Ramasamy Paulmurugan, PhD
Canary Center
MIPS

Kim Butts Pauly, PhD
RSL

Zina Payman, MD
Neuroradiology

Norbert Pelc, ScD
RSL

Sharon Pitteri, PhD
Canary Center
MIPS

Peter Poullos, MD
Abdominal Imaging

Jianghong Rao, PhD
MIPS

Allan Reiss, MD
RSL

David Rex, MD, PhD
Neuroradiology

Geoffrey Riley, MD
Musculoskeletal Imaging

Erika Rubesova, MD
Pediatric Imaging

Daniel Rubin, MD
ISIS

Brian Rutt, PhD
RSL
MIPS

Lisa Schmelzel, MD
Breast Imaging

George Segall, MD
Nuclear Medicine, VA Palo Alto

Rajesh Shah, MD
Interventional Radiology, VA Palo Alto

Lewis Shin, MD
Abdominal Imaging, VA Palo Alto

F. Graham Sommer, MD
Abdominal Imaging
Body MRI

Daniel Spielman, PhD
RSL

Kathryn Stevens, MD
Musculoskeletal Imaging

Daniel Sze, MD, PhD
Interventional Radiology

Jeffrey Tseng, MD
Nuclear Medicine & Molecular Imaging

Volney Van Dalsem, MD
Abdominal Imaging
Outpatient Imaging

Minal Vasanawala, MBBS
Nuclear Medicine, VA Palo Alto

David Wang, MD
Interventional Radiology

Joseph Wu, MD, PhD
MIPS

Dorcas Yao, MD
Diagnostic Radiology, VA Palo Alto

Kristen Yeom, MD
Pediatric Imaging
Neuroradiology

Greg Zaharchuk, MD, PhD
Neuroradiology

Michael Zeineh, MD, PhD
Neuroradiology

Ashwini Zenooz, MD
Diagnostic Radiology, VA Palo Alto

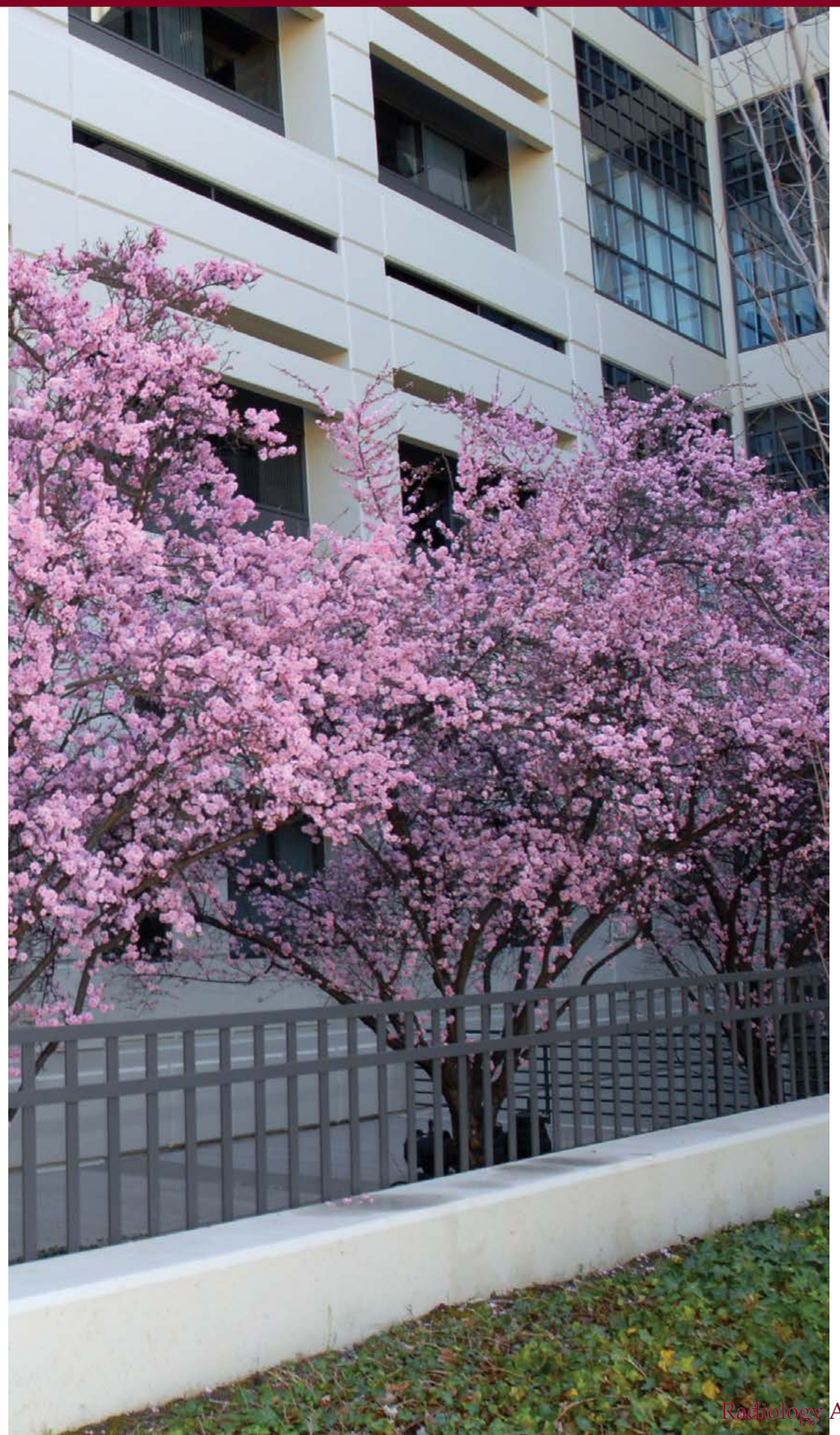
Retirees

Michael Goris, MD, PhD
Nuclear Medicine

Peter Moskowitz, MD
Pediatric Radiology

Faculty Departures

Scott Atlas, MD
Senior Fellow
Hoover Institution



New Administrative Roles

Roland Bammer, PhD
3DQ Lab Technical Director

Nancy Fischbein, MD
Acting Section Chief
Neuroradiology

Dominik Fleischmann, MD
3DQ Lab Clinical Director

Garry Gold, MD
Associate Chair, Research

Andrei Iagaru, MD
Acting Co-Section Chief
Nuclear Medicine and
Molecular Imaging

Payam Massaband, MD
Interim Chief
Radiology Service, VA Palo Alto

Norbert Pelc, ScD
Chair, Department of Bioengineering

Andrew Quon, MD
Acting Co-Section Chief
Nuclear Medicine and
Molecular Imaging

Juergen Willmann, MD
Section Chief, Abdominal Imaging

Joseph Wu, MD, PhD
Co-Director, Cardiovascular Institute

Emeriti

Herbert Abrams, MD
Diagnostic Radiology

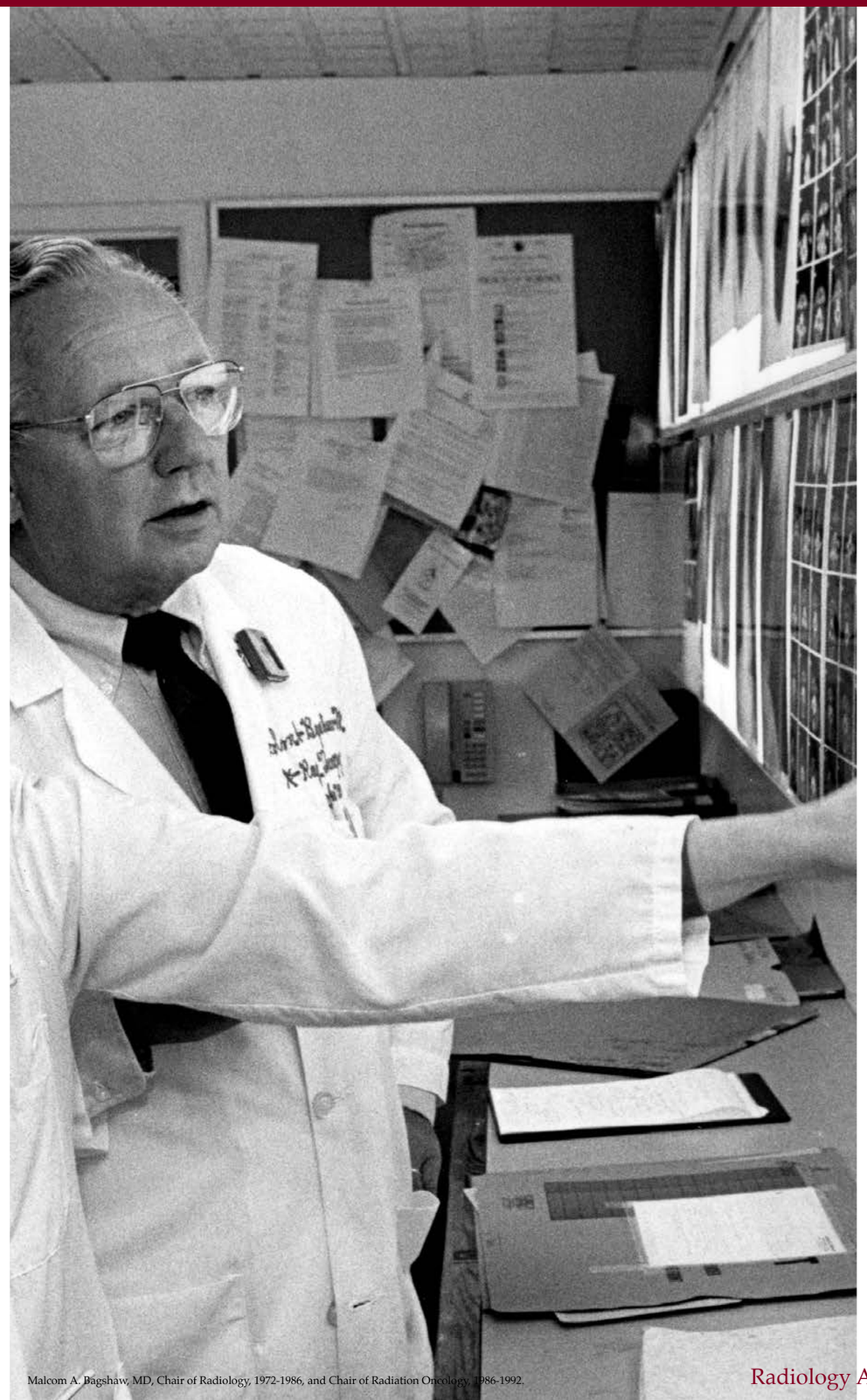
Ronald Castellino, MD
Diagnostic Radiology

Gerald Friedland, MD
Abdominal Imaging
Palo Alto VA

David Goodwin, MD
Nuclear Medicine
Palo Alto VA

Michael Goris, MD, PhD
Nuclear Medicine

Barton Lane, MD
Neuroradiology
Palo Alto VA



Malcom A. Bagshaw, MD, Chair of Radiology, 1972-1986, and Chair of Radiation Oncology, 1986-1992.

Albert Macovski, PhD
Radiation Therapy

William Marshall, MD
Neuroradiology

I. Ross McDougall, MBCHB, PhD
Nuclear Medicine

Robert Mindelzun, MD
Abdominal Imaging

Peter Moskowitz, MD
Pediatric Radiology

William Northway, MD
Pediatric Radiology

Bruce Parker, MD
Pediatric Radiology

Kendric Smith, PhD
Radiation Physics

Lewis Wexler, MD
Cardiovascular Radiology

Leslie Zatz, MD
Neuroradiology

F. Frank Zboralske, MD
Diagnostic Radiology

Gary M. Glazer, MD (1950-2011)

Gary Glazer, MD, was an extraordinary man, a visionary and a pioneer in the field of radiology. Glazer served as chairman of the Department of Radiology at the Stanford University School of Medicine from 1989 until August 2011. He passed away on October 16, 2011, at age 61, after a long battle with prostate cancer.

Dr. Glazer, the Emma Pfeiffer Merner Professor in the Medical Sciences at Stanford, authored more than 155 scientific articles and three books. He was one of 21 radiologists ever to receive Gold Medal awards from both the Radiological Society of North America and the Association of University Radiologists. Among his many other national and international awards, he was given honorary membership in the French, Japanese and German radiological societies.

"Gary was the first of our generation to really hit it big in academic circles," said William Bradley, Jr, MD, director of radiology at the University of California, San Diego. "He became chair at a young age and did some very innovative things. MRI was Dr. Glazer's ticket for success", Dr. Bradley said. The technology provided a financial foundation for growth through the department's investment in Diasonics, a pioneer MRI scanner manufacturer, whose stock went viral at that time.

Moreover, Dr. Glazer gained the support of the Richard M. Lucas family, that funded the construction of the Richard M. Lucas Center for Magnetic Resonance Spectroscopy and Imaging in 1992, as well as a major addition to that facility in 2005. With aid from other private endowments, Stanford's medical imaging facilities supported equipment inventory valued at more than $30 million. The university's first-class infrastructure was a magnet for world-class researchers.

"Gary had an exceptional capacity to see new directions in which our field should go, even when that meant significant departures from the status quo," Dr. Pelc remembered. "He used his intuition, as well as his ability to judge talent and his solid sense of right and wrong, to transform the department into the international leader it is now."

Dr. Glazer was strongly dedicated to his family, including his wife Diane, and their two sons, David and Daniel. "Gary loved his family deeply and was tremendously proud of their many accomplishments," said Radiology Professor and Associate Chair Richard Barth, MD, who has been a friend of Glazer's since their days as residents at UCSF. "He often began meetings with a highlight about family milestones before diving into the business at hand. He was equally caring to his friends and colleagues, never missing an opportunity to inquire with genuine interest about their personal well-being."

We are fortunate to have known and worked with Dr. Gary M. Glazer and pleased to call Gary our friend.

Henry H. Jones, MD (1917-2012)

Dr. Henry Jones, with more than 50 years of service to Stanford Radiology (1948–2006), died peacefully at home, Saturday, August 11, 2012 with his wife Peggy and family nearby.

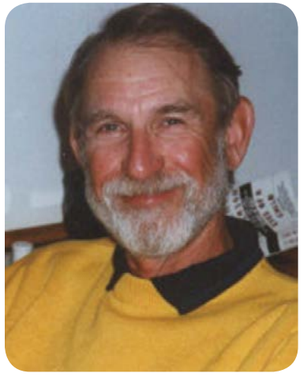
Dr. Jones came to Stanford in 1948. He became the first chief of the radiology service at the Palo Alto Veterans Administration Hospital, and he earned the moniker "Bones Jones" in recognition of his subspecialty regarding the skeletal system. His research focused on the mechanisms governing the growth and modeling of the skeletal system. Dr. Jones left the department with a legacy of more than 2,000 case studies, which are being digitized to make them available to students today and in the future.

Students and faculty praised Jones as a devoted teacher, who won the medical school's Henry J. Kaiser Award for Excellence in Teaching. His trainees have gone on to become radiologists in private practices and academic medical centers nationwide. As chief of the radiology service at the Palo Alto Veterans Administration Hospital, now the Veterans Affairs Palo Alto Health Care System, he trained many Stanford medical students, interns and residents. Upon assuming emeritus status in 1985, Jones also reported that he had provided pre-med counseling to 847 undergraduates.

"His wealth of experience and patient approach to problems was unmatched," said Christopher Beaulieu, MD, PhD, chief of musculoskeletal imaging in the Department of Radiology. "We were all very lucky to have worked with him."

Jones is survived by his wife, Peggy, of Stanford, daughter Virginia Jones of Castro Valley, CA, son Henry C. Jones of Eugene, OR, son Keasley Jones and daughter-in-law Autumn Stephens of Berkeley, CA, and two grandchildren. He also leaves many friends, colleagues and former students who retain warm memories of his exuberant spirit, which informed his customary way of ending a conversation: "Happy Day!"

James F. Silverman, MD (1932-2012)



Dr. James F. Silverman came to Stanford in 1969 to begin a two-year Fellowship in Cardiovascular Radiology, after which he accepted a junior faculty position. From the outset, it was clear that Dr. Silverman was a skilled clinical radiologist and a natural teacher. He produced 44 manuscripts, mainly in the fields of cardiac radiology and health policy research. To assist angiographers, primarily cardiologists, he published a book, "Coronary Angiography: An Introduction to Interpretation and Technique," that included a tear-out 3-D model of the heart. His academic career flourished and he was promoted to full Professor in 1984.

Dr. Silverman's interests in improving the quality of patient care led to his appointment as Clinical Chief of Diagnostic Radiology in 1974. He was the first physician to earn a Master's degree in Business Management from the prestigious Sloan Program at the Stanford Graduate School of Business. From 1979 to 1986 he served as Chief of Staff of Stanford University Hospital, converting a previously ceremonial post into an active management position. Dr. Silverman instituted policies to expedite quality patient care by crafting strong working relationships between hospital administrators, physicians, hospital personnel and the Dean. During this period he also served as Associate Dean for Clinical Affairs, Stanford University School of Medicine.

Dr. Silverman loved the outdoors: camping and hiking with family and friends, skiing, tennis, running and golf. He was loyal, selfless, compassionate and great company. His devotion to his family was uncompromising and they were a source of constant joy to him. Barbara, his wife and best friend of 50 years, his daughter Susie and son Ben, their spouses and three grandchildren survive him.

Clinical Education and Training

Stanford Radiology offers multiple clinical training opportunities including the Radiology Residency (four years), Advanced Residency Training (ARTS –duration varies), Clinical Fellowships (1-2 years), a Clerkship (duration varies), and a unique Visitors' Program tailored to each visitor for one-on-one training. In this section, we highlight those programs.

Radiology Residency Program

Director: Terry Desser, MD
Associate Director: Peter Poullos, MD

Radiology's residency program provides four years of clinical training in a rich learning milieu where everyone is on a first-name basis and the faculty is passionate about teaching. The residents learn radiology working side-by-side with internationally acclaimed clinicians. They encounter a breadth of clinical material and gain confidence in their clinical skills through a carefully structured program of graduated responsibility and autonomy. Since our department's research faculty are among the most productive and creative scientists in the world, the residents will preview -- even help develop -- the imaging of tomorrow while mastering the techniques of today. Please visit our website for more information about radiology residency training at http://xray.stanford.edu/. See next page for a current residents.

PGY II


Lauren Chan


Alexis Crawley


Ibrahim Idakoji


Benjamin Johnson


Michael Llewellyn


Michael Muelly


Jessica Sin


Tust Techasith


Neil Thakur

PGY III


Stephanie Chang


Michael Chiou


Steven Deso

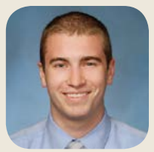

Jacob Harter


Gabriel Howles-Banerji


Osamu Kaneko


Mia Kazanjian


Lina Nayak


Jason Oppenheimer

PGY IV


Michael Cutalo


Radhika Dave


John Downey


Gregory Havlena


Robert Jones


Paul Laeske (CR)


Irene Liu


Connie Montgomery (CR)


Russell Stewart

PGY V


Ed Boas


Veronica Cox


Sarah Garaas


Ted Jerdee


Tim Joseph


Stacey Keel


Marnie Kremer


Andreas Loening


Jonathan Williams

Nuclear Medicine Residency Program

Director: Andrei Iagaru, MD

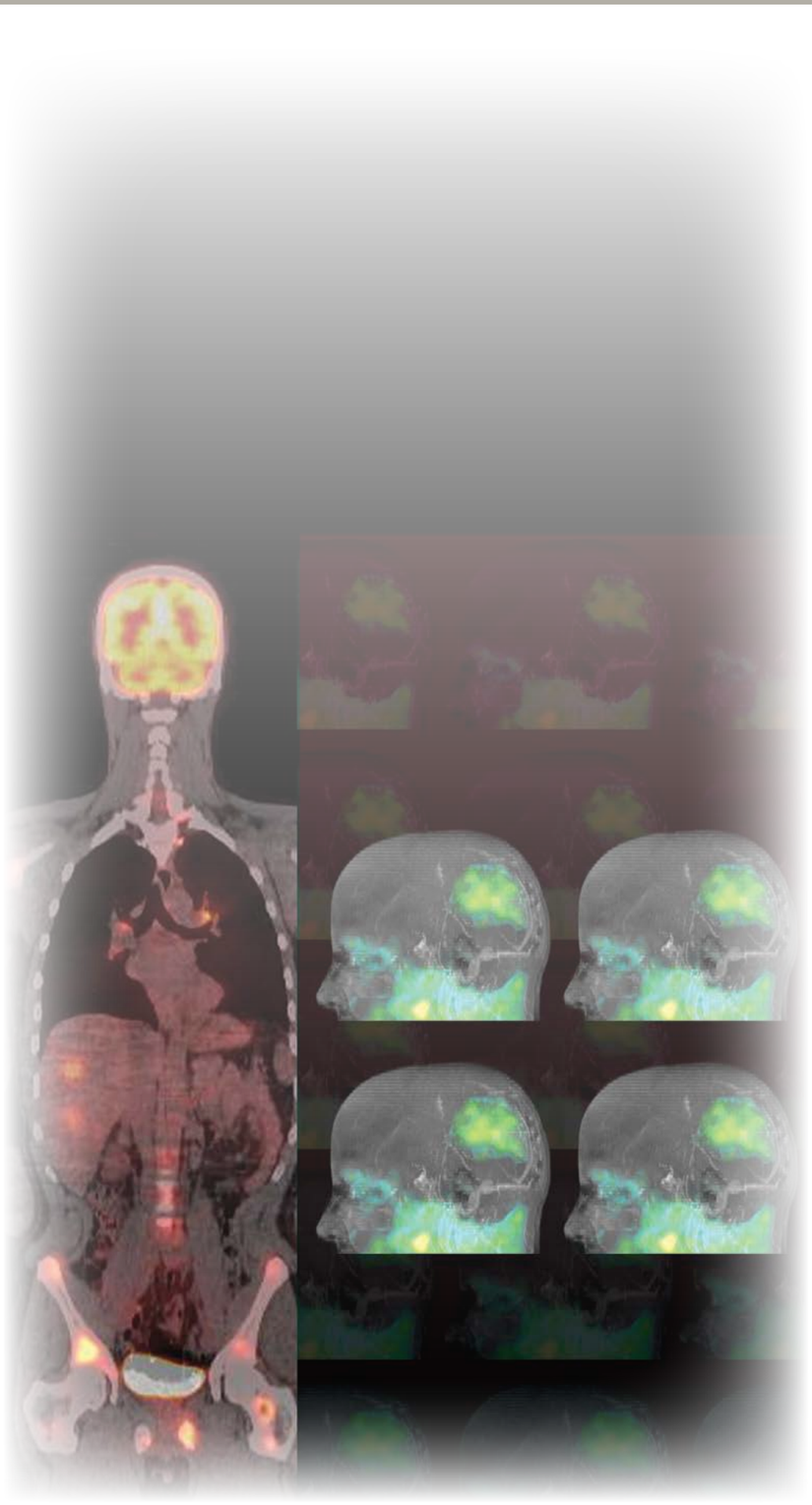
The residency training program in Nuclear Medicine and Molecular Imaging provides exceptional education in the basic science related to instrumentation, molecular imaging, and clinical nuclear medicine. The Stanford Nuclear Medicine & Molecular Imaging Clinic combines unique features in order to offer a solid multi-modality training program in both the adult and pediatric settings. The Program has the main rotations at the Stanford University Medical Center (including patients from Lucile Packard Children's Hospital), as well as at the Palo Alto VA Hospital. Training in conventional Nuclear Medicine, PET/CT and therapeutic procedures is provided. Ample research opportunities are also a unique feature of the program.


Guido Davizon


Tatianie Jackson


Judy Nguyen

Current Residents



Fellowships in Radiology

Fellowship Directors:
Abdominal Imaging: Brooke Jeffrey, MD and Aya Kamaya, MD
Body MRI: Bruce Daniel, MD
Breast Imaging: Sunita Pal, MD
Cardiovascular Imaging: Frandics Chan, MD, PhD
Interventional Radiology: William Kuo, MD
Musculoskeletal Imaging: Sandip Biswal, MD
Neuroradiology: Huy Do, MD
Neuro/Interventional: Michael Marks, MD
Nuclear Medicine PET/CT: Andrew Quon, MD
Pediatric Radiology: Richard Barth, MD and Erika Rubesova, MD
Thoracic Imaging: Ann Leung, MD

The Department offers a number of one or two year postdoctoral clinical fellowships that begin July 1 of each year. Each Section in Radiology interviews and selects fellows specific to their area of clinical interest.

Pediatric


Amy White


Vy Tran


Matthew Schmitz


Rakhee Gawande


Siobhan Flanagan

Abdominal


Matthew Jones


Rupesh Kalthia


Kendra Klang


Charles Kosydar


Monish Laxpati


Parmbir Sandhu


Ali Tahvildari


Nha Tran


Joel Verbrugge

Body MRI


Iva Petkovska

Breast


Sonya Edwards


William Thomas

Cardiovascular


Susan Duffy


Roopa Vemireddy

NCI Body


Christopher Parham


Bhavik Patel

Musculoskeletal


Michael Kim


Christopher Way

Interventional


Amy Asandra


Jay Desai


Albert Hsiao


John Oh


Vishal Sidhar


Anobel Tamrazi

Nuclear Medicine PET/CT


Thomas Hope


David Weinreb

NCI MSK


Bhavya Shah

Neuroradiology


Michael Antonucci


Matthew Dobbs


Mircea Dobre


Neilesh Gupta


Michael Iv


James Kang


Lex Mitchell

Neuro/Interventional

Omar Choudhri

Ryan McTaggert

Advanced Residency Training at Stanford (ARTS)

Director: Sanjiv Sam Gambhir, MD, PhD

The ARTS Program offers the opportunity to combine clinical training with advanced research training to complete a PhD degree during or upon completion of residency or clinical fellowship. The program begins with one or more years of postgraduate clinical training, followed by research training in a graduate program in Stanford University's Schools of Medicine, Engineering, or Humanities and Sciences.

Residents/clinical fellows admitted to the program complete clinical training toward board certification in their chosen field. These include internal medicine, its subspecialties (cardiovascular medicine, hematology, immunology and rheumatology, infectious diseases, nephrology, oncology, pulmonary and critical care medicine), surgical disciplines (neurosurgery, obstetrics and gynecology, surgery and urology), or non-surgical disciplines (neurology, pediatrics, psychiatry, radiation oncology and radiology).

The Advanced Residency Training at Stanford (ARTS) Program prepares trainees for today's competitive clinical/research environment that demands rigorous scientific training for young academicians. The ARTS Program offers a high level of knowledge and intense training to physician-scientists. The program is designed to prepare trainees for a career that combines basic science research with residency or clinical fellowship training. The goal is to foster development of physicians with comprehensive scientific training. Applications for this program are accepted throughout the year. Please see the ARTS program website for further details at http://med.stanford.edu/arts/.

Current Students

Andrew Beck

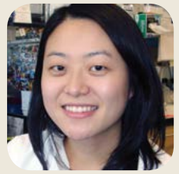
Andrew Beck, MD

Pathology - Resident
PhD Program: Biomedical Informatics, 2009-Present
Mentor: Daphne Koller, PhD

Katherine Fuh

Katherine Fuh, MD

OBGYN - Gynecology Oncology Clinical Fellow
PhD Program: Cancer Biology, 2009-Present
Mentor: Amato Giaccia, PhD



Elizabeth Choe

Elizabeth Choe, MD,

Medicine - Cardiovascular Medicine Fellow
PhD Program: Cancer Biology, 2010-Present
Mentor: James Spudich, PhD

Haruka Itakura

Haruka Itakura, MD

Medicine - Hematology/Oncology Clinical Fellow
PhD Program: Biomedical Informatics, 2010 - Present
Mentor: Phil Tsao, PhD

Charles Gawad

Charles Gawad, MD

Pediatrics - Hematology/Oncology Clinical Fellow
PhD Program: Cancer Biology, 2011-Present
Mentor: Patrick Brown, MD, PhD

David Kurtz

David Kurtz, MD

Medicine - Resident
PhD Program: Bioengineering, 2012-Present
Mentor: Sanjiv Sam Gambhir, MD, PhD

Eugene Richardson

Eugene Richardson, MD

Medicine - Infectious Diseases and Geographic Medicine Fellow
PhD Program: Sociology, 2012-Present
Mentor: Andrew Zolopa, MD

Radiology Clerkship

Director: Michael Federle, MD

The goal of the basic four-week clerkship (Diagnostic Radiology and Nuclear Medicine Clerkship 301A) is to teach the fundamental principles of interpreting radiographic and nuclear medicine studies. The medical student will learn the value and limitations of such studies in commonly encountered clinical problems. The concept of what constitutes an adequate radiographic study will be examined. Case material will be selected to illustrate both normal and abnormal anatomic and physiologic states. Additionally, an introduction to the principles of radiation protection and the public health implications of diagnostic radiation will also be discussed. Contact Grayling Thompson (grayling@stanford.edu) for additional information regarding this course.

Visitors Program

Program Coordinators: Jackie Walker and Samantha Scott

The Department of Radiology is pleased to offer Visiting Fellowships in all subspecialties. Our unique program offers individualized instruction that ensures each participant will receive one-on-one training with some of the leading radiologists in the country. Each personally tailored program offers flexibility to accommodate the schedules of both the visitor and the sponsoring faculty member. Please visit our website to complete an application and specify your clinical focus area: http://radiology.stanford.edu/education/clinical/visitors.html. Also, contact Sofia Gonzales, Visitors' Program Coordinator at sofias@stanford.edu.

Research Education and Training

NIH/NCI T32 CA 09695

Advanced Techniques for Cancer Imaging and Detection (SCIT)

Directors: Sandy Napel, PhD and Graham Sommer, MD
Program Manager: Sofia Gonzales, MS

http://scitprogram.stanford.edu/

The Department of Radiology at Stanford University offers qualified individuals a unique research opportunity through our Advanced Techniques for Cancer Imaging and Detection Program, which began its 20th year of training on March 1, 2012. Initially designed and directed by Dr. Gary M. Glazer in 1992, the goal of this program is to provide MD and PhD research fellows training in cancer-related imaging research. Fellows have the opportunity to work with our world-renowned faculty who are committed to sharing their knowledge and mentoring future leaders in radiology. Our program allows basic scientists in medical imaging (PhD) and clinical scientists (MD post-residency) to collaborate in an unparalleled environment that combines medical imaging sciences, clinical sciences, a strong cancer focus, and an institutional commitment to training academic radiologists and basic scientists in imaging science. New Program Directors, Drs. Napel and Sommer, renamed the program to "Stanford Cancer Imaging Training (SCIT) Program" and submitted a competing renewal application in January 2012, which was reviewed and given an outstanding score. Our program received news on March 10, 2013, that NIH will continue to fund the SCIT program for another five years or until 2018.

A specific aim of our training program is to position our trainees for a career in academic radiology. To date, we have graduated 34 trainees from our program, 24 of which have taken positions in academia, 3 in industry and 7 are in private practice. Our trainees continue to be extremely productive. We often collaborate with them in their new positions both locally and throughout the country. We are grateful to the National Institutes of Health for its recognition of the strength and success of our training program.

Recent graduates from the SCIT program include Dr. Pejman Ghanouni who ended his fellowship in December 2011 and joined the Department of Radiology as an Assistant Professor. Dr. Dragos Constantin also ended his fellowship in February 2012 and accepted a position as a Research Associate in Dr. Fahrig's laboratory at Stanford. As our grant was recently approved for another 5-year funding cycle, we are now recruiting two more fellows to join the program. Currently we have 7 trainees in the program: Drs. Sarah Geneser, Catherine Moran, Bhayva Shah, Steven Sensarn, Daniel Golden, Christopher Parham, and Bhavik Patel; their interests are described on page 34-35.

The following table lists all graduates from our NIH/NCI funded training program (T32 CA09695):

NCI Fellow	Completed	Current Position	Current Institution	Primary Mentor
John Strang, MD	1995	Assistant Professor	University of Rochester, Rochester, NY	Herfkens
Ian Chen, MD	1996	Radiologist	Southwest Washington Medical Center, Vancouver, WA	Li
Susan Lemieux, PhD	1996	Assistant Professor	Diagnostic Imaging Western Virginia Univ., Morgantown, WV	Glover
Bruce Daniel, MD	1997	Associate Professor	Radiology, Stanford University, Stanford, CA	Herfkens
Garry Gold, MD	1997	Associate Professor	Radiology, Stanford University, Stanford, CA	Macovski
Yi-Fen Yen, PhD	1997	Research Scientist	GE Advanced Health Care	Glover
Esther Yuh, PhD	1998	Clinical Fellow	Radiology (Neuroradiology), UCSF, CA	Li & Napel
Roger Shifrin, MD	1998	Assistant Professor	University of Florida, FL	Pelc & Herfkens
Steven Heiss, MD	1999	Radiologist	Radiology Imaging Associates, Denver, CO	Li
Martin Blum, MD	2000	Researcher	PET/Nuclear Medicine, Palo Alto VA, CA	Jeffrey
Curtis Coulam, MD	2001	Radiologist	Gem State Radiology Group, Boise, ID	Sommer
Lawrence Chow, MD	2002	Assistant Professor	University of Oregon, Eugene, OR	Sommer
Samira Guccione, PhD	2002	Assistant Professor	Radiology, Stanford University, Stanford, CA	Bednarski
Yishan Yang, PhD	2002	Research Associate	Radiology, Stanford University, Stanford, CA	Bednarski
Charles Liu, MD	2003	Radiologist	La Jolla Radiology, La Jolla, CA	Herfkens & Sommer
Karl Vigen, PhD	2003	Research Scientist	University of Wisconsin-Madison, Madison, WI	Butts Pauly
Susan Hobbs, MD, PhD	2003	Radiologist	CT Section Chief, Kaiser Permanente, Walnut Creek, CA	Bednarski
John Levin, MD	2004	Radiologist	St. Luke's Medical Center & Clinic, Minneapolis, MN	Herfkens & Sommer
Laura Pisani, PhD	2004	Postdoctoral Fellow	Radiology, Stanford University, Stanford, CA	Glover
Daniel Margolis, MD	2005	Assistant Professor	Dept. of Radiology, UCLA, Los Angeles, CA	Jeffrey
Daniel Ennis, PhD	2006	Postdoctoral Fellow	University of Washington, Seattle, WA	Pelc
Anthony Faranesh, PhD	2007	Research Scientist	NIH, Washington, DC	Pelc & Hargreaves
Lewis Shin, MD	2007	Assistant Professor	Radiology, Stanford University, Stanford, CA	Herfkens
Michael McDonald, PhD	2007	Research Scientist	NIH, Washington, DC	Guccione
Byard Edwards, MD, PhD	2008	Scientific Researcher	Vanderbilt University	Jeffrey
Cristina Zavaleta, PhD	2008	Scientific Researcher	MIPS, Radiology, Stanford University, Stanford, CA	Gambhir
Jinha Park, MD, PhD	2008	Assistant Professor	University of Southern California, Los Angeles, CA	Gambhir
Stephanie Bailey, PhD	2009	Scientific Researcher	Comprehensive SDSU/UCSD Cancer Center	Plevritis
Moses Darpolor, PhD	2010	Postdoctoral Fellow	Radiation Oncology, Stanford University, Stanford, CA	Spielman
Rachel Bitton, PhD	2010	Postdoctoral Fellow	RSL, Stanford University, Stanford, CA	Butts-Pauly
Grace Tye, MD	2011	Radiologist	Alvarado Breast Center, La Jolla, CA	Jeffrey, Napel
Pejman Ghanouni, MD PhD	2011	Clinical Applications of MR Guided Focused Ultrasound Surgery	Assistant Professor, Stanford University	Butts Pauly
Dragos E. Constantin, PhD	2012	MR Real Time Image Guidance in Radiation Therapy	Research Associate, Stanford University	Fahrig

http://scitprogram.stanford.edu/

Current NCI T32 Postdoctoral Trainee Research Interests

Catherine Moran, PhD

(2/16/2011 - 2/15/2013) received her PhD degree in Medical Physics in 2009 from the University of Wisconsin under the supervision of Dr. Walter Block. Her thesis work focused on radial MRI acquisition methods for the detection and diagnosis of breast cancer. She is currently a postdoctoral fellow in Dr. Brian Hargreaves' lab in the RSL and is co-mentored by Dr. Bruce Daniel. Her primary research interest continues to be breast cancer with the goal of improving lesion characterization in breast MRI, with specific application of these techniques to women at a high risk for breast cancer. Training with Drs. Daniel and Hargreaves, her work encompasses both basic science and clinical translational aspects of breast MRI. Prior to beginning graduate school, Dr. Moran spent three years as a management consultant at PricewaterhouseCoopers, LLC, and utilizes this experience in improving business processes to facilitate the translation of research to the clinic.

Catherine Moran

Sarah Geneser, PhD

(2/16/2011 - 2/15/2013) received a Masters degree in mathematics and a PhD in computer science from the University of Utah in 2002 and 2008, respectively. She is currently is a postdoctoral fellow in Dr. Lei Xing's lab in Radiation Oncology working on improving the accuracy of radiation therapy targeting. Dr. Geneser has developed a novel method for treating lung and liver tumors that improves targeting accuracy while reducing the total time for delivery of radiation therapy. Dr. Geneser is also working with collaborators at UCSF (Pouliot and Kirby) to accurately model the effects of organ motion on radiation dose delivered to tissues to help account for organ motion in the treatment planning process and improve treatment accuracy.

Sarah Geneser

Bhavya Shah, MD

(8/1/2011 - 7/31/2013) completed a double-major in Biologic Systems and Philosophy from Washington University and subsequently completed medical school at University of Missouri-Columbia. He completed a transitional internship at Lutheran General Hospital before completing his radiology residency at Boston University Medical Center. While there, Dr. Shah was involved in research projects investigating applications of quantitative magnetic resonance imaging in body imaging, interventional radiology and neuroradiology. During his residency he also engaged in research at the Massachusetts Institute of Technology in regenerative medicine applications of nanotechnology. He is presently working with Dr. Biswal and Dr. Beaulieu developing a database of quantitative features of radiographs of bone tumors for decision support and discovery applications, and investigating the imaging of pain from bone tumors. He looks forward to a career in academic radiology with a focus in minimally-invasive regenerative medicine and musculoskeletal intervention.

Bhavya Shah

Steven Sensarn, PhD

(3/1/2012 - 2/28/2014) received his PhD degree in Electrical Engineering in 2010 from Stanford University, is currently a postdoctoral fellow in Dr. Christopher Contag's lab. Dr. Sensarn has designed and constructed a fluorescence endoscope system to enable wide-field imaging of tumor-targeting molecular biomarkers that were obtained from collaborators here at Stanford (Dr. Bogyo) and at Vanderbilt (Marnett). He has used this system to image colon polyps in rats (transgenic rats modeling human colon cancer). This work has led Dr. Sensarn to explore the link between cancer stages and the expression of target enzymes labeled with fluorescent biomarkers.

Steven Sensarn

Daniel Golden, PhD

(7/1/2012 - 6/30/2013) received his PhD in Electrical Engineering at Stanford University in March 2011. His doctoral work in the field of space physics was performed in the VLF (very low frequency) group in the EE Department. His background and training, which involves the in-depth use of machine learning and statistical analysis, provides skills, which directly translate into the field of biomedical informatics, his particular area of interest. Dr. Golden's planned research in Dr. Rubin's lab focuses on the identification of quantitative imaging features derived from dynamic contrast-enhanced MRI (DCE-MRI) that can be used to characterize the heterogeneity of breast cancer lesions. The goal of this work is to provide a input for support in treatment plan decision-making. For Dr. Golden, imaging informatics is a shift in focus and commitment from space physics to the more humanitarian study of health and disease.

Daniel Golden

Christopher Parham, MD PhD

(7/1/2012 - 6/30/2013) received his MD and PhD in Biomedical Engineering from the University of North Carolina at Chapel Hill in May 2006. His doctoral work was focused on the development of a clinical Diffraction Enhanced Imaging (DEI) system. This novel imaging technique uses multiple x-ray interactions to generate high contrast, ultra-low dose images with applications to many areas of radiology. Initially developed using a synchrotron, the challenge has been to design a compact system for clinical use. After completing his doctorate, Dr. Parham co-designed and built a DEI prototype during his engineering postdoc at the UNC Biomedical Research Imaging Center. He then completed a medicine internship at the University of California, San Diego and will complete radiology residency training at UNC Chapel Hill in June 2012. Dr. Parham will be joining the radiology department at Stanford as a body imaging fellow and plans to continue working towards the development of new imaging technologies in Dr. Levin's lab.

Christopher Parham

Bhavik Patel, MD

(7/1/2012 - 6/30/2013) received his B.S. in Microbiology from the University of Alabama and subsequently completed medical school at UAB. He completed a surgical internship at Harvard Medical School/Brigham & Women's Hospital before completing his radiology residency back at UAB. While at UAB, Dr. Patel was involved in research projects involving chest radiology, neuroradiology, interventional radiology, and abdominal imaging and was recognized with several awards including the RSNA Research & Education Foundation Roentgen Resident Research Award and the Alabama Academy of Radiology Robert Stanley Outstanding research award. His latest research focused on the Dual Energy CT applications in pancreatic lesions and hepatic steatosis. He has presented his findings at various scientific meetings, published his findings, as well as authored/co-authored two book chapters. At UAB, he served as Chief resident and served on several administrative committees. He is looking forward to continuing his body imaging research in Dr. Sommer's lab.

Bhavik Patel

NIH/NIBIB T32 EB009653-01

Training in Biomedical Imaging Instrumentation (TBI²)

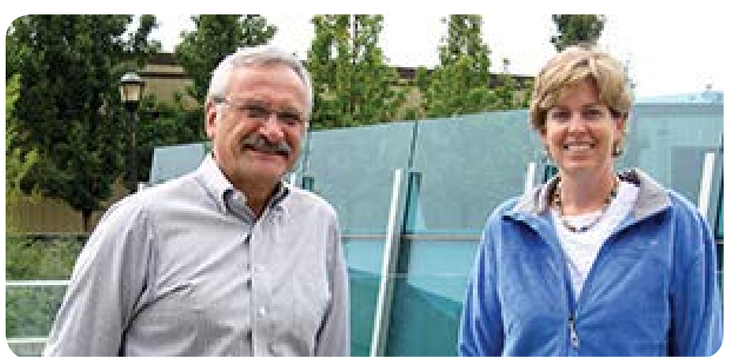
Directors: Norbert Pelc, ScD and Kim Butts Pauly, PhD

http://tbi2.stanford.edu/

Training in Biomedical Imaging Instrumentation (TBI2, http://tbi2.stanford.edu) is a multidisciplinary pre-doctoral training program at Stanford University in biomedical imaging technology that is entering its third year. Our mission is to train the next generation of researchers in and inventors of biomedical imaging technology. Imaging technology continues to evolve at a rapid pace generating new techniques in research today that will become the standard of care for tomorrow. There is a high need for trained researchers in this field to fill positions in academia, industry, and government. Stanford University has a unique multidisciplinary research effort in biomedical imaging, spanning magnetic resonance, computed tomography and radiography, radionuclide and optical methods for molecular imaging, ultrasound, and hybrid imaging such as Xray/ MR and PET/MR, as well as image processing and analysis for diagnosis, radiation therapy, and science.

Our program attracts students from six different degree granting programs to train in biomedical imaging technology with faculty from 8 different departments and Interdepartmental Programs.

In general, we recruit two new trainees each year and provide each with financial support for 2 years. However, we were able to leverage the funding from NIH and currently have 2 new students (Farah Memon and Nicholas Dwork , and 3 second year trainees (Matt Bieniosek, Arbi Tamrazian and Mihir Pendse).



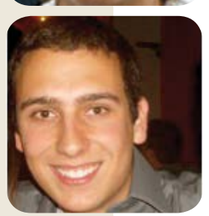
New Trainees

Farah Memon

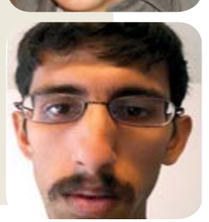
Nicholas Dwork

2nd Year Trainees

Matt Bieniosek



Arbi Tamrazian



Mihir Pendse

NIH/NCI P50CA114747

In vivo Cellular and Molecular Imaging Center at Stanford (ICMIC)

Director: Sanjiv Sam Gambhir, MD, PhD
Program Manager: Billie Robles, BS

http://mips.stanford.edu/grants/icmic/

Dominique van de Sompel, PhD, joined the ICMIC program in 2010. Dr. Van de Sompel completed his PhD training at the University of Oxford in Medical Image Processing prior to coming to Stanford and joining Dr. Sam Gambhir's research lab in multimodality molecular imaging. Dr. Van de Sompel is particularly interested in algorithm development for quantitative in vivo cancer imaging, and would like to learn more about the underlying molecular biology that prompts the need for research in the first place. His current work is focused on Raman spectroscopy and photoacoustic tomography.

Thillai Sekar Veerapazham, PhD, also joined the ICMIC program in 2010. His interests in nanoscale synthesis and assembly for biomedical applications make him a good fit for the labs of Dr. Jianghong Rao and Dr. Heike Daldrup-Link. Dr. Veerapazham will acquire hands-on experience with cell cultures, collecting image data, small animal handling, as well as strengthening his organic and nanoparticle synthetic skills, as well as gaining experience with clinical work. His clinical interests focus on applying his basic science knowledge and experience in areas of breast cancer research.

Current Trainees

Dominique van de Sompel

Thillai Sekar Veerapazham

The following table lists all graduates from our NIH/NCI funded ICMIC program (P50CA114747):

ICMIC Fellow	Completed	Current Position	Current Institution	Primary Mentor
Sheen-Woo Lee, MD	2005	Assistant Professor	Gachon University Medical School, Inchon, Korea	Biswal
Gayatri Gowrishankar, PhD	2006	Research Scientist	Stanford University	Rao
Ehran Yenilmez, PhD	2007	Research Scientist	Nanomix, Inc.	Melosh
Meike Schipper,MD	2007	Chief Resident, Nuclear Medicine	Stanford University	Gambhir
Weibo Cai, PhD	2007	Assistant Professor	Univ of Wisconsin, Madison, WI.	Chen
Arne Vandenbroucke, PhD	2008	Research Scientist	Cenix BioScience	Levin
Frank Cochran, PhD	2008	Postdoctoral Fellow	Bioengineering, Stanford Univ	Cochran
Michael Helms, PhD	2008	Research Scientist	Cenix BioScience	Contag
Phuoc Tran, MD, PhD	2008	Assistant Professor	Johns Hopkins	Felsher
Zibo Li, PhD	2008	Assistant Professor	Univ of Southern California	Chen
Gang Ren, PhD	2009	Research Scientist	Stanford University	Cheng
Michael Benoit, PhD	2009	Research Scientist	Stanford University	Matin
Priti Balchandani, PhD	2009	Post-doctoral fellow	Stanford University	Spielman
Zheng Miao, PhD	2009	Research Scientist	Stanford University	Cheng
John Ronald, PhD	2010	Postdoctoral Fellow	Stanford University	Gambhir/Rutt
Dominique van de Sompel, PhD	2011	Postdoctoral Fellow	Stanford University	Gambhir
Pascale Kallasi, PhD	2011	Postdoctoral Fellow	Stanford University	Harris
Thillai SekarVeerapazham, PhD	2011	Postdoctoral Fellow	Stanford University	Ramasamy
Yang Liu, PhD	2011	Postdoctoral Fellow	Stanford University	Zhen Cheng

NIH/NCI R25 CA 118681

Stanford Molecular Imaging Scholars (SMIS)

Director: Craig Levin, PhD
Program Manager: Sofia Gonzales, MS

http://mips.stanford.edu/grants/smis/

The Stanford Molecular Imaging Scholars Program was previously led by Dr. Sam Gambhir (September 2006 - August 2012) who transferred leadership to Dr. Craig Levin (September 2012). The Program is a cross-disciplinary postdoctoral training program at Stanford University that brings together 45 faculty mentors from 15 departments in the Schools of Medicine, Engineering, and Humanities and Sciences. Faculty mentors provide a diverse training environment spanning biology, physics, mathematics/biocomputation/biomedical informatics, engineering, chemistry, biochemistry, cancer biology, immunology, and medical sciences. The centerpiece of the SMIS program is the opportunity for trainees (PhD or MD with an emphasis on PhD) to conduct innovative molecular imaging research that is co-mentored by faculty in complementary disciplines. SMIS trainees also engage in specialized coursework, seminars, national conferences, clinical rounds, ethics training, and the responsible conduct of research. The three-year program culminates with the preparation and review of a mock grant in support of trainee transition to an independent career in cancer molecular imaging with the ultimate goal of training them to become leaders in the field. Thus far, 20 trainees have entered the SMIS program and 13 have completed the program.

The following table lists all graduates from our NIH/NCI funded SMIS training program (R25 CA 118681):

SMIS Fellow	Completed	Current Position	Current Institution	Primary Mentor
Ted Chu, PhD	2008	Research Scientist	Regeneron	Calvin Kuo
Hen-Tzu Jill Lin, PhD	2009	Consultant	Campbell Alliance	David Paik
Keith Hartman, PhD	2009	Senior Analyst	Boston Consulting Group	Sam Gambhir
Bryan Smith, PhD	2010	Research Scientist	Stanford University (MIPS)	Sam Gambhir
Henry Haeberle, PhD	2010	Senior Scientific Officer	University of New South Wales, Australia	Chris Contag
Hua Fan-Minogue, MD, PhD	2010	Graduate Student, BMI Program	Stanford University	Sam Gambhir
Jennifer Prescher, PhD	2010	Assistant Professor of Chemistry	University of California, Irvine	Chris Contag
Richard Kimura, PhD	2010	Senior Research Scientist	Canary Center at Stanford for Cancer Early Detection	Jennifer Cochran
Marybeth Pysz	2011	Scientist	Stem CentRx	Juergen Willmann
Nicholas Conley	2012	Principal Research Engineer	HGST / Western Digital	Matthew Scott
Benjamin Cosgrove	2012	Postdoctoral Scholar	Stanford University (Baxter Lab)	Helen Blau
Eric Gonzalez	2012	Self Employed		Craig Levin
Sharon Hori	2012	Postdoctoral Scholar	Stanford University (MIPS)	Craig Levin

Current Trainees

Moiz Ahmad

Moiz Ahmad, PhD, will begin his SMIS fellowship in Dec 2012 after completing his PhD in Medical Physics at The University of Texas Graduate School of Biomedical Science. His primary mentor in the program is Dr. Lei Xing. Moiz will be working on improving x-ray stimulated luminescence tomography, which uses targeted phosphor nanoparticles combined with spatially targeted x-ray stimulation for high-specificity molecular imaging.

Michael Angelo

Michael Angelo, MD, PhD, joined the SMIS program in 2012 after completing his clinical training in Clinical pathology at the University of California San Francisco. He is working with Drs. Garry Nolan and Helen Blau on developing a new methodology for multiplexed immunohistochemical staining for visualizing expression of dozens of proteins within a single tissue section.

Rehan Ali

Rehan Ali, PhD, joined the SMIS program in 2010 under the joint supervision of Drs. Edward Graves and Ramasamy Paulmurugan, after completing his PhD in Biomedical Image Analysis at the University of Oxford. His research focus is the development of non-invasive in vivo techniques for detecting and predicting tumor resistance to radiation therapy, using a combination of experimental and modeling techniques.

Jesse Jokerst

Jesse Jokerst, PhD, joined the SMIS program in 2009 after completing his PhD in Chemistry at University of Texas, Austin. With a background in graduate school that emphasized Raman fluorescent nanoparticles for biomarker measurement in vitro, Dr. Jokerst has found the SMIS program an opportunity to expand his experience in nanotechnology a perfect fit. His primary mentor in the program is Dr. Sam Gambhir.

Timothy Larson

Timothy Larson, PhD, began his SMIS fellowship in 2012 after completing his PhD in Biomedical Engineering at the University of Texas at Austin. He was co-advised by Dr. Sokolov and Dr. Ellington and worked on developing gold nanoparticle probes for diagnostic and therapeutic applications in cancer. He is now working with Dr. Gambhir on gaining a better understanding of the in vivo behavior of nanoparticles in order to design improved nanoparticle systems for medical applications.

Prachi Pandit

Prachi Pandit, PhD, began her SMIS fellowship in 2010 after completing her PhD in Biomedical Engineering at Duke University. Her primary mentor in the program is Dr. Brian Rutt. Prachi, in collaboration with Dr. Jianghong Rao's group, is working on developing magnetic resonance imaging based molecular imaging systems to image cancer-specific enzymatic activity of protease in vivo. This work focuses on "smart" Gd-based probes, which upon encountering a specific molecular target aggregate to form nanoparticles, thereby increasing the detection sensitivity of the system.

Katheryne Wilson

Katheryne Wilson, PhD, began her SMIS fellowship in 2012 after completing her PhD in Biomedical Engineering at The University of Texas at Austin. She is currently working with Dr. Juergen Willmann in the Department of Radiology as her primary mentor to develop molecular imaging contrast agents for combined ultrasound, photoacoustic, and mammographic imaging, three highly complementary modalities. The goal of these agents to aid in early detection of breast cancer in high risk patients with dense tissues, where current methods have poor sensitivity and specificity.

Clinical Sections

Abdominal Imaging

Section Chief: Juergen Willmann, MD

Our team. Seated left to right: Dr. Aya Kamaya, Dr. Michael Federle, Dr. Terry Desser. Standing left to right: Dr. Brooke Jeffrey, Dr. Robert Mindelzun, Dr. David Gross, Dr. Juergen Willmann, Dr. Bruce Daniel, Dr. Peter Poullos, Dr. Volney Van Dalsem, Dr. Graham Sommer.

The Abdominal Imaging Section strives for excellence in clinical care, teaching, and research. Our goal is to care for our patients and referring clinicians with the utmost of professionalism and train the next generation of imaging scientists in the field of abdominal imaging.

Clinical Services

Abdominal imaging encompasses CT, ultrasound, MRI and fluoroscopy of the abdomen and pelvis. All of our inpatient and outpatient facilities have state-of-the-art equipment, and all examinations are optimized for maximal diagnostic information, and supervised by highly trained technologists and attending physicians. We strive to develop highly innovative techniques that push the boundaries of the diagnostic capabilities of advanced technologies.

Our Team

Our team at Stanford University Hospital (SHC) includes ten faculty dedicated to the use of conventional (fluoroscopy), cross-sectional (CT, US, MR) and molecular imaging techniques for diagnosing diseases of the abdomen and pelvis. In addition, we maintain strong collaborations with radiology faculty at the Palo Alto VA, which includes Drs. Laufik, Nino-Murcia, Olcott, Shin, and Yao.

Education

Our section is actively involved in the training of medical students, radiology residents, and fellows. Our radiology residents rotate through our CT, ultrasound and fluoroscopy services, and are frequently supervised by abdominal imaging attending radiologists while on the Body MRI service. All of our Abdominal Imaging Section members participate in resident conferences, as well as advanced lectures for our body imaging fellows. In addition to our standard, one-year body imaging fellowship in clinical radiology, there are additional research-focused fellowships in our section that are funded by the National Cancer Institute.

Research

Our section has multiple NIH grants dealing with such diverse areas as ultrasound contrast agents, MRI of the prostate and pancreas, and breast MRI. Numerous members of our faculty do translational clinical research involving such innovative techniques as photoacoustic ultrasound, high-intensity focused ultrasound, and 3-D imaging of the pancreas.

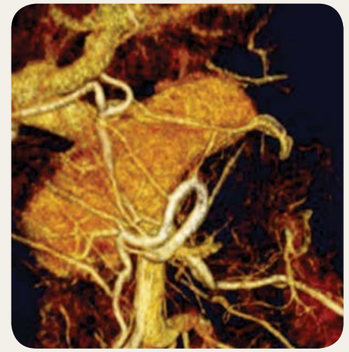


Fig 1. 3D VR image of the pancreas shows an anomalous loop in the superior mesenteric artery (SMA).

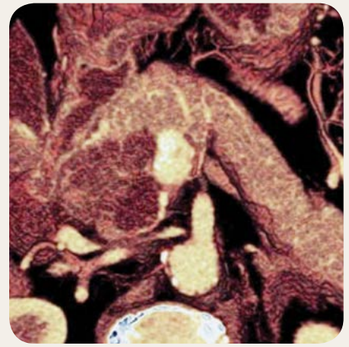
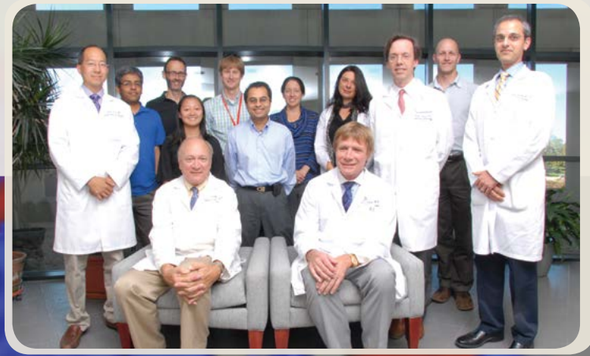


Fig 2. 3D VR image shows a serous micocystic adenoma in the head of the pancreas.

Body MRI

Section Chief: Shreyas Vasanawala, MD, PhD



Our team. Seated left to right: Dr. Robert Herfkens, Dr. Graham Sommer. Standing left to right: Dr. Lewis Shin, Dr. Manojkumar Saranathan, Dr. Marcus Alley, Jocelyn Shaw, Dr. Tom Hope, Dr. Shreyas Vasanawala, Dr. Catherine Moran, Dr. Iva Petkovska, Dr. Bruce Daniel, Dr. Brian Hargreaves, Dr. Pejman Ghanouni.

The body MR section aims to provide outstanding patient care, lead innovations in the practice of body MR, and train the next generation of clinician scientists. The overall direction of the group is development of a tight link between diagnosis and therapy to enable highly personalized care.

Clinical Services

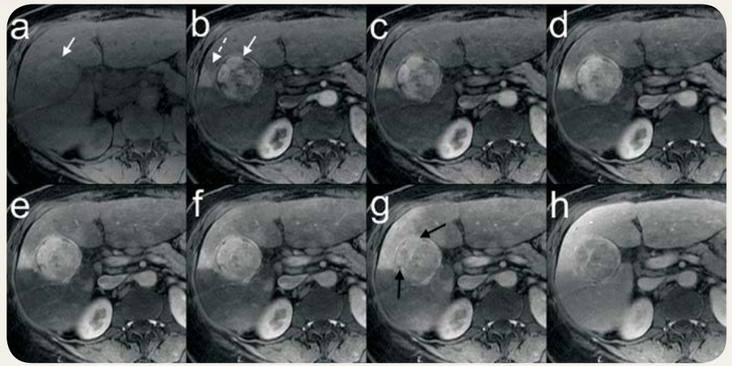
We provide services that are personally tailored for each patient and delivered with state-of-the-art MRI technology and highly trained staff. Most exams use techniques developed and uniquely available here at Stanford. Each faculty member is an internationally recognized expert in body MRI, and has experience developing new methods to improve diagnostic precision. Recently we introduced whole body MR exams, MR-HIFU fibroid therapy, and MR elastography to our services.

Education

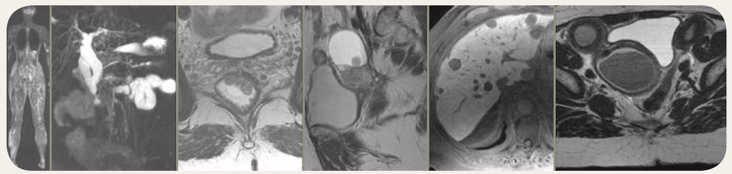
Recently, we have developed an innovative hands-on weekend intensive course focused on teaching trainees the essentials of body MRI. Core-concept interactive didactics are interlaced with hands-on imaging sessions. Participants are a mix of residents, fellows, technologists, attendings, and MR physicists actively learning to optimize images, troubleshoot, build protocols, time image acquisitions, and handle advanced post-processing.

Research

Body MRI research at Stanford is fostered by close collaborations and friendships between clinicians and research scientists in the Department of Radiology, the University, and throughout the Bay Area. The past year has seen strides in better cancer detection and treatment. We are grateful that these efforts are supported by multiple NIH and Foundation grants.

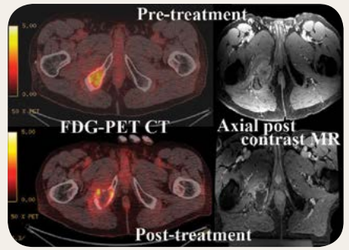


Fast MRI techniques: Research at the Stanford University Department of Radiology has enabled MRI techniques that are rapid enough to capture multiple serial snapshots of tumors that quickly take up contrast agents that are intravenously injected.

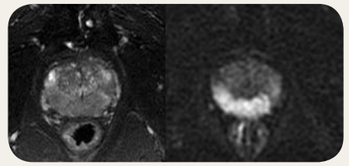


From left to right: Whole body MRI, pancreas with ductal tumors, rectal cancer, endometriosis complicated by ovarian cancer, neuroendocrine tumor spread to liver, two uterine horns with obstruction.

Hands-on weekend intensive training course for fellows, postdocs, technologists, and other attendees.



MR-HIFU: Pre and post MR-HIFU treatment images in a patient with good pain relief after therapy of a bone metastasis.



Prostate MRI: Novel prostate cancer detection by high-resolution diffusion imaging.

RESEARCH AREAS
Breast MRI
Fast MRI techniques
Focal pancreatic ablation
Focal prostate ablation
Interventional MRI
MR Enterography
MR-HIFU of bone metastases and soft tissue tumors
Novel MRI Hardware
MR-PET
Advanced Prostate MRI
Quantitative Methods
Sleep MRI
Small Bowel Motility
Whole body MRI

Image left: Kidney donor evaluation

Breast Imaging

Section Chief: Debra Ikeda, MD

Our team. clockwise from top left: Dr. Marnie Kremer, Dr. Sunita Pal, Dr. Russ Thomas, Dr. Sonya Edwards, Dr. Jafi Lipson, Dr. Debra Ikeda, Jennifer Kao

Our team is dedicated to improving the health and lives of women by detecting and diagnosing breast cancer at its earliest stage using standard and emerging advanced diagnostic procedures, one woman at a time. We are devoted to providing personalized and comprehensive breast care in a holistic manner, minimizing discomfort and anxiety, using Stanford's expert physicians, a multidisciplinary approach, integrated healthcare solutions, and state-of-the-art equipment.

Clinical Services

We provide breast imaging services in two Stanford Hospital locations: the Advanced Medicine Women's Center and the Blake Wilbur Outpatient Clinic, where our patients expect a full range of services dedicated to their individualized care. Our breast imaging centers achieved the Breast Imaging Center of Excellence designation from the American College of Radiology in 2011 due to our expertise in mammography, breast ultrasound, breast biopsy and MRI. We will also soon offer digital breast tomosynthesis, a recently FDA-approved 3D mammographic technique that has been shown in early clinical trials to increase cancer detection and decrease the rate of false positive exams in a screening population.

Our Team

Our team of five faculty are Radiology (ABR) credentialed and certified by the FDA Mammography Quality Standards Act (MQSA) to read mammography and tomosynthesis. Our team also includes seven technologists, a medical assistant and nurse.

Education

Our Breast Imaging Fellowship offers nine months of breast imaging, one month breast MRI, and two months of elective. The fellowship also provides a three-month body imaging (cross-sectional) rotation for individuals interested in this option. Research time is provided during the fellowship for academic projects.

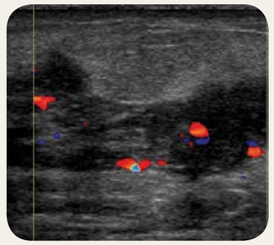
Research

Breast imaging research is fostered by close collaborations among clinicians and research scientists. Our section also has long-standing collaborations with Surgical Oncology, Medical Oncology, Radiation Oncology, and Pathology.

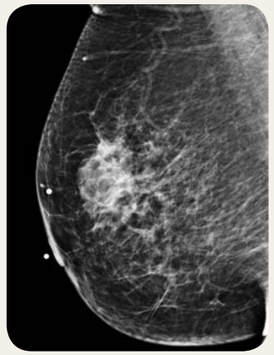
Dr. Ikeda has published on digital breast tomosynthesis compared to full field digital mammography to respond to the need for improving breast cancer detection. She will continue this work with installation of 2 new tomosynthesis units in 2013. Other work includes the study of genetic signatures of breast tumors and surrounding stroma (Dr. Robert West, Pathology) and correlating results with plasma proteomics by mass spectrometry (Dr. Sharon Pitteri, the Canary Center). These data will be compared with their phenotypes on FFDM, US and MRI. Other work focuses on imaging utilization and women's perceptions of breast density, risk and imaging tests in response to the California SB 1538 Breast Density Law, effective April 1, 2013.

Dr. Lipson's research focuses on breast cancer risk assessment; mammographic density and cancer risk; early detection with alternative screening modalities including automated whole breast ultrasound and tomosynthesis; cost-effective strategies to assess the likelihood of breast malignancy and extent of disease using contrast-enhanced mammography and tomosynthesis; and the evaluation of novel biomarkers of cancer burden and neoadjuvant chemotherapy response. She received Department of Radiology Angel Funding for a pilot study of correlative imaging, leukocyte telomere length, and circulating telomerase levels of patients with benign and malignant breast lesions (Co-PI: Sharon Pitteri - Canary Center). She is also a co-investigator on an NCI-funded R01: "Genetics of mammographic breast density and breast cancer risk in a Kaiser cohort (PI: Weiva Sieh - Health Research and Policy).

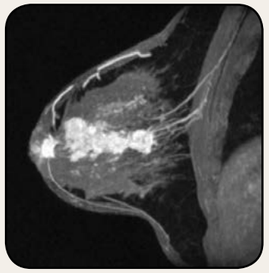
Drs. Pal, Kao and Schmelzel are 100% dedicated to patient care; their presence in the clinic provides a consistency to our infrastructure that enhances patient care by providing a familiar and comfortable experience for our patients. Our entire team is committed to a patient experience that includes a personal encounter focused entirely on a woman's needs.



Real-time ultrasound of a mass that was hard to see on the mammogram (dark area in the box) shows high blood flow on color doppler imaging (red and blue spots)



Right mediolateral mammogram shows a mass representing cancer hidden in dense tissue (white area, marked by a round bright white skin marker over the mass).



DCE-MRI shows a large enhancing mass (white area) against dense tissue (gray area) that the woman felt but could not be seen on the mammogram.

Cardiovascular Imaging

Section Chief: Dominik Fleischmann, MD

Our team. Back: Dr. Aya Kino, research associate; Malwana Adalat, Administrative Associate, Dr. Roopa V, clinical cardiovascular imaging fellow; Front: Dr. Frandics Chan, Dr. Dominik Fleischmann, and Dr. Robert Herfkens.

The Cardiovascular Imaging (CVI) section, a radiology subspecialty dedicated to the care of patients suffering from diseases of the heart and blood vessels, was built on the pioneering works of Drs. Herbert Abrams and Lewis Wexler, who developed many early catheter-based angiographic techniques. Following the revolutionary developments of cardiac MRI, cardiac CT and medical image post-processing in the 1990s, there was great interest in applying these technologies to cardiovascular diseases.

Thus, in 2001, Drs. Geoffrey Rubin and Robert Herfkens organized the CVI Section. The goals of the section are to support basic research in promising CVI technologies, to develop new patient imaging protocols, and to investigate innovative image-based treatments and their outcomes, including sophisticated post-processing techniques. CVI advanced imaging enables unprecedented 3- and 4-D visualization of complex cardiovascular anatomy, function, and pathology that facilitate treatment planning for surgical or endovascular procedures.

Clinical Services

The CVI section provides a full spectrum of noninvasive imaging services using MRI and CT for adult and pediatric patients with cardiovascular diseases. This includes diseases of the heart (coronary and valvular diseases, cardiomyopathy, tumors, and congenital heart disease) and diseases of the blood vessels (obstruction, aneurysm, dissection, thrombosis, and vasculitis). Patients are referred from adult cardiology, pediatric cardiology, rheumatology, cardiothoracic surgery, vascular surgery, interventional radiology, as well as the emergency department. Cardiovascular imaging is technically demanding and requires sophisticated image acquisition and contrast injection protocols carried out by experienced CVI faculty, and highly-trained CT and MRI technologists.

Our Team

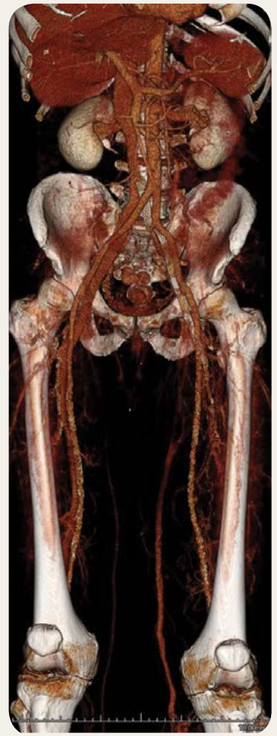
The CVI faculty consists of renowned experts in non-invasive cardiovascular imaging. Dr. Fleischmann is an expert on CT technology, contrast medium kinetics, imaging post-processing, and aortic diseases. Dr. Chan is an expert in pediatric cardiovascular imaging and a nationally recognized specialist in congenital heart disease. Dr. Herfkens is an expert in cardiac MRI technology and cardiac nuclear medicine.

Education

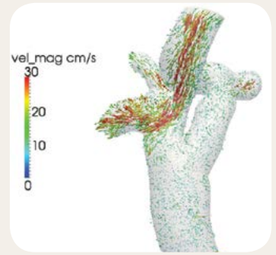
The CVI Section provides dedicated training in non-invasive cardiovascular imaging for medical students, radiology residents and fellows, and visiting physicians. The Cardiovascular Imaging (CVI) Fellowship provides one year of training in noninvasive cardiovascular imaging using CT and MRI. Fellows receive detailed training in the principles and use of state-of-the-art multidetector row CT and cardiovascular MR imaging systems. Clinical studies include CT and MR angiography of the aorta, coronary arteries, renal arteries, pulmonary arteries, peripheral arteries, mesenteric arteries, pulmonary and systemic venous structures as well as cardiac CT and MRI in the assessment of congenital heart disease, ischemic heart disease, valvular heart disease, cardiomyopathy, cardiac tumor, and pericardial disease. Fellows in the CVI program study cardiovascular diseases in adults as well as in children. Fellows may also participate in research projects and develop skills for clinical investigations.

Research

CVI section members engage in technical and clinical research programs that are enhanced through close collaboration with scientists and engineers in the Radiological Sciences Lab, and extensive collaborations with clinical and industry partners. Clinical research topics include imaging of the aorta and heart valves, transcatheter aortic valve replacement (TAVR), imaging of acute aortic syndromes. Research in pediatric cardiovascular imaging includes surgical planning for congenital heart disease, MRI 4D-flow visualization and measurements for cardiovascular physiology, radiation dose reduction strategies in pediatric cardiac CT, and sedation-free CT techniques. Technical research includes iterative image reconstruction in cardiovascular CT, contrast optimization for subsecond CT, and the development of image postprocessing technology of vascular diseases.



3D volume rendered image of a CT venogram obtained at 80kVp shows excellent delineation of abdominal, pelvic and lower extremity veins in patient with treated pelvic vein thrombosis.



Blood flow simulated by computational fluid dynamics in a Y-Fontan graft for surgical planning.

Interventional Radiology

Section Chief: Lawrence "Rusty" Hofmann, MD

Our team. Center Image: (clockwise from left) Dr. David Hovsepian, Dr. John Louie, Dr. Lawrence 'Rusty' Hofmann, Dr. Daniel Sze and Dr. Nishita Kothary. Individual Images (clockwise from left) Dr. Gloria Hwang, Dr. Rajesh Shah, Dr. David Wang and Dr. William Kuo.

The goal of the Interventional Radiology section is to provide outstanding patient care, education, and research while pioneering new interventional endovascular treatments. Our section is one of the most active clinical and research sections in the School of Medicine, with over 20 clinical research studies and an active basic research initiative. Our studies focus on three main areas of interest: Deep Vein Thrombosis (DVT)/Pulmonary Embolism, Venous Stenoses, and Interventional Oncology.

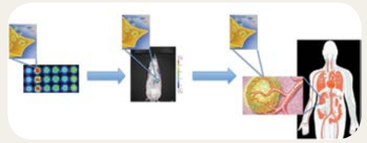


Figure 1. Development of VIPER. VIPER is a tranfection cocktail developed in the basic research laboratory using bioluminescence. Initially used in vitro, VIPER is currently being optimized for intra-arterial delivery in rats. From there, the hope is that VIPER will move on to clinical trials for intra-arterial delivery in humans.

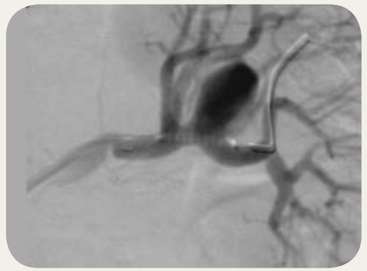


Figure 2. Stent-graft placement for a renal arterial aneurysm.

Clinical Services

We lead active clinical trials for the treatment of DVT and Pulmonary Embolisms (PE). Some of these studies are first in human studies to provide better treatments for subjects with DVT/PE. Our studies often bridge clinical and basic research. For example, in a DVT study we identify blood biomarkers linked to imaging characteristics to identify those patients who will develop DVT or PE; preliminary data has successfully identified potential DVT biomarkers for this purpose. Our group has also pioneered the treatment of venous stenoses in patients with May-Thurner Syndrome or in patients with vein blockages, typically due to deep vein thrombosis. We have also demonstrated that women on birth control pills who develop DVT present with a normal variant in venous anatomy (May-Thurner Syndrome) thereby significantly increasing their risk for DVT. We continue to pursue prospective and retrospective clinical trials for further study of the May-Thurner Syndrome.

Our Team

The interventional section includes eight faculty, five clinical fellows, two residents, five nurses, three medical assistants, two clinical trials coordinators, and one practice manager; all contributing to provide high-quality patient evaluation and management in a patient-oriented clinically intensive section that is unusual in the field of interventional radiology.

Education

Our section accepts five fellows annually with two residents rotating through at any one time. The fellowship experience encompasses the entire range of IR including vascular and nonvascular interventions. Fellowship trainees perform a variety of cases, including for example: tumor therapy (chemoembolization, radioembolization, radiofrequency ablation, cryoablation); transplant interventions; angioplasty; IVC filtration; venous reconstruction; vascular ablation and stenting; and aortic stent grafting. Our goal is to provide IR fellows with an extraordinarily high level of appropriate hands-on experience during this intense advanced training. We also ensure our residents of a rich experience that will benefit them in their clinical imaging career.

Research

We lead investigator sponsored and industry-sponsored clinical trials, including a new study utilizing a tumor selective vaccinia virus for the treatment of hepatocellular carcinoma, and a highly successful collaboration using Highly Focused Ultrasound (HiFU) to treat pain due to bone metastasis. Also, working with the Radiology ISIS section, CPMC, and the VA Palo Alto, we examine/describe microvascular invasion in hepatocellular carcinoma (HCC). This new project combines genomic signature from extracted tumors with radiological images to create a building block to help identify microvascular invasion prior to treatment. Study results ensure that individual HCC patients are offered appropriate treatment options.

We also specialize in localized delivery of therapy directly to a tumor using drugs or small radioactive beads. The VIPER project, shown in Figure 1, provides a gene-therapy treatment example using current techniques. We also conduct basic research with animal models to determine the potential off label, catheter based delivery of existing drugs for the treatment of acute pancreatitis.

Musculoskeletal Imaging

Section Chief: Chris Beaulieu, MD, PhD

Our team. Dr. Chris Beaulieu, Dr. Kate Stevens, Dr. Payam Massaband, Dr. Sandip Biswal, Dr. Garry Gold. Faculty not pictured: Dr. Amelie Lutz, Dr. Bao Do, and Dr. Geoff Riley.

The musculoskeletal (MSK) section aims to develop and deliver high quality imaging and image-guided procedures for patients with bone, joint, and soft tissue abnormalities.

Clinical Services in Musculoskeletal Imaging

The MSK service is one of the busiest and highest profile sections in the Department, serving Stanford Hospital and Clinics (SUH) as well as part time coverage at the Palo Alto VA Medical Center (PAVAMC). Exam volumes in 2012 surpassed 60,000, including nearly 10,000 MRI studies and over 1,000 injection and interventional procedures. February 2013 marked the fourth anniversary of comprehensive MSK services at the Stanford Medicine Outpatient Center in Redwood City. This center has six diagnostic x-ray rooms, two 3T MRI scanners, a multidetector CT scanner, two radiography and fluoroscopy rooms, and an ultrasound room, all immersed in a beautifully appointed facility staffed with highly talented and committed staff. MSK provides interpretation of skeletal radiographs (x-rays), MRI, CT, and diagnostic US. Using fluoroscopy or US guidance, we inject or aspirate joints, tendon sheaths, and benign soft tissue collections. Recent enhancements to the clinical service include improved methods for MRI in patients with metallic implants, MR neurography, and special injections of biological agents such as platelet rich plasma. We provide all MSK imaging and image-guided therapeutic procedures to Stanford athletics as well as to the San Francisco 49ers Football Club and the Golden State Warriors Basketball Club.

Our Team

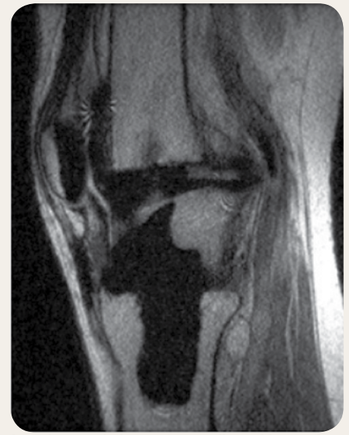
There are currently five MSK faculty primarily based at Stanford, including Christopher Beaulieu, MD, PhD, Section Chief, Garry Gold, MD, Kathryn Stevens, MD, Sandip Biswal, MD, and Amelie Lutz, MD. At PAVAMC, Payam Massaband MD, and Bao Do MD are the primary MSK radiologists. Vol Van Dalsem MD, director of outpatient imaging at Stanford, is an affiliated section member. Administrative support is provided by Thomas (T.J.) Mims.

Education

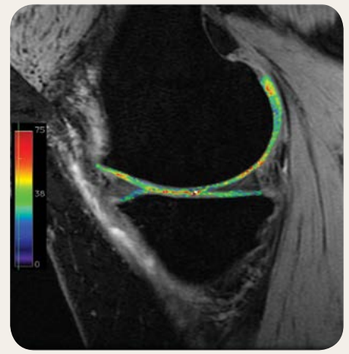
Each year there are two to three full time MSK clinical fellows. In recent years, nearly 50% of Stanford radiology residents have elected to pursue fellowship training in MSK. All faculty are active in developing lectures and teaching materials for either local use or online teaching.

Research

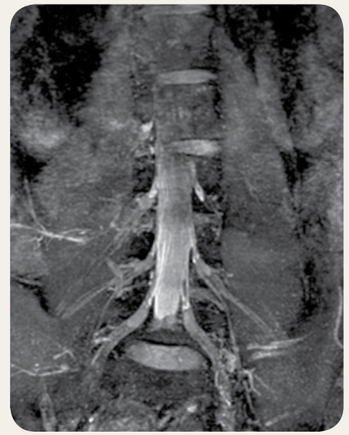
MSK faculty are involved in a number of clinical and basic science projects. Drs. Beaulieu and Do are particularly active in developing biomedical informatics methods for application to MSK and other areas. Dr. Gold, now Associate Chair of Research in the department, is actively involved in development of new MRI pulse sequences and imaging methods for articular cartilage and around metallic implants. Dr. Stevens is heavily involved in the translation of new MRI pulses to clinical utilization, and in clinically-focused MSK projects. Dr. Biswal is developing novel molecular imaging methods to image mechanisms of peripheral pain, primarily based in animal models. Dr. Lutz is also involved in abdominal imaging, and has special expertise in development of molecular imaging methods for early detection of ovarian cancer. In the MSK arena, she is particularly interested in imaging of peripheral nerves.



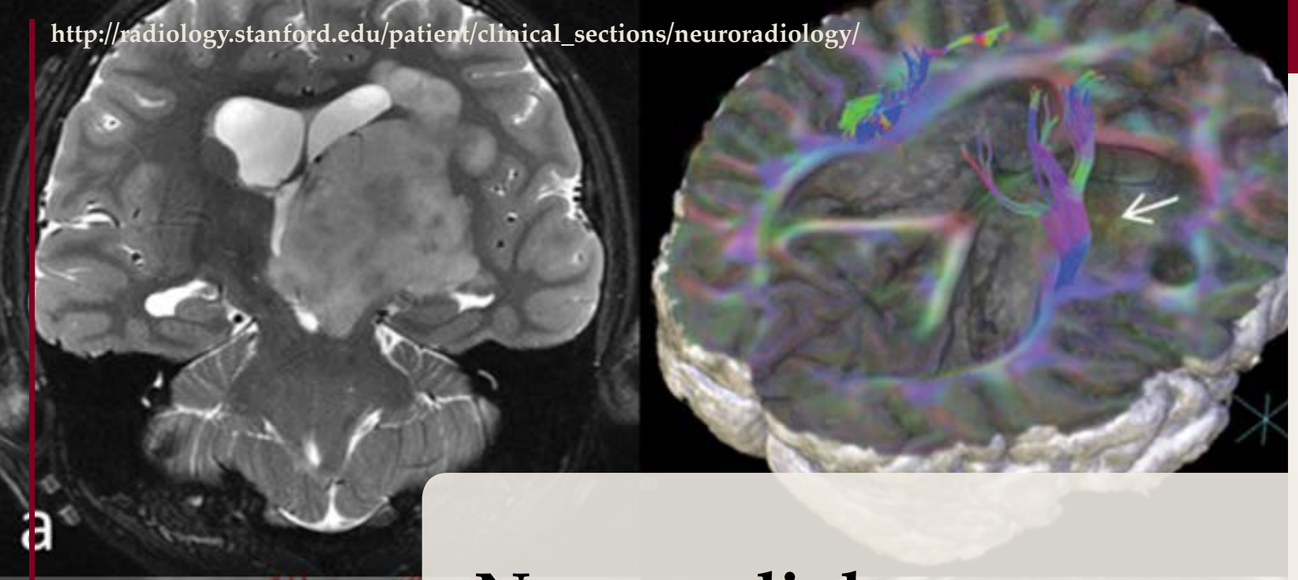
Sagittal image of a knee with a metallic total knee replacement. Black areas are metal components, which traditionally cause so much artifact that surrounding bone and soft tissues cannot be seen. Provided by Drs. Gold and Stevens.



Mapping of articular cartilage with MRI. Color scale maps to variation in the T2 relaxation time of cartilage, which reflects the hydration status of cartilage. Provided by Dr. Gold.



Coronal maximum intensity projection of the lumbar spine, showing spinal fluid and peripheral nerves exiting the spinal canal. Provided by Dr. Biswal.



Neuroradiology

Section Chief (Acting): Nancy Fischbein, MD

Our team. Seated left to right: Kari Galatolo, Dr. Sirisha Komakula, Dr. Nancy Fischbein, Dr. Zina Payman, Patty Smith. Standing left to right: Dr. Pat Barnes, Dr. Michael Zeineh, Dr. Michael Marks, Dr. Huy Do, Dr. Greg Zaharchuk, Dr. David Rex. Faculty not pictured: Dr. Kristen Yeom, Dr. Bart Lane, and Dr. Robert Dodd.

The Neuroradiology section provides diagnostic and interventional neuroradiological services at Stanford Hospital and Clinics (SHC), Lucile Packard Children's Hospital (LPCH), and the Palo Alto VA (VAMC). Diagnostic neuroradiology includes imaging of the brain, spine, and head and neck with CT and MR; the diagnostic section also performs fluoroscopically-guided procedures such as lumbar puncture and myelography.

Interventional neuroradiology includes diagnostic angiography of the blood vessels that supply the brain, head and neck, and spinal cord, as well as therapeutic angiographic procedures related to treatment of aneurysms, vascular malformations, and acute stroke. Embolization of tumors, image-guided biopsies, vertebroplasty and percutaneous sclerotherapy of vascular malformations of the head and neck are also provided. In the past year, the interventional neuroradiology section introduced two new stent procedures, making Stanford Hospital one of the earliest hospitals in the nation to routinely use them: 1) a new stent retriever to open arteries at the time of acute stroke, and 2) an intravascular flow-diverting stent to occlude large and giant intracranial aneurysms.

Clinical Services and the Diagnostic Neuroradiology Team

The diagnostic neuroradiology service includes nine faculty and seven fellows, with five faculty based at SHC, two at LPCH, and two at the VAMC. Of the SHC-based members, acting section chief, Nancy Fischbein, MD, has particular expertise in head and neck imaging; she manages the head and neck service and collaborates with clinicians and researchers in Otolaryngology and Radiation Oncology; she also works on image post-processing projects with Dr. Roland Bammer's group (page 96). Greg Zaharchuk, PhD, MD, recognized as a leading authority on non-invasive methods to image brain perfusion, collaborates with faculty in Neurology and Neurosurgery and conducts research to investigate xenon CT, arterial spin label perfusion, and bolus perfusion methods to evaluate cerebral perfusion. Michael Zeineh, MD, PhD, uses diffusion-tensor imaging (DTI) and high-field MRI methods to study epilepsy, Alzheimer disease, and traumatic brain injury; he also collaborates with Dr. Brian Rutt's group (page 103) and Dr. Roland Bammer's group (page 96). David Rex, MD, PhD, has expertise in functional neuroradiology and biomedical informatics, while Zina Payman, MD, has expertise in general neuroradiology. At LPCH, Pat Barnes, MD, Chief of Pediatric Neuroradiology, is recognized as an expert in child abuse, while Kristen Yeom, MD, studies DTI methods related to the diagnosis and treatment of pediatric brain tumors. At the VA, Bart Lane, MD, performs both diagnostic and interventional neuro procedures and collaborates with the War-Related Injuries Group. Sirisha Komakula, MBBS, practices general diagnostic neuroradiology and collaborates on clinical and research projects with faculty in Spinal Neurosurgery and Otolaryngology

Clinical Services and the Interventional Neuroradiology Team

The interventional neuroradiology group consists of three full time physicians and two fellows. The faculty manage all adult and pediatric neurointerventional procedures performed at Stanford Hospital and LPCH and conduct clinical research studies. Michael Marks, MD, the interventional neuroradiology section chief, has ongoing research projects in ischemic stroke treatment, management of brain AVMs, and the endovascular treatment of intracranial atherosclerotic disease. Huy Do, MD, has research interests in percutaneous spine intervention, traumatic brain injury in athletes, and vascular treatment of oncologic diseases. Robert Dodd, MD, has a joint appointment in Neurosurgery and Radiology and does both endovascular interventions and open surgical procedures. He has research interests in cerebral artery vasospasm and pharmacologic protection strategies for vasospasm.

Education and Training

Resident and fellow training and education are central to the mission of the Neuroradiology section. Our competitive two year fellowship in diagnostic neuroradiology attracts strong candidates who join our group following residency training to develop their clinical and research skills in diagnostic neuroradiology. Many of our graduates are now in faculty positions at major universities across the country. An additional two fellows train in Interventional Neuroradiology each year to develop proficiency in diagnostic catheter angiography, catheter-based intervention, and image-guided procedures.

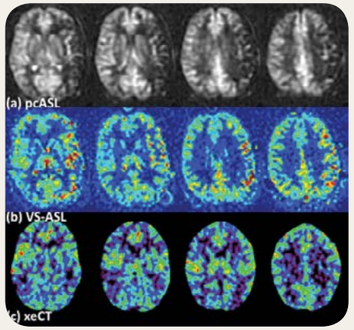


Figure 1. Perfusion imaging in a 41 year-old man with high-grade left middle cerebral artery stenosis. (a) Conventional arterial spin labeling (ASL) shows apparent reduced blood flow in the left MCA region. (b) Velocity-selective ASL a measure of CBF in the presence of artery delays, shows normal blood flow in this region, which is confirmed with (c), stable xenon CT, the gold-standard method. ASL methods offer potential to measure CBF without contrast agents, enabling perfusion assessment in patients with renal failure or contrast agent sensitivity. (Figure courtesy of Greg Zaharchuk, PhD, MD)

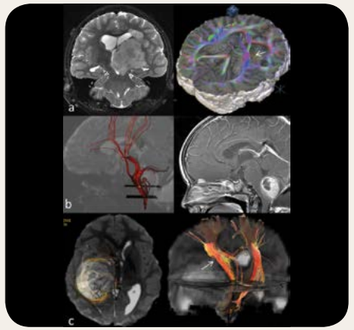


Figure 2. (a) Large thalamic tumor in a 9-year old boy (upper left). Motor tract (arrow) relationship to the tumor is combined with 3-D brain volume imaging (upper right). (b) Large brainstem tumor in a different child (middle right). Tracts (red) coursed anterior to the tumor rather than through the tumor (middle left), characteristic of a specific pediatric tumor, pilocytic astrocytoma. (c) Axial and coronal fiber-tracking images (lower row) show displacement of the corticospinal tracts (arrow) in a 7-year old girl with a large brain tumor (glioblastoma). (Figure courtesy of Kristen Yeom, MD)

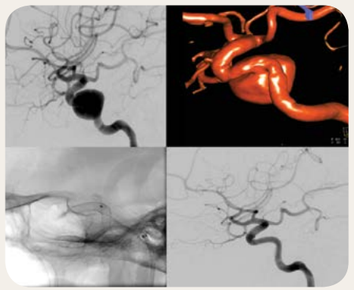


Figure 3. 47 year old woman with ophthalmoplegia. A large aneurysm of the internal carotid artery is demonstrated on planar (upper left) and 3D (upper right) digital subtraction angiography (DSA) prior to treatment. A flow-diverting stent was placed via an endovascular approach (lower left). At a 6 month follow-up DSA (lower right), there is complete thrombosis of the aneurysm. (Figure courtesy of Michael Marks, MD)

Nuclear Medicine and Molecular Imaging

Co-Section Chiefs: Andrei Iagaru, MD and Andrew Quon, MD

Left to Right: Dr. Henry Guo, Dr. Andrew Quon, Dr. I. Ross McDougall, Julie Kulm, Luan Nguyen, Dr. Tatianie Jackson, Matthew Gabriele, Dr. Guido Davidzon, Zachary Leonard, Nora Gurevich, John Valenton, Elizabeth Farmer, Paulo Castaneda, Dr. Andrei Iagaru, Dr. Erik Mittra

Nuclear Medicine uses radioactive materials (or tracers) to help diagnose and treat a variety of diseases. We determine the cause of a medical problem based on the function of an organ, tissue or bone. In this way Nuclear Medicine differs from x-ray, ultrasound or any other diagnostic tests that determine the presence of disease based on structural appearance.

Positron Emission Tomography (PET)

PET is a powerful diagnostic test that has a major impact on the diagnosis and treatment of disease. PET can detect and stage many cancers, often before they are evident through other tests. PET can also provide to physicians important information about heart disease and many neurological disorders.

Clinical Services

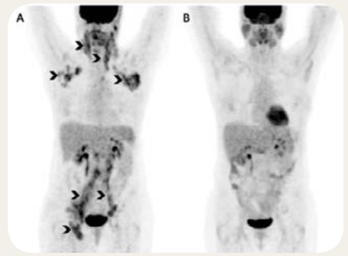
Our Clinic is an integral part of a busy tertiary referral center. We conduct SPECT/CT, PET/CT and therapies as routine clinical practice, as well as part of clinical translational research. We make every effort to support collaborations across academia, as well as with the industry, with the ultimate goal of advancing patient care. Our patients benefit from the most modern imaging modalities, delivered in a state of the art facility.

Our Team

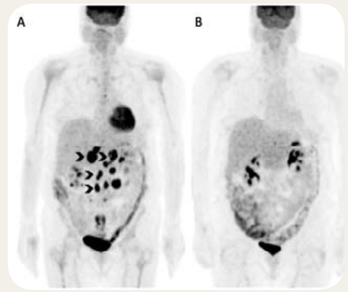
The Nuclear Medicine and Molecular Imaging Clinic at Stanford includes 4 physicians, 2 scientists (radiochemistry, physics), 10 technologists, 1 nurse, 4 administrative and research support personnel, and 6 trainees.

Education

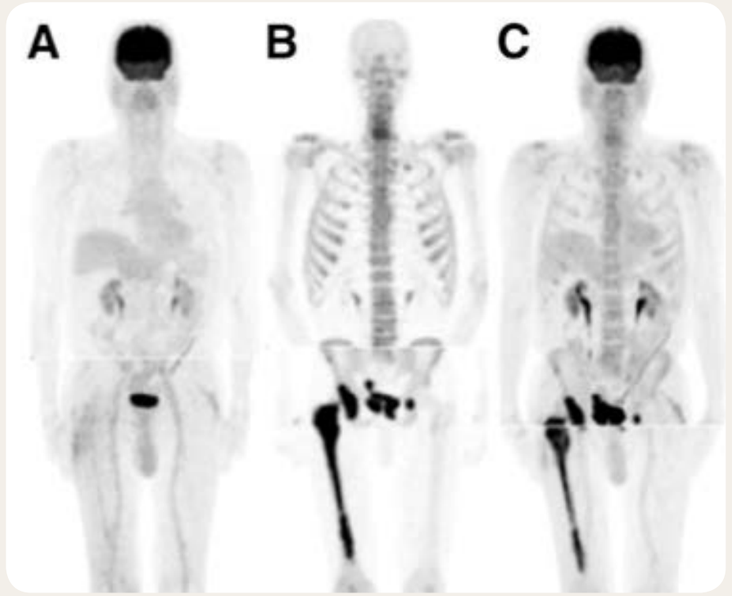
The Division of Nuclear Medicine and Molecular Imaging offers several programs for medical students, residents and fellows, with a mix of traditional didactics and strong clinical exposure. Our trainees rotate at the VA Palo Alto, Lucile Packard Children's Hospital, and Stanford University Hospital. There are ample clinical research opportunities at the Stanford University Medical Center and more basic science oriented projects in the Molecular Imaging Program based at the Clark Center (http://nuclearmedicine.stanford.edu/education/).

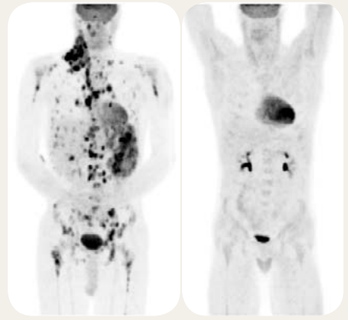


60 year-old woman with NHL and complete response after 90Y-Ibritumomab Tiuxetan (Zevalin®) treatment. A) pre-therapy (1 month) 18F FDG PET shows cervical, axillary, abdominal, pelvic and inguinal lesions (arrowheads); B) 18F FDG PET after therapy (3 months) is negative for active disease



65 year-old woman with NHL and complete response after 131I-Tositumomab (Bexxar®) treatment. A) pre-therapy (1 month) 18F FDG PET shows abdominal lesions (arrowheads); B) 18F FDG PET after therapy (3 months) is negative for active disease





24 year-old man with relapsed Hodgkin's lymphoma. 18F FDG PET shows extensive disease that completely resolves after treatment.

74 year-old man with metastatic prostate cancer. (A–C) Extensive pelvic osseous metastases (arrows) are not identified on 18F FDG PET scan (A) but are clearly seen on 18F NaF (B) and combined 18F FDG / 18F NaF PET (C) scans.

Pediatric Imaging

Section Chief: Richard Barth, MD

Our team. Front row, left to right: Dr. Siobhan Flanagan, Dr. Beverley Newman, Dr. Heike Daldrup-Link, Dr. William Northway, Dr. Richard Barth, Dr. Shreyas Vasanawala, Dr. Frandics Chan, Dr. Peter Kane. Back row, left to right: Dr. Matthew Schmitz, Dr. Vy Tran, Dr. Amy White, Dr. Peter Moskowitz, Dr. Rakhee Gawande, Dr. Erika Rubesova, Dr. Roland Bammer. Missing from photo: Dr. Patrick Barnes, Dr. Kristen Yeom, Dr. Francis Blankenberg.

The mission for the pediatric radiology section is to improve the health of fetuses and children via high resolution imaging of both anatomy and function for detection and minimally invasive treatment of diseases.

Clinical Services

Pediatric radiologists provide a full compliment of pediatric imaging services including x-ray, fluoroscopy, ultrasound, CT, and MRI at the Lucile Packard Children's Hospital at Stanford. Pediatric radiology subspecialists in cardiovascular imaging (Drs. Chan, Newman, and Vasanawala), neuroradiology (Drs. Barnes and Yeom), fetal imaging (Drs. Barth and Rubesova), and musculoskeletal imaging (Drs. Vasanawala and Rubesova) are aligned with the centers of excellence at the Lucile Packard and provide state of the art imaging care for children.

Our Team

The Pediatric Radiology section includes fifteen faculty and six clinical fellows. Our team of imaging specialists includes world renown clinicians and scientists and dedicated technologists and support staff. We strive to provide the very best in state-of-the-art imaging for children.

Education

The Pediatric Radiology Fellowship is jointly sponsored by the Lucile Salter Packard Children's Hospital and Stanford University Hospital. Our clinical fellowship training provides a comprehensive pediatric radiology imaging program utilizing state-of-the-art imaging technology, including two fluoroscopy suites, three ultrasound rooms, as well as 3.0T MRI, 1.5T MRI, and CT imaging suites. Pediatric Radiology faculty are devoted to teaching, patient care, and translational research. Fellows are exposed to a wealth of clinical case material in an organized, structured, hands-on educational approach. Fellows rotate through a series of services, including pediatric MRI, pediatric CT, PET/CT, pediatric fluoroscopy, pediatric ultrasound, pediatric neuroradiology, nuclear medicine, interventional radiology, and general radiography. Stanford's program also provides a comprehensive educational curriculum, including didactic lectures pertinent to pediatric radiology, radiology case conferences, and multi-disciplinary imaging conferences in which all of the major pediatric clinical subspecialties participate. In addition, Stanford also offers interested fellows unique exposure to fetal imaging including fetal MRI and cutting-edge pediatric radiology research.

Research

Clinical and basic science research of the section address imaging issues unique to children including motion correction techniques, minimizing radiation exposure and general anesthesia requirements, visualization of anatomically small structures, and early detection of disease. Shreyas Vasanawala, MD, PhD, has developed MRI clinical applications to reduce radiation exposure, reduce effects of motion (Figures 1a-c), as well advanced cardiovascular flow imaging (Figure 1c). Kristine Yeom, MD, introduced fiber tract imaging of the pediatric brain at Lucile Packard Children's Hospital over the past year to guide neurosurgical procedures and minimize neurological deficits associated with brain tumor resection (Figure 2). Richard Barth, MD, and Erika Rubesova, MD, have collaborated to develop a fetal MRI program at Stanford to improve outcomes of fetuses with severe anomalies (Figure 3).

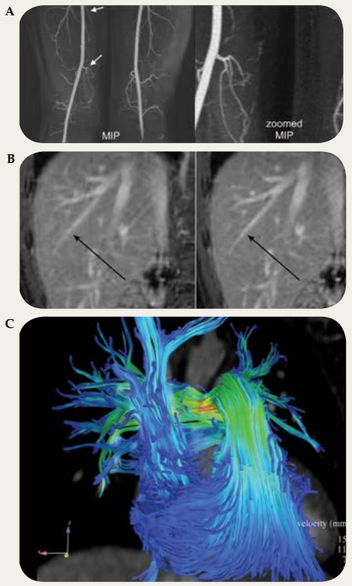


Figure 1 (a-c). Recent introductions to our clinical practice include (a) a custom designed and built MR receiver coil enabling sub millimeter resolution MR angiography in a 4 year old, (b) motion reduction via a unique deformable correction algorithm that auto detects regional breathing motion during a scan and (c) fast quantitative cardiovascular flow imaging via a novel image reconstruction algorithm

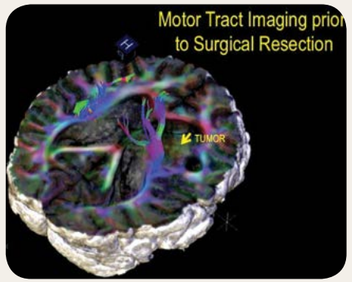


Figure 2. MRI fiber tract image accurately displays the critical relationship between a brain tumor and cortico-spinal motor fiber tract (color); thereby directing neurosurgical resection of the tumor.

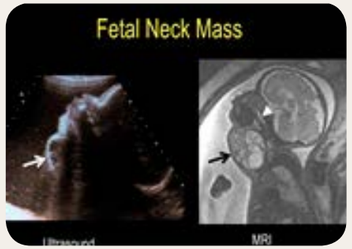
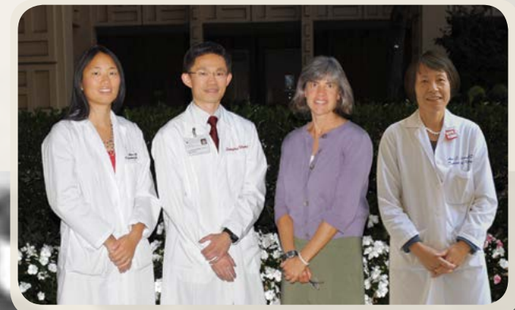


Figure 3. Fetal MRI at 35 weeks gestational age demonstrates fetal neck mass (arrows) and abrupt cut off of fetal airway (arrowhead) indicating need for airway intervention during delivery as a life saving maneuver.

Thoracic Imaging

Section Chief: Ann Leung, MD



Our team. Dr. Anne Chin, Dr. Henry Guo, Roberta Brissette, Dr. Ann Leung

The thoracic imaging section provides a range of diagnostic examinations, including chest radiography and inpatient and outpatient computed tomography of the thorax, high-resolution chest CT, and low-dose CT screening for lung cancer.

Clinical Services

Chest section members serve as active consultants who work closely with the subspecialty services of Stanford Hospital and Clinics including infectious disease, pulmonary medicine, thoracic oncology, radiation oncology, thoracic surgery, and pulmonary pathology. Working in concert with pulmonologists and thoracic surgeons, the chest section began offering low-dose CT screening studies in the summer of 2012 for eligible individuals who are at high-risk for lung cancer (images). Current research activities in the section include a collaboration with ISIS in linking imaging and genomic data in patients with non-small cell lung cancer.

Our Team

There are currently three faculty in the section, all based at Stanford Hospital and Clinics. Ann Leung, MD, the section head, has particular expertise in imaging of infiltrative lung disorders and opportunistic pulmonary infections. Anne Chin, MD is a visiting assistant professor from the University of Montreal who will be working in the department for a 1-year period. Henry Guo, MD, PhD is fellowship trained in both chest imaging as well as nuclear medicine and began his appointment as a clinical instructor in July of 2012.

Education

Education on imaging of lung diseases either at the view box or in the form of lectures is provided by section members to medical students, radiology residents, radiology fellows, and pulmonary fellows. The section also offers a 1-year thoracic imaging fellowship with the majority of prior graduates now working in academic radiology departments across North America.

Research

Through on-going research with the ISIS group, the thoracic team collaborates to identify prognostic imaging biomarkers in patients with non-small cell lung cancer (NSCLC) by means of a radiogenomics strategy that integrates gene expression data and medical images by leveraging survival data in public gene expression data sets. These research techniques are currently being translated into clinical use to very soon improve patient care through early detection and monitoring of disease. Please see the cover of this year's Annual Report for a sample of this work.

Figure A

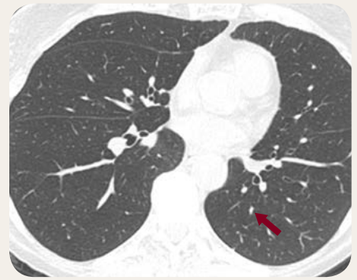
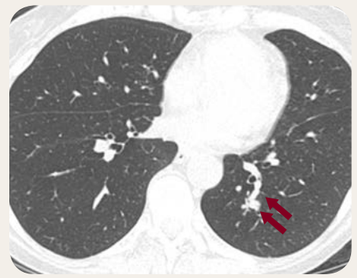


Figure B



65 year-old woman with history of smoking was found on screening CT study (Figure A) to have a new 2mm nodule (arrow). On an 11-month follow-up CT study (Figure B), this nodule had increased in size (double arrows). Subsequent biopsy and staging resulted in diagnosis of an early stage small cell lung cancer that was successfully resected.

Veterans Affairs Diagnostic Radiology

Section Chief: Payam Massaband, MD (Acting)

Front row: Melissa Phillips, Laurie Carr, Shivani Buch, Colleen Wong, Dr. Dorcas Yao, Dr. Matilde Nino-Murcia, Isidor Jardin, Belinda Quintanilla, Dorian Good-Dunbar, Olga Senot, Fe Cabanag, Val Sia; Back Row: Thelma Kalua Seeto-Mook, Dr. Eric Olcott, Dr. Payam Massaband, Patty Craig, Dr. Lewis Shin, Ben Romanowski, Paul Brandon, Bill Bourgeois, Bob Percival, Tim Teachout, Jason Cervantes, Frank Trinidad, Dr. Bao Do, Dr. Ashwini Zenooz

The VA Palo Alto is the key VA hospital of the region, consisting of three inpatient facilities and seven outpatient clinics throughout northern California and the Bay Area. The Palo Alto Health Care System is a flagship of the VA for clinical care and maintains one of the top three research programs in the VA. It is a large multispecialty tertiary care center with a 900+ bed system. There are multiple ongoing expansion projects with over $1 billion dollars of capital projects within the next decade, including a new radiology department. The Palo Alto VA serves more than 85,000 veterans including polytrauma, multi-organ system, as well as traumatic brain and spinal cord injury patients.

Clinical Excellence

The VA Department of Radiology helps provide our veterans with outstanding care utilizing state-of-the-art technology. The Department includes 16 radiologists, 47 technologists, 10 nursing and 11 administrative staff.

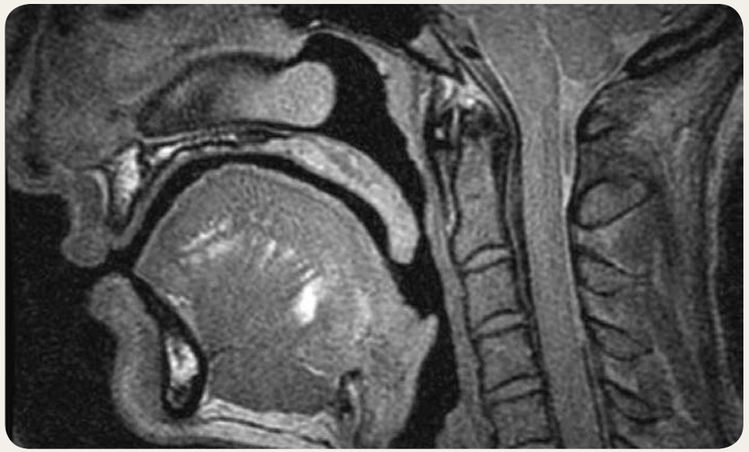
The Radiology team works to provide truly comprehensive care for our veterans, with faculty taking part in well over 30 interdisciplinary conferences each month and cultivating outstanding rapport with other departments. Our Department provides imaging services in all modalities and sections, including chest, cardiovascular, fluoroscopic, body, neuroradiology, and musculoskeletal imaging, as well as interventional radiology procedures. Recent Department milestones include the addition of numerous outstanding, Stanford-affiliated faculty as well as a planned expansion of the department physical plant. A new second 64 slice dual energy CT, a 3T MR, and two new ultrasound scanners have also been recently added.

Teaching

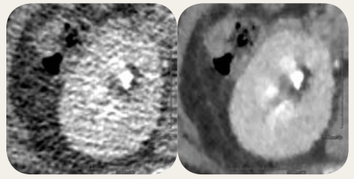
VA Radiology provides excellent resident teaching in all services, stemming from a strong faculty commitment to education. Residents also benefit from excellent pathology, high volume, and daily teleconferencing from Stanford Medical Center.

Research

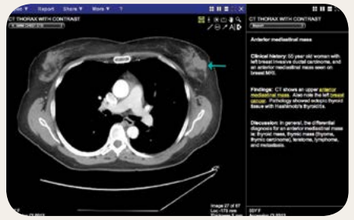
We are strongly dedicated to both clinical and non-clinical research, with numerous ongoing studies including for example: 1) algorithms for improved image quality and radiation dose CT, 2) three dimensional image reconstruction, 3) functional neuroimaging , 4) neuroimaging of traumatic brain injury, 5) neuroimaging of degenerative brain diseases, 6) dynamic MRI of the airway during sleep, 7) imaging of complex cholecystitis, 8) MRI of the prostate, Gastrointestinal endoluminal imaging, 9) radiology informatics, 10) Metal artifact reduction in CT, 11) natural language processing, 12) PACS customization for paperless practice, 13) abdominal aortic aneurysm modeling and risk stratification, and 14) cloud based radiology training.



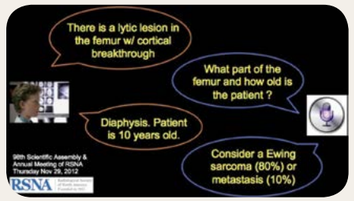
Sagittal high resolution MRI image of the upper airway obtained for obstructive sleep apnea research.



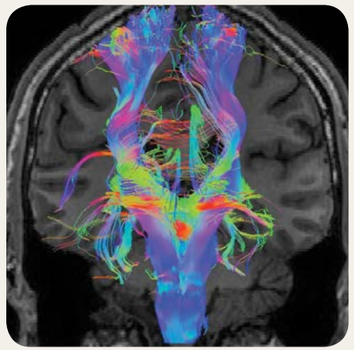
Conventional ASIR image (top) and improved MBIR image (bottom) , both at 30mA.



CT image showing a cancer in the left breast. This system mirrors a typical PACS reading station and can be used to create more realistic radiology simulators for residency training.



Graphic proposing a real-time application of a natural language processor (NLP) that identifies "missing" information in reports. As the radiologist is dictating a study, the NLP prompts the radiologist to provide additional, "missing" information that could be used to calculate disease probability.



HARDI DTI in a patient with early onset Parkinson's disease depicting white matter tracts.

Veterans Affairs Nuclear Medicine

Section Chief: George Segall, MD

Top row (left to right): Ronni Norte, Administrative Officer; Kent Hutchings, NM Technologist Training Program Director; George Segall MD, Chief; Julie Loero, Chief Technologist; Ken Luong, Technologist; Juanita Gooding, RN; Natalia Samoilova, Technologist; Janet Smith, Program Assistant; Milton Johnson, Technologist. Bottom row (left to right): Rick Huntington, Technologist; Clarita Domingo, Program Assistant; Christine Keeling MD, Physician; Minal Vasanawala MD, Physician; Jen-Shi Liu, RN; Joanne Delano, Program Assistant.

The Nuclear Medicine Service at VA Palo Alto Health Care System is a tertiary referral center in Northern California for veterans requiring PET/CT, myocardial perfusion imaging, and other molecular imaging procedures and radioisotope therapies. Veterans are also referred from Sacramento, San Francisco and Fresno VA medical centers for advanced imaging procedures.

The mission of the Nuclear Medicine Service is to maintain and improve the health of veterans through the use of unsealed radionuclides in diagnosis and therapy; advance the field through medical research in molecular imaging; and provide training for technologists and physicians.

Molecular imaging is an emerging discipline that uses radioisotopes and other imaging technologies to investigate processes at a cellular and molecular level. Molecular imaging performed in conjunction with anatomic based techniques such as CT and MR for spatial and structural information is also known as Hybrid Imaging.

Clinical Services

The department has three SPECT-CT cameras, a PET/64-slice CT scanner, and one bone densitometer at the Palo Alto Division. A second bone densitometer is located at the Livermore Division. Approximately 6,000 procedures are performed annually, including 2,000 PET/CT scans, 2,000 myocardial perfusion studies, 1,000 general nuclear medicine/molecular imaging studies, and 1,000 bone density studies. The department also uses unsealed radioisotopes for therapy of hyperthyroidism and thyroid cancer, as well as palliation of painful skeletal metastases.

Our Team

The department is staffed by two full-time Nuclear Medicine Physicians, Chief Technologist, Nuclear Medicine Technologist Training Program Director, four Nuclear Medicine/CT Technologists, Administrative Officer, and three Program Assistants.

Education

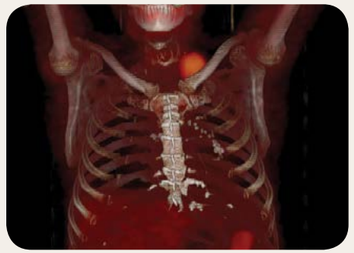
Education and training is provided for nuclear medicine residents, radiology residents, and cardiology fellows. The department also has a Nuclear Medicine technologist training program, which is the only VA-based training program in the United States, and only one of two training programs in Northern California. Our graduates have been hired by Stanford, University of California, VA medical centers throughout California, and other major hospitals.

Research

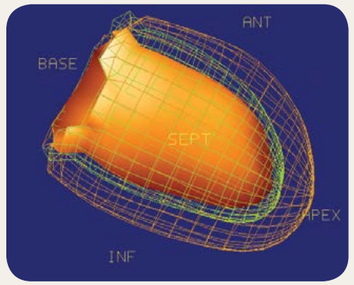
The department collaborates with investigators from Cardiology, Oncology and Neurology to support research in coronary artery disease, cancer, and dementia using molecular imaging.

A study investigating the impact of PET myocardial perfusion imaging (MPI) plus CT coronary arteriography (CTA) on clinical decision making is now closed to enrollment, and the results are being analyzed. PET MPI and CTA are also being used for a second protocol investigating the effect of exercise on severity of coronary artery disease. The department is also participating in a Phase 3 trial of a new F-18 radiopharmaceutical for PET MPI.

The VA/Stanford Aging Center and VA Mental Illness Research and Clinical Center (MIRECC) are participating in the Alzheimer's Disease Neuroimaging Initiative (ADNI) trials: ADNI-1, ADNI-2, and ADNI-GO. Normal volunteers and patients with Alzheimer's disease enrolled in these trials have FDG PET/CT brain scans and amyloid PET/CT brain scans. A new study about to begin will use FDG PET/CT brain scans to evaluate the effect of repetitive transcranial magnetic stimulation (rTMS) in subjects with traumatic brain injury.



FDG PET/CT scan showing increased metabolic activity in a left supraclavicular lymph node metastasis.



Tc99m myocardial perfusion scan of the left ventricle showing normal wall motion.

Research Sections

Canary Center Overview

The Canary Center at Stanford for Cancer Early Detection
Director: Sanjiv S. Gambhir, MD, PhD
Deputy Director: Bree Mitchell, PhD

http://canarycenter.stanford.edu/

Group Photo: back row, left to right: Richard Kimura, Rammohan Devulapally, Kai Cheng, Seema Sharma, Linda Kullolli, Ataya Sathirachinda, Jelena Levi, Mark Stolowitz, Bree Mitchell, Eva Bajorek, Parag Mallick, Dario Amodei; Front row, left to right: Anath 'Srini' Srinivasan, Paul Ramasamy, Bonita Crabbe, Lingyun Xu, Kira Foygel, Jean Stevens, Maria Arampatzidou, Thillai Sekar Veerapazham, Sharon Pitteri, Ken Lau

Not pictured: Ivalo Georgiev Bahtchevanov, Janet Cecchi-Acosta, Edwin Chang, Ying Chen, Zhen Cheng, Sam Gambhir, Russell Haynes, Sharon Hori, Ohad Ilovich, Angie Koo, Uma Kota, Hongguang (Simon) Liu, James 'Mike' Mathis, Arutselvan Natarajan, Rashi Ojha, Carolina Ornelas, Patricia Riley, Stephanie Van de Ven, Olga Vitek, Tzu-Yin Wang, Yuyu Yao, Cristina Zavaleta, Huimao Zhang, Steven Zheng

The Canary Center at Stanford for Cancer Early Detection will celebrate its fourth anniversary in June 2013. This year we added a new Agilent triple-quadrupole mass spectrometer and an Agilent 400 MHz NMR instrument to our state of the art shared instrument facilities. As we head into the upcoming year, our goals include recruiting several new faculty members, building up the Biorepository Core which will store and organize human samples for research efforts headed by the Canary Center, and pursuing a number of other funding and collaboration opportunities.

The mission of the Canary Center is to lead and foster research programs leading to the development of blood and imaging tests for the early detection of cancer. The Canary Center represents a novel alliance between the Canary Foundation, the Department of Radiology, the Cancer Center, and the School of Medicine. The Canary Center also actively fosters intellectual and programmatic alliances with the Schools of Engineering & Humanities and Sciences.

The Canary Center's mission is based on the striking association between early cancer diagnosis and improved survival rates: the chances of survival are far greater when cancer is detected in its earliest stages when it is most treatable. To optimize the detection of cancer at this stage, the Canary Center is taking a two-stage approach to cancer diagnosis pairing blood tests with imaging for cancer early detection. The extraordinary technical challenges associated with this dual strategy include the refinement of molecular imaging agents to specifically detect pre-invasive malignant tumors the size of a small blueberry (< 5 mm). They also include the development of proteomic approaches that can reliably detect minute (< 0.1 ng/ml) quantities of cancer-specific proteins released into the bloodstream by these small lesions. Cost-effective solutions are expected by applying a relatively inexpensive blood test followed by a more expensive imaging study, although in some cases the blood test and the imaging test will be performed concurrently. Having both approaches will also likely lead to a greater overall accuracy.

To accomplish these goals, the Canary Center was specifically designed to house state-of-the-art core facilities and collaborative research programs in molecular imaging, proteomics, chemistry, and bioinformatics. The Proteomics Core facility houses cutting-edge mass spectrometry platforms dedicated to the discovery and validation of blood and tissue protein biomarkers. The Chemistry Core is engaged in the specific design and refinement of molecular imaging agents for early detection, which then undergo preclinical testing using in vivo and ex vivo model systems, including patient blood and tissue samples. The Molecular and Cell Biology Core works closely with both the Proteomics and Chemistry Cores to screen and refine agents that can bind cancer-specific targets in tissues and thus complements the efforts of the Chemistry and Proteomics Cores to develop blood and imaging tests for cancer early detection. A significant effort has been put forward over the past few years to equip the Canary Center cores and laboratories with state-of-the-art instrumentation to promote and facilitate innovative research efforts.

CANARY CENTER
AT STANFORD

Collaborative research efforts fostered at the Center are made possible by creating a truly multidisciplinary team of faculty members. Current faculty members focus on imaging technologies, chemistry, and disease mechanisms/cell biology. We are currently in the process of recruiting 4 additional faculty for billets committed by the Stanford School of Medicine with the intent to have a total of 8 faculty by 2016. Canary Center research programs are actively interfacing with other facilities and programs on campus, including MIPS and the CCNE, in order to leverage the latest developments in molecular imaging and nanotechnology into the early detection effort. Collectively, these initiatives form a direct pipeline for the translation of early cancer detection into clinical trials and practice.

A specific example of a novel molecular imaging strategy that is expected to help the goal of early cancer detection is ultrasound with targeted microbubbles. These gas filled microbubbles can be chemically coupled to targeting ligands that allow the bubbles to bind to tumor vasculature. This will allow molecular imaging using a conventional anatomical imaging strategy (ultrasound). This is expected to allow detection of tumors in the 3-5 mm range. A specific example of a novel strategy being pursued for blood biomarker detection is based on magnetonanoarrays being developed as part of the Stanford CCNE. This novel technology allows the detection of many different biomarkers at levels that are 10 to 100-fold better than the most sensitive ELISA tests currently available.

Multiscale Diagnostics Laboratory

Parag Mallick, PhD

http://canarycenter.stanford.edu/

The Multiscale Diagnostics laboratory focuses on developing and applying systems approaches to quantitatively describe organisms' physiologic states toward the goal of enabling personalized, predictive medicine. As part of this effort we are trying to characterize the diverse states of cells and how signals describing those states are propagated from molecular and cellular length scales to tumor and organismic length scales. In addition, we are developing experimental and computational approaches for quantifying and interpreting cellular and organismic proteomic changes in order to identify robust, mechanistic, diagnostic protein fingerprints. Lastly, we are exploring human clinical application of these fingerprints. As each of these biologic challenges poses significant technical hurdles, we are additionally working to develop novel technologies to overcome these challenges.

Most recently, we have been highly active in developing software tools to accelerate progress in the field of proteomics (the high-throughput study of proteins). This research is part of the ProteoWizard Project that was recently published in *Nature Biotechnology* (Oct 2012). Figure 1 shows a snapshot of an image generated by our msPicture tool. Most recently we have begun developing a comprehensive experimental design and execution framework that will allow proteomics researchers to collect data in a manner that is optimized for the biological question they are asking. This research is in collaboration with Agilent Corporation.

Once proteomics data has been collected, it can be complex to interpret. We have been working to integrate multi-omics data using sophisticated models of cellular regulation. We show an example of one such model in Figure 2. In this model, triangles represent transcription factors, and boxes are groups of genes regulated by that transcription factor. Edges represent a regulatory relationship. All these relationships were learned directly from experimental studies.

We have been additionally been active in biomarker validation. As published in *Prostate* (Aug 2012), we have demonstrated that AGR2, a protein we discovered in broadscale proteomics screens, is elevated in metastatic prostate cancer and associated with the particularly aggressive neuroendocrine phenotype.

Beyond our studies in 'omics' we have begun studies in the area of biomechanics. Biomechanics is the study of a cell's mechanical properties. In much the same way that a nerf ball is different from a bowling ball, an aggressive, metastatic cell is different from a benign cell. By using a novel device called a Suspended Microchannel Resonator, we have been able to, for the first time, measure the biomechanical properties of thousands of cells revealing a relationship between cells' biomechanical properties and metastatic potential. This work has been submitted for publication and is a collaboration with the Manalis Lab at MIT.

Left to Right – Dario Amodei, Parag Mallick, and Seema Sharma.

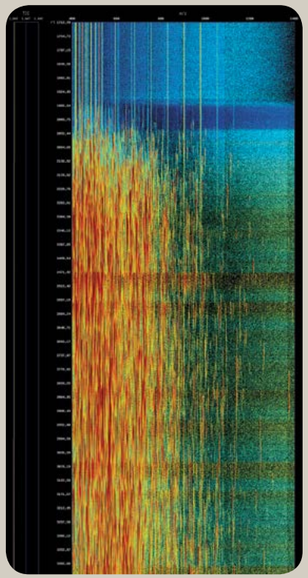


Figure 1 – Proteomics view of a drop of blood. Shown is a 'psuedo-2d gel,' which illuminates the complexity of a typical proteomics experiment. The X axis is m/z, the Y axis is retention time and the color reflects intensity.

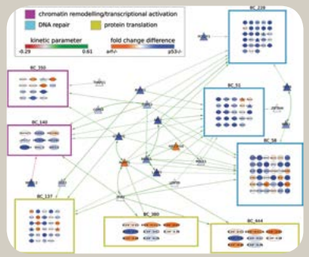


Figure 2 – A small portion of a complex regulatory network comparing two cell types and how they respond to DNA damage. Triangles are transcription factors. Boxes contain sets of genes regulated by a given transcription factor.

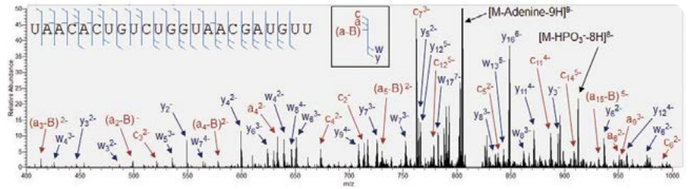
Cancer Molecular Diagnostics Laboratory

Sharon Pitteri, PhD

http://canarycenter.stanford.edu/

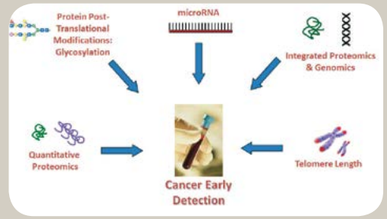
Our group is focused on the discovery and validation of blood-based molecular diagnostic markers for cancer early detection. We are interested in defining novel molecular signatures for breast, ovarian, and other epithelial cancers, including sub-types of these diseases. These molecular signatures have potential applications such as molecular indicators of cancer risk, diagnosis, progression, and recurrence.

We are currently exploring different classes of molecules as potential blood-based early indicators of disease. The following are some highlights of our ongoing efforts: 1) Proteins are known to be differentially glycosylated in cancer. We have developed a workflow to quantify glycoproteins directly in blood samples and are currently applying this approach to identify novel glycoproteins as potential cancer biomarkers. 2) Leukocyte telomere length has been shown to be altered in cancer. In collaboration with the Breast Imaging Section in the Radiology Department (pages 46-47), we are investigating the utility of telomere length and circulating telomerase levels in the blood, to differentiate women with benign and malignant breast lesions. 3) In collaboration with the Cancer Prevention Institute of California, we are examining blood-based protein levels in women up to two years before they were diagnosed with breast cancer. 4) MicroRNAs have been shown to be potentially useful indicators of cancer. We are using new technologies to investigate microRNAs, and their modifications, as potential blood-based cancer biomarkers.



Using mass spectrometry to sequence microRNA

Left to Right – Majlinda Kullolli PhD, Sharon Pitteri PhD, Maria Arampatzidou PhD



Approaches to discovering blood-based biomarkers for early cancer detection

ISIS Overview

Information Sciences in Imaging at Stanford

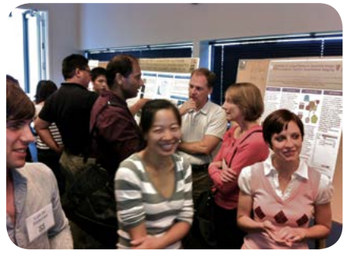
Section Co-Directors: Sandy Napel, PhD and Sylvia K. Plevritis, PhD

http://isis.stanford.edu/

The mission of the ISIS (Information Sciences in Imaging at Stanford) section of the Radiology Department is "pioneering, translating, and disseminating methods in the information sciences that integrate imaging, clinical, and molecular data to understand biology and improve clinical care." This includes deriving new clinical and biological knowledge regarding normal and pathological processes, predicting clinical outcomes such as response to therapy and probability of survival, and translating these advances into practice, such as by creating decision support applications. Researchers within ISIS collectively explore the full spectrum of information-intensive activities in imaging (e.g., image management, storage, retrieval, processing, analysis, understanding, visualization, navigation, interpretation, reporting, and communications) in associated non-imaging domains (e.g., pathology, ophthalmology, oncology, molecular and genetic markers, medical record data, and clinical outcomes). This is done by developing methods to extract computational and semantic features from images and by integrating them with related clinical and molecular data.

The expertise of the ISIS faculty, staff, postdocs, and students span image acquisition, image quantification, imaging informatics, knowledge engineering, bioinformatics, biocomputation, and systems biology. ISIS is co-led by Drs. Sandy Napel, Professor of Radiology, and Sylvia K. Plevritis, Associate Professor of Radiology, and includes core faculty David S. Paik and Daniel L. Rubin, both Assistant Professors of Radiology. Administrative Program Manager Danae Barnes handles ISIS administrative activities. In addition to pervasive collaboration, the four faculty maintain individual laboratories (described elsewhere in this report): 3D Visualization and Analysis Laboratory (Napel; 4 doctoral students, one scientific staff), Cancer Systems Laboratory (Plevritis: 3 doctoral students, 6 postdoctoral fellows, 3 scientific staff), Laboratory of Imaging Informatics (Rubin: 11 doctoral students, 2 postdoctoral fellows, 2 scientific staff), and Image Analysis, Bioinformatics, and Computational Modeling (Paik: 2 doctoral students, one scientific staff). Collectively, we are supported by major funding agencies for projects listed in ISIS Funding (Page 136).

The 2012 ISIS Annual Retreat, a half-day event held on 8/30/2012 in the Clark Center, attracted nearly 40 participants involved or interested in ISIS activities. Goals were to find synergies, motivate additional projects, and to help plan the future of ISIS. Our keynote speaker, Dr. Sandy Anderson, Chair of the Department of Integrative Mathematical Oncology at the Moffitt Cancer Center in Tampa Florida, spoke on the topic of developing 3D cellular automata models of the tumor microenvironment. The keynote was followed by brief lab overviews from the four ISIS faculty, and a "speed-dating" session in which all the ISIS students, postdoctoral fellows and staff, each described themselves in terms of general interests and research projects in one minute using 3 slides. Two poster sessions followed, wherein everyone could showcase and discuss their work. We also organized three small "break-out" discussion groups to focus on identifying research themes in ISIS that unify us and distinguish our work. We later reconvened, and each breakout group summarized their discussion to all the attendees. This information was very valuable, as it was used in the later part of the day, which focused on strategic planning for ISIS. Overall, the general consensus was that the retreat was a big success in conveying the diversity of our work and enabling interactions, but it was too short. Many thanks go to the Retreat Committee and to our Administrative Program Manager, Danae Barnes.



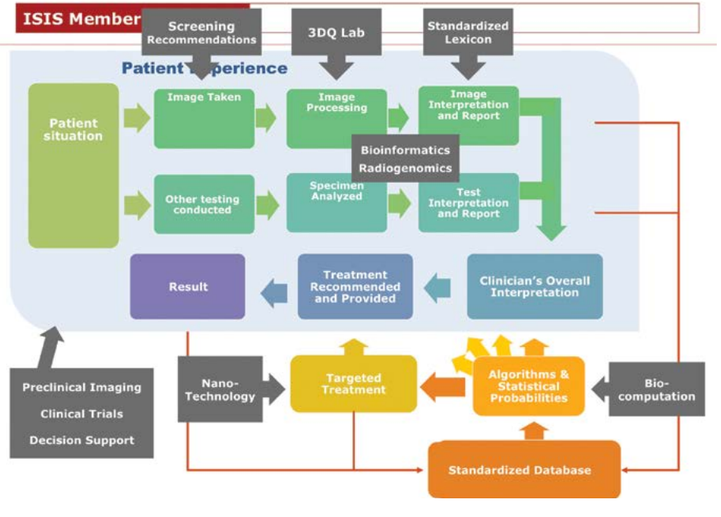
Retreat Poster Session

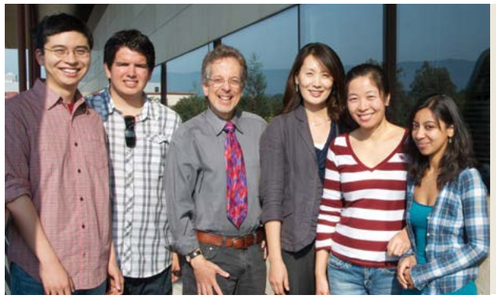
ISIS RETREAT ATTENDEES:
Front row, L to R: Debra Willrett, Jessica Faruque, Tiffany Liu, Vanessa Sochat, Xingwei Wang, Sandy Napel, Alan Snyder, Luis de Sisternes
Second row, L to R: William Du, Betty Pham, Xi Zhao, Xi Rao, Mary Do, Rebecca Lynn Sawyer, Sylvia Plevritis, Benedict Nchang, Chinyere Nwabugwu, Daniel Golden, Danae Barnes, David Paik
Back row, L to R: Daniel Rubin, Dr. Alexander Anderson (visiting Keynote Speaker), Wei Lu, Selen Bozkurt, Anita Samantaray, Francisco Gimenez, Diego Munoz, Ramesh Nair, Olivier Gevaert

This year, ISIS began its strategic planning process with the help of the Office of Institutional Planning (OIP), with goals to clarify our mission and to identify and prioritize areas for growth. During the summer, OIP staff interviewed 19 thought leaders from around the globe to elicit key strategic strengths, weakness, opportunities, threats and priority initiatives. During the afternoon following the retreat, OIP presented their findings to ISIS faculty and staff, and with a similar number of stakeholders from several School of Medicine departments who have synergies with and interests in ISIS' future. Key findings were that ISIS embodied "world class creative scientists with a great track record covering a broad spectrum of research in a growing field." They also commented "ISIS cannot, at its current size, significantly impact key areas," "translating research into clinical applications requires a bigger critical mass," and "stronger networks would be beneficial." Over the next several months we will be scrutinizing these findings and meeting again with our stakeholders to define the best way forward for ISIS.

Please see projects led by our faculty on page 147.

ISIS involvement in clinical and research activities aimed at improving patient care.



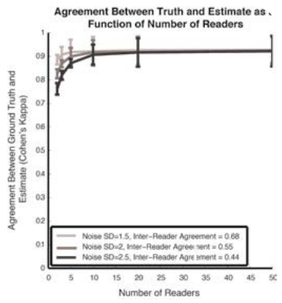


Radiology 3D Visualization and Analysis Laboratory

Sandy Napel, PhD

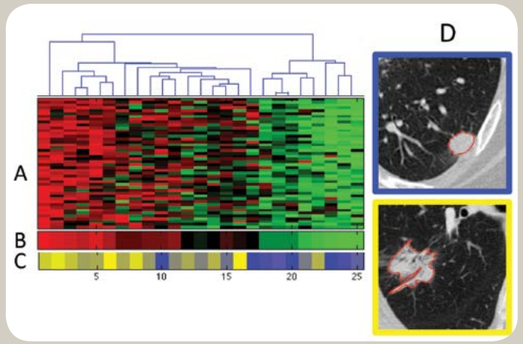
http://med.stanford.edu/profiles/radiology/researcher/Sandy_Napel/

Our group addresses the field of medical image analysis, focusing on volumetric visualization, structure segmentation, quantitative analysis, computer-aided detection of lesions, and the capture and use of imaging phenotype and integration with other clinical data, including those from high throughput technologies such as gene arrays, for knowledge discovery and decision support. Advances here have impact in many technical and clinical areas. Examples are: automated visualization and quantitation of vascular image data, virtual colonoscopy, intra-procedural registration of 2D fluoroscopic images of instruments with 3D volume data, automated computation of peak flow velocity using a novel ultrasound transducer for reproducible determinations of carotid stenosis, automatic generation of curved-planar images through blood vessels, determination of likely neuronal connections of the visual tracts in the brain. Our group is highly collaborative, working with many radiology department investigators (including Chris Beaulieu, Heike Daldrup-Link, Nishita Kothary, David Paik, Sylvia K. Plevritis, and Daniel L. Rubin) as well as many other Stanford (e.g., Pierre Khuri-Yakub, electrical engineering) and non-Stanford (e.g., Geoffrey D. Rubin: Duke University) faculty. This year we have focused on efficient methods for the creation of a visual similarity standard for content-based image retrieval and decision support, automated volumetric segmentation of tumors from cross-sectional images, feature extraction from these segmentations, building integrated databases of image features of lesions and other associated data, and correlation of image features to molecular profiles of excised tissue in lung cancer. Based on our work this past year, 7 new manuscripts have been accepted for publication, 7 presentations were given at international meetings. One major NIH grant proposal (Tools For Linking And Mining Image And Genomic Data In Non-Small Cell Lung Cancer) and one industrial contract (Next –Generation PACS 2.0: Content –Based Image Retrieval in Centricity System) were funded, and 4 grant proposals were submitted to the NIH.

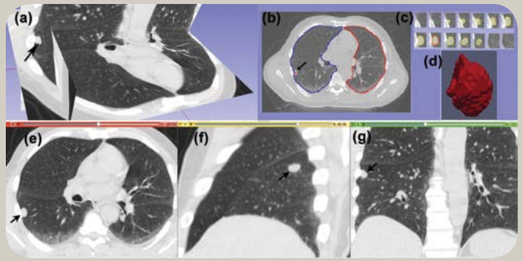


Simulations of agreement between observers on similarity of tumors in cross-sectional images reveal how many readers' ratings of similarity must be averaged in order to have good agreement with truth as a function of uncertainty in ratings.

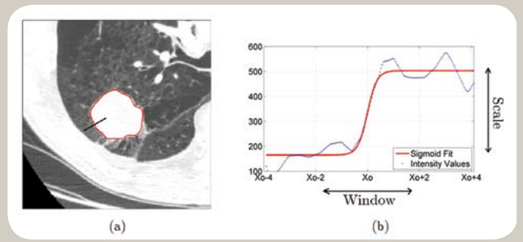
Jiajiung Xu, Sebastian Echegary, Sandy Napel, Inseong Kim, Xingwei Wang, Jessica Faruque.



Correlation of gene expression of excised lung tumors (left) with image features in CT scans (right). Smooth, compact lesions (e.g., top right) correlate with down-regulation (green; left), while irregularly shaped lesions (bottom right) correlate to up-regulation (red; left) of specific gene modules.



3D lung tumor segmentation: (a; e-g) 3 intersecting perpendicular cross-sections through CT scan of lung tumor (arrow). (b) lung segmentation and tumor (arrow) location. (c) cross-sections and (d) volumetric reconstruction of automatic tumor segmentation.



Sharpness of edge, one of many features we extract from lung tumors. Perpendicular lines (one shown in (a)) to tumor edge are computed, and gray values along perpendiculars are fit to sigmoid function (b). Different distributions of fit parameters (window, scale) around edge are characteristic of different tumor types.

Imaging Bioinformatics Laboratory

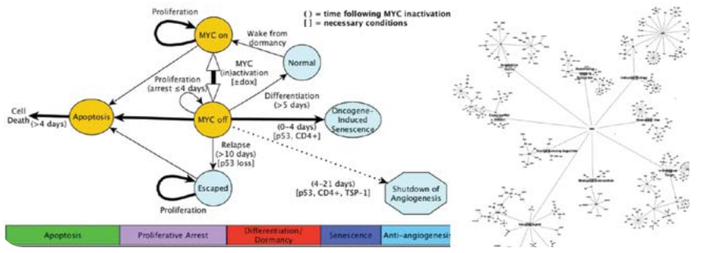
David Paik, PhD

http://www.stanford.edu/people/david.paik

Our group is primarily interested in how biological information is extracted and quantified from both anatomic and molecular imaging, how it is represented, how it is modeled, and how it is disseminated with the larger goal of combining imaging-derived information with other types of data such as molecular and/or clinical information. We are particularly interested in applying computational techniques toward a better understanding of cancer biology. While most computational models and analyses focus on a single source or modality of data, it is becoming increasingly clear that models must integrate across a wide variety of data types as well as spatial and temporal scales. Our focus is on developing and validating these types of models.

Molecular imaging is a key technology in producing breakthrough biological results where better quantitation and mathematical modeling will lead to a more detailed understanding of specific biological mechanisms. We are working on a variety of projects to improve and standardize the quantitative measurements from molecular imaging. Examples include statistical analysis of ROI methods, knowledge representations of quantitative imaging, and improving software for quantitative imaging (Fig. 1). In collaboration with MIPS, we are performing studies of pre-clinical imaging to develop and validate methods for high-throughput imaging of mouse subjects so that studies can use more subjects to produce higher confidence results. As a part of the ICMIC center, we are collaborating with the lab of Dean Felsher to develop and validate a model of how oncogenes affect the response of tumors to directed therapies and in particular, how the immune system is a key player (Fig. 2a). We hope to demonstrate how this modeling will allow us to develop new combination therapies that will produce improved outcomes for cancer patients. We are also working on methods for representing the vast data and knowledge using quantitative imaging biomarkers in clinical trials and other research to deal with the onslaught of new information being produced (Fig. 2b).

Our long-term goal is to tackle the problem of information extraction and information flow from medical/molecular imaging to be on par with that of genomic and proteomic profiling technologies so that these very different types of information may be treated as equals. Our philosophy is that for an integrative approach to imaging and non-imaging information to come to fruition, a major pre-requisite is to be able to maximally extract and represent information from imaging, with an emphasis on the specificity of molecular imaging.



From L to R: Danielle Rasooly, David Paik, Tiffany Liu, Kranthi Kode, Chinyere Nwabugwu, Rahul Agrawal, Frezghi Habte

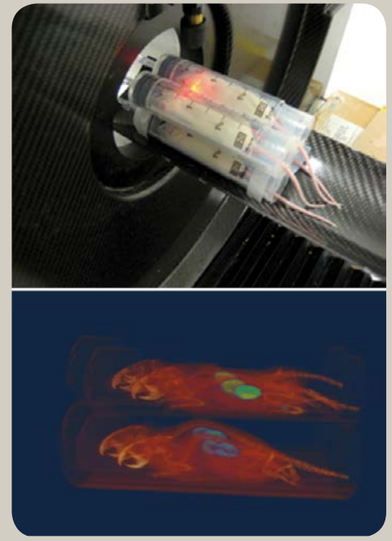


Figure 1. High-throughput imaging using a multiple mouse holder in PET scanner with 3D rendering.

Figure 2. Mathematical model of oncogene-dependent tumor growth kinetics in mouse model. Right: Knowledge model of quantitative imaging biomarkers.

Cancer Systems Laboratory (CSL)

Sylvia K. Plevritis, PhD

http://plevritis.stanford.edu/

The Plevritis' Cancer Systems Laboratory (CSL) takes a multidiscisplinary approach to identify drivers and rates of cancer progression in order to improve clinical strategies for early detection and treatment. CSL research draws from the domains of biocomputation, engineering, genomics/proteomics, imaging, and population sciences. Four key components of CSL are depicted in Figure 1, namely: (1) the Stanford Cancer Systems Biology Program (CCSB, ccsb.stanford.edu) (2) Information Sciences in Imaging at Stanford (ISIS, isis.stanford.edu) (3) the NCI Cancer Intervention and Surveillance Modeling Network (CISNET) and (4) the System Biology Laboratory (SBL) which is a new component of CSL and established to experimentally validated computationally-derived biological findings in in-vitro and in-vivo model systems. To demonstrate the breadth and depth of CSL, below is a summary of its current funded research programs.

A. Understanding Cancer Cellular Hierarchy by Reconstructing Regulatory Networks: Within the NCI-funded U54 Center for Cancer Systems Biology (CCSB), for which Dr. Plevritis is the Principal Investigator, CSL has been identifying a cellular hierarchy of cancer. Most recently, the lab has begun testing the hypothesis that the evolution of any given tumor is encoded in the tumor itself, and is accessible through single-cell analysis. To reconstruct a likely hierarchical relationship among distinct subsets of malignant cells that are potentially related through varying states of differentiation, CSL postdoctoral fellow Dr. Benedict Anchang developed a novel computational approach to identify and gate the cellular heterogeneity of cancer from flow cytometry data. CSL's graduate student Aravind Babu has developed a new topological measure to decode complex gene-gene regulatory interaction network for comparison across different cancer datasets. Research associate Dr. Monica Nicolau has developed an approach to determine the likely cell-of-origin of cancer and assess the degree of normal differentiation underlying cancer heterogeneity. Senior research associate Dr. Andrew Gentles, in close collaboration with Prof. Ash Alizadeth, has expanded a gene-centric survival analysis of the majority of publically available cancer datasets. Dr. Gentles, together with CSL's analyst Dr. Ramesh Nair, has developed a computational pipeline for next gen sequencing data analysis. CSL's Anita Samantary, Program Manager for CCSB, promotes our educational and outreach efforts.

B. Inferring the Plasticity of Cancer : CSL has established a Systems Biology "wet-lab" in LUCAS P169 to experimentally validate our computationally-derived findings. With this new experimental laboratory, CSL is expanding its molecular-network-based research to the analysis of solid tumors, specifically the microenvironment of breast cancer. CSL's postdoctoral fellow Dr. Mary Do is analyzing the maintenance of cellular heterogeneity from sorted breast cancer cells based, in part, on the computational techniques of CSL postdoctoral fellow Dr. Benedict Anchang. CSL's postdoctoral fellow Dr. Xi Rao is exploring potential drivers of the epithelial-to-mesenchymal transition (EMT) of breast cancer derived from regulatory networks inferred by CSL postdoctoral fellow Dr. Olivier Gevaert. CSL's systems biology lab manager Betty Pham facilitates all the experimental studies.

C. Unraveling the Tumor Microenvironment by Inferring an Intercellular Interactome: With a newly funded five-year NCI grant, Dr. Plevritis is Principal Investigator, together with Prof. Clarke, and collaborators Prof. Diehn and Prof. Choang, on a project to reconstruct a regulatory network of the tumor microenvironment of human non-small cell lung cancer (NSCLC). This work involves flow sorting

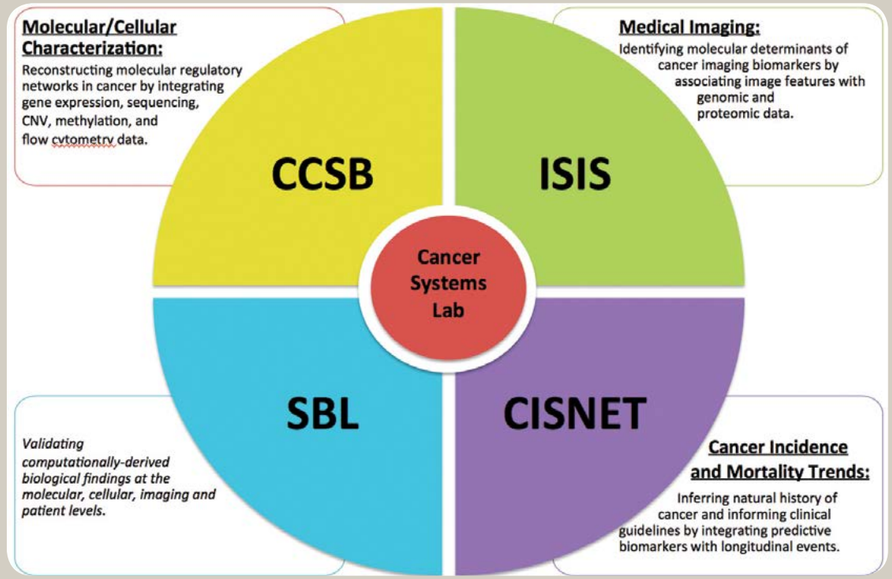


Figure 1. Major components of the Plevritis' Cancer Systems Laboratory.

cellular sub-compartments of human NSCLC (i.e. malignant cells, infiltrating immune cells, fibroblasts, and endothelial cells), genomically profiling each sub-compartment, then reconstructing a gene regulatory network that captures intercellular and intracellular interactions. The main goal of this program is to identify mediators that represent promising drug targets for disrupting the interaction between lung cancer cells and their microenvironment to improve survival outcomes for lung cancer patients. CSL's senior research associate Dr. Andrew Gentles is working together with data analyst Dr. Ramesh Nair to establish RNASeq analysis of the sorted cell populations. CSL's postdoctoral fellow Dr. Xi Zhoa is developing new analytical approaches to infer the cellular communication between the malignant cells and its microenviroment.

D. Decoding Tumor Heterogeneity by Integrating Genomic, Imaging and Clinical Data: With a funded five-year NCI grant, Dr. Plevritis is a Principal Investigator, together with Dr. Napel, on a project to correlate CT and PET information with gene expression microarray data of human NSCLC in order to better understand the molecular heterogeneity of the disease from imaging studies. Initial analyses led by CSL postdoctoral fellows Dr. Olivier Gevaert and Dr. Vish Nair showed the genes up-regulated with the activation of extracellular matrix remodeling, cell migration and NF Kappa-Beta signaling were associated with CT and PET features. In this work, CSL developed a novel approach that leverages the public gene expression microarray databases that contain clinical outcomes across thousands of patients to identify candidate prognostic and predictive image biomarkers from clinical studies with limited clinical follow-up.

E. Reconstructing the Natural History of Cancer by Simulating Clinical Trials and Population Cancer Trends: With renewed 5-year funding from the NCI CISNET, CSL is expanding a previously funded 10-year program in population level studies focused on modeling the natural history of breast and lung cancer in order to estimate the impact of risk-stratified screening and molecularly-targeted therapeutics on current and future cancer incidence and mortality US trends. This modeling work is based on Monte Carlo simulation of cancer progression and clinical outcomes. In the area of breast cancer, CSL's graduate student Deigo Munoz, working together with Assistant Professor Allison Kurian, translated its work on the natural history of breast cancer into a decision support tool for BRCA1/2 mutation carriers to manage their heightened breast and ovarian cancer risk (brcatool.stanford.edu). In addition, Diego Munoz is evaluating the impact of new biomarker-specific breast cancer therapeutics on clinical outcomes, and evaluating the effect of hormone replacement therapy on breast cancer trends, together with recently graduated PhD student Yihan Guan. In the area of lung cancer screening, CSL's postdoctoral fellow Dr. Ayca Erdogan and medical scholar Wenshaui Wan are working to extend the results of the National Lung Screening Trial of CT to the population-level setting by characterizing the effect of screening on indolent versus aggressive disease subtypes. Recently, CSL expanded its effort in population level modeling with the recruitment of NIH-trained statistician Dr. Summer Han who is focusing on the parameter estimation algorithms.

In summary, CSL brings together biocomputational modelers, engineers, statisticians, molecular biologists and clinical researchers to improve our understanding of cancer by producing insights that are biologically and clinically relevant and have potential for clinical translation.

Quantitative Imaging Laboratory

Daniel Rubin, MD, MS

http://stanford.edu/~rubin/

Our research group develops computational methods and tools to leverage "Big Data" in medical imaging to discover imaging biomarkers of disease that enable precision medicine. We translate our discoveries into practice through decision support applications to reduce variation in clinical care and to improve patient outcomes. Our work spans a broad gamut from basic science discovery (using image phenotypes to define subtypes of diseases and to understand their molecular characteristics) to clinical practice through translational research (decision support, disease profiling, treatment response assessment, and personalized treatment selection). Our vision is that Big Data related to imaging will guide clinical practice and drive scientific discovery. Our ultimate goal is to bring cutting-edge radiological data and knowledge into practice to guide precision care of individual patients.

Basic science activities: We are developing computational methods to extract quantitative and semantic content from images ("image biomarkers") and to use them in conjunction with clinical, pathology, and molecular data to discover image-based predictors of disease and treatment response. Our ultimate goal is to discover disease subtypes and to "profile" patients based on image-based characteristics for personalized care. Our laboratory is one of the sites in the National Cancer Institute's Quantitative Imaging Network (QIN), a national research consortium which is advancing the science of quantitative methods of imaging to understand cancer and improve its treatment. We are developing a national informatics infrastructure to define a new paradigm for acquiring, mining, and using a broad range of quantitative imaging data in cancer research, and to provide decision support to physicians based on quantitative imaging assessments of patients with cancer. We are also developing innovative imaging informatics methods to enable this work, including (1) tools to efficiently and thoroughly capture the semantic terms radiologists use to describe lesions (Figure 1); (2) standardized terminologies and ontologies to enable radiologists to describe lesions comprehensively and consistently; (3) novel image processing methods to extract quantitative features from images that are informative of the underlying biology of lesions (Figure 2); (4) methods to integrate molecular and imaging data to identify disease subtypes in brain cancer and other malignancies (Figure 3); and (5) a large database of annotated quantitative imaging cancer studies as a resource for discovering new biomarkers that will improve the sensitivity of detecting cancer treatment response (in collaboration with the Cancer Center). We recently began a new program in quantitative evaluation of breast cancer with the Body Imaging (pages 38-39) and Breast Imaging sections (pages 46-47) (Figure 2).

Translational and clinical activities: Projects include (1) content-based image retrieval to improve radiologist diagnostic accuracy (a collaboration with the Body, pages 42-43, and MSK, pages 52-53, sections); (2) automated segmentation of lesions in serial imaging studies, enabling physicians to objectively and reproducibly assess lesions in images and to monitor the response to treatment; (3) quantitative image analysis of retinal images to detect and monitor progression of eye diseases (a new collaboration with **Dept. of Ophthalmology**) (Figure 4), (4) natural language techniques to enable uniform indexing, searching, and retrieval of radiology information resources such as radiology reports (a new collaboration with the Radiology Service at the VA, pages 62-63); and (5) decision support applications integrated into the reporting workflow to improve diagnosis and reporting clarity and completeness.

Top row (left to right): Wei Lu, Debra Willrett, Vanessa Sochat, Rebecca Sawyer, Christina Hung, Dan Golden, Tiffany Ting Liu.; Bottom row (left to right): Francisco Gimenez, Daniel Rubin, Jiajing Xu, Alan Snyder, Selen Bozkurt, Luis deSisternes

Figure 1. We are developing a Web-based image viewing workstation that seamlessly captures quantitative and other information about images from radiologists as they view images. The application, called ePAD, runs on any computer platform and can display a broad variety of medical images besides radiology (such as pathology and retinal images). In this example, the radiologist has measured lesions on a CT scan that were measured previously. The ePAD tool mines the patient's historical imaging studies to locate the same lesions seen on older studies and summarizes them with their measurements, helping physicians to rapidly and accurately detect change in the disease status of the patient.

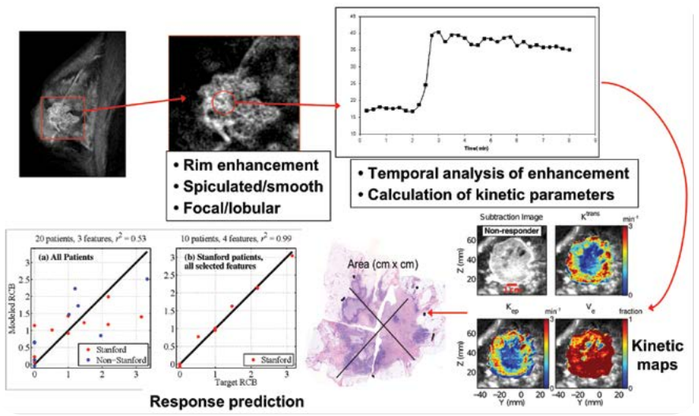


Figure 2. We have developed quantitative imaging methods to characterize breast cancer. Our methods analyze the raw MRI perfusion image of the breast (upper left) and we derive quantitative features from the images such as rim enhancement, heterogeneity, and the rate of change in enhancement over time (upper, middle and right). From this quantitative information we create maps of the quantitative parameters (lower right) to which we correlate quantitative analysis of the corresponding pathology images (lower middle). We create statistical models to relate the image features to the pathology features, yielding a model that predicts the patient's disease response to treatment based on the quantitative analysis of image features (lower left).

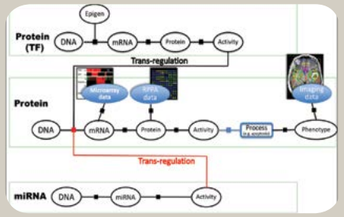
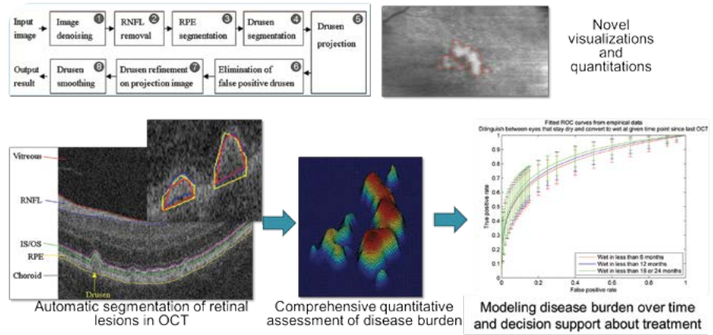


Figure 3. We have developed a framework to integrate and relate molecular data and imaging data. The image data—which provides phenotypic characterization of cancer—derive from the molecular features, since the latter give rise to processes and pathways that ultimately produce changes in tissues that are visible on images. The molecular data are being used to define subtypes of cancers, and these subtypes determine optimal therapies for individual patients. On the other hand, obtaining molecular characterization is invasive, requiring biopsy and is not practical to repeat during treatment to monitor for biological change in cancer during treatment. Our hypothesis is that we can predict the molecular changes based on quantitative analysis of the imaging features—since the latter ultimately derive from the former. We are linking the image feature to the molecular features by incorporating them into a formal model of the basic biological dogma and mining large, publicly available molecular/imaging datasets.

Figure 4. We have developed a set of tools and algorithms to quantify disease seen in retinal imaging (using a modality called Optical Coherence Tomography—OCT—which produces volumetric images). We created a fully automated pipeline that take in an OCT dataset and output quantitative features of retinal lesions (upper left). The pipeline also outputs projection images of the retina showing the lesions circumscribed by the algorithm (upper right). On the cross sectional images the individual lesions are automatically circumscribed and measured (lower right). Quantitative features of lesions seen in the image volume are also derived (lower middle). A mathematical model predicts the change in disease over time based on analysis of the quantitative retinal features, which can provide decision support to the physician treating the patient (lower right).



MIPS Overview

Molecular Imaging Program at Stanford
Director: Sanjiv S. Gambhir, MD, PhD
Co-Director: Christopher Contag, PhD

http://mips.stanford.edu/

The Molecular Imaging Program at Stanford (MIPS) (http://mips.stanford.edu) continues to experience significant growth. The participation of many faculty members and trainees within the Department of Radiology and from other departments contributes to building and growing the program. MIPS now has 58 faculty members with 26 full members and 32 associate members, representing more than 25 different disciplines. In addition, MIPS includes five instructors, 35 research associates and scientists, and more than 150 postdoctoral fellows, graduate and undergraduate students. The number of graduate students, MSTP students, post-doctoral fellows, research scientists, technicians, and administrative staff continues to grow and is currently approximately 250. Although we have experienced a significant increase in personnel with the Canary Center for Cancer Early Detection, we anticipate that number of MIPS faculty and staff to continue increasing.

Our program continues to benefit from support of two highly productive NCI-funded programs, the In vivo Cellular Molecular Imaging Center (ICMIC) P50 grant and the Center for Cancer Nanotechnology Excellence (CCNE) U54, through which we have advanced projects in the Radiology Department, the School of Medicine, the School of Engineering, across the Stanford campus, nationwide at a number of academic centers, as well as in the medical imaging industry. In 2012, the Stanford Molecular Imaging Scholars (SMIS, R25T) NIH training program, which is now being led by Dr. Craig Levin, was renewed and is now in its eighth year of training the next generation of cancer molecular imaging post-doctoral scholars. More than 90% of SMIS graduates have gone on to seed imaging programs at other academic and industrial centers. We also participate in an NIH post-doctoral training grant (T32) for cardiovascular molecular imaging, which is in its fourth year. In addition, all labs continue to grow with new students, post-doctoral fellows, and outstanding research staff joining the program. Many scientists from around the world visit our program to learn more about molecular imaging.

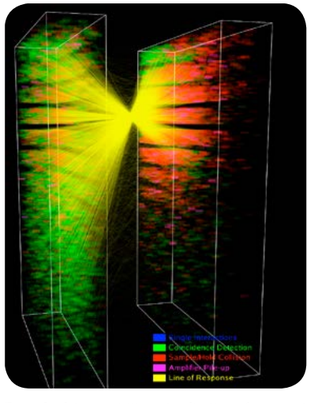
Through the Canary Foundation's efforts to develop the Canary Center at Stanford for Cancer Early Detection (http://canarycenter.stanford.edu/), we continue to build bridges with many investigators on campus. Our off-campus space on California Avenue facilitates our cancer early detection efforts. We are convinced that more investments are needed in the earlier detection of all disease. Detecting disease earlier allows a much better potential for cure. The Canary Center works on novel in vitro diagnostics (e.g., using patient blood samples) as well as new imaging strategies with high sensitivity to detect very low burden cancer signatures. It is hoped that in the next three to five years, Stanford will become a world leader in the important field of early cancer detection.

WMIC 2012, Dublin, Ireland

2012 MIPS Retreat Poster Session, Sharon Heights Golf & Country Club.

2012 MIPS Retreat Invited Speaker, Frank McCormick, PhD, FRS, Director, Helen Diller Family Comprehensive Cancer Center at UCSF, and President, American Association of Cancer Research (AACR).

Patient-specific induced pluripotent stem cells as a model for familial dilated cardiomyopathy



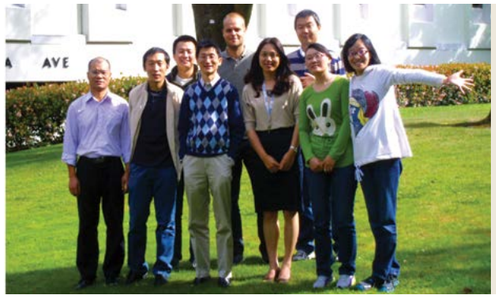
Example data acquisition visualization of an event based simulation of a point source between two panels

We continue to have several seminar series on campus to help educate scientists about molecular imaging. The Molecular Imaging seminar series (http://mips.stanford.edu/public/mi_seminar.adp) is now in its sixth year and has a large collection of videos available online of speakers from the last few years. Students from different MIPS labs now routinely present as well. The Nanobiotechnology seminar series (http://mips.stanford.edu/public/nanobiotech_seminar.adp), which focuses on new applications of nanotechnology to cancer, continues to draw attendance from faculty from all over the Stanford campus as well as surrounding academic, medical, and industry centers. Several speakers from around the country have presented in the series; all lectures are available on-line. We also host a year-long graduate course entitled: "Multi-modality molecular imaging of living subjects" directed by Dr. Craig Levin, which covers the science and technology of molecular imaging.

Our Molecular Imaging/Nuclear Medicine clinic is an advanced facility with spectacular design and state-of-the-art equipment that consolidates all of the PET-CT, and SPECT-CT, and SPECT imaging systems and related equipment in one location, including a new radiochemistry facility. Newer cardiac and optical imaging equipment will also be placed in this new clinic. And for our advanced pre-clinical research, we have designed the clinic so that large animal imaging experiments can be performed there. Research trials that combine state-of-art imaging with in vitro diagnostics (e.g., blood proteomics) are also now possible in this new facility.

An important link in the MIPS research chain focuses on industrial partnerships with key leaders in the molecular imaging community. Several projects to develop new imaging agents, methods, and instrumentation are underway with General Electric Global Research, General Electric Healthcare, Bracco Diagnostics, Siemens Healthcare, Philips Healthcare, Schering-Plough, Bayer-Schering, Sanofi-Aventis, Millennium Pharmaceuticals, and GlaxoSmithKline. It is likely that additional industrial partners will enter into long-term collaborative research relationships over the next several years. These relationships support and strengthen our goals to translate discoveries at Stanford to the patient bedside. Several faculty are also involved in new startup-company efforts with intellectual property from their laboratories at Stanford. These include new instrumentation, methods, and assays in diagnostics, small animal imaging and clinical imaging.

For a complete summary of MIPS funding led by Radiology faculty, please see pages 148-149.



Cancer Molecular Imaging Chemistry Laboratory (CMICL)

Zhen Cheng, PhD

http://mips.stanford.edu/research/cmicl.html

The main research of the Cancer Molecular Imaging Chemistry Laboratory (CMIML) is to develop novel multimodality imaging probes and techniques for cancer early detection. Our multidisciplinary team is composed of members with expertise in organic chemistry, radiochemistry, bionanotechnology, biochemistry, molecular and cell biology, radiological science, medicine and molecular imaging. Currently, we are actively studying several important problems in the molecular imaging field as described below in detail.

I. Molecular Probe Development Based on Novel Protein Scaffolds

Our research group is interested in studying whether the protein scaffold based approach could become a generalizable strategy to facilitate molecular probe development. We have focused our work on studying two new emerging protein scaffolds for their diagnostic applications: Affibody and Cystine knot miniproteins (knottins). Affibody molecules are engineered to form a protein scaffold with 58-amino acid residues and have a three-helix bundle scaffold structure (Figure 1). Cystine knot proteins are small constrained polypeptides that share a common disulfide-bonded framework and a triple-stranded β-sheet fold. We have synthesized and evaluated a variety of radiolabeled (18F, 68Ga, 64Cu, 111In, etc) or optical dye labeled Affibody (3-hellix and 2-helix) and Cystine knot miniproteins. These imaging aμΩgents could be used to image several important tumor targets such as human epidermal growth factor receptor type 2 (HER2), epidermal growth factor receptor (EGFR), tumor angiogenesis target integrin receptor $\alpha_v\beta_3$. Overall, our studies have clearly demonstrated that Affibody and Cystine knot protein scaffolds can be used as excellent platforms for molecular probes development. Those Affibody and Cystine knot based probes are worthy of further evaluation and optimization for the development of positron emission tomography (PET) probes for clinical HER2, EGFR and $\alpha_v\beta_3$ imaging.

II. Melanoma Early Detection

Cutaneous malignant melanoma is one of the most lethal cancers. The most important approach for improvement of survival of melanoma patients still remains early diagnosis, along with accurate staging of disease. Positron emission tomography (PET) is a very promising technology for non-invasively imaging tumor micrometastases. Though 18F-fluorodeoxyglucose (18F-FDG) PET has been widely used clinically for melanoma imaging, other approaches to specifically identify, characterize, monitor and guide therapeutics for malignant melanoma are still needed. Our research has focused on developing novel peptides and small molecules based PET probes targeting melanoma associated specific targets such as melanocortin receptor 1 (MC1R), melanin, etc. For example, we have successfully developed novel benzamide analogs based PET probes, such as 18F-N-[2-(diethylamino)ethyl]-4-fluoro-Benzamide (18F-FBZA) for melanoma imaging (Figure 2). We are currently optimizing the probe and will move one of its analogs with best in vivo properties into clinical evaluation very soon.

III. Cerenkov Luminescence Imaging

Recently, we and others have found that a variety of radioactive materials (β^+ and β^- emitters) could be detected using optical imaging techniques (Figure 3). This is mainly attributed to the ability of radioactive materials to produce low energy visible photons (1.2-3.1 eV, 400-1000nm) associated with Cerenkov radiation. Optical imaging of Cerenkov radiation has thus emerged as an important and promising strategy for molecular imaging research that nicely bridges nuclear imaging and optical imaging. This technique could be particularly useful in preclinical research such as radiopharmaceutical development and drug screening. It may also find applications in clinical cancer diagnosis. Moreover, we also demonstrated that the radioactive luminescent light at visible and NIR window could serve as an internal source for illumination of many different fluorophores such as QDs, and the resulting fluorescent emissions could then be used for optical imaging in living subjects. We are actively exploring the applications of Cerenkov Luminescence Imaging in biomedical imaging and clinical translation.

Our research is supported by National Institutes of Health, Department of Defense, Department of Energy, Melanoma Research Alliance and the Radiology Department at Stanford. Trainee fellowships are supported by China Scholarship Council.

Lab photo (l-r): Xinhui Su, Shuxian Meng, Jinbo Li, Zhen Cheng, Morten Persson, Xiaohua Zhu, Kai Cheng, Chunxia Qin, Xiaoling Wang

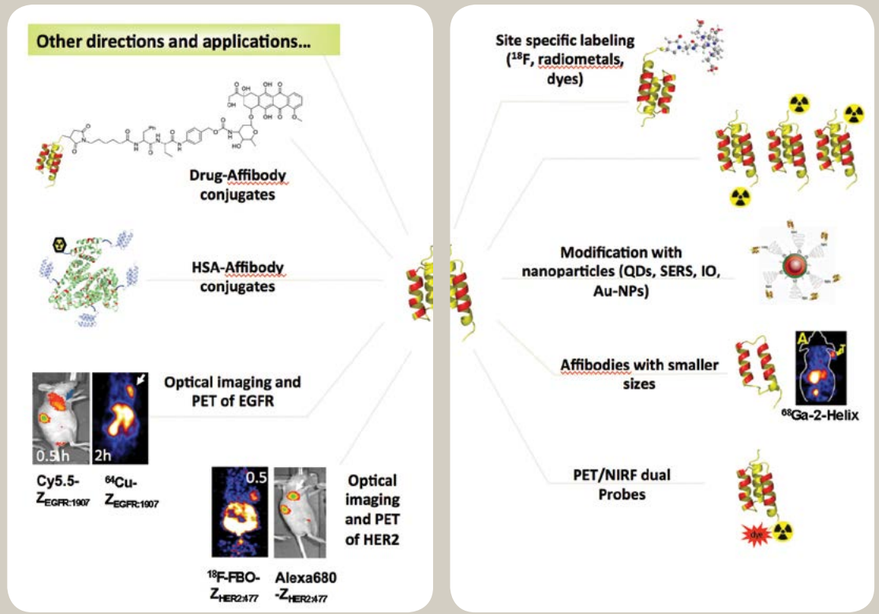


Figure 1. Affibody protein scaffold based approach for molecular probe development.

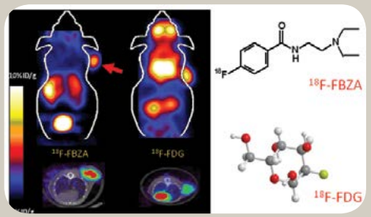


Figure 2. Melanin targeted probe for melanoma PET imaging.

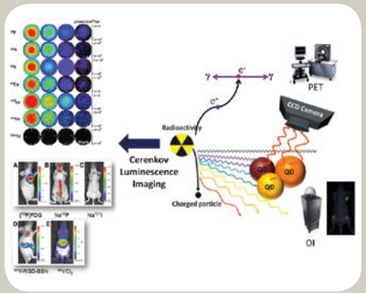


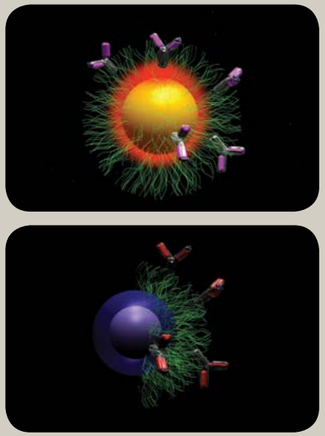
Figure 3. Cerenkov Luminescence Imaging

Multimodality Molecular Imaging Lab (MMIL)

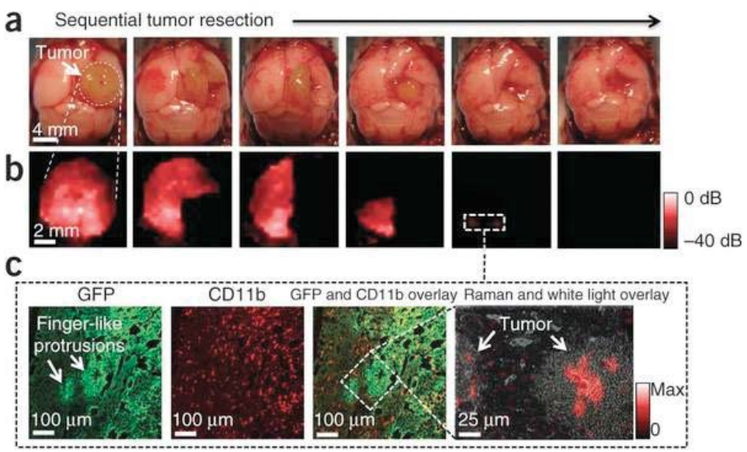
Sanjiv Sam Gambhir, MD, PhD

http://mips.stanford.edu/research/mmil.html

The Gambhir Group develops imaging assays to monitor fundamental cellular processes in living subjects. To complete these studies, we use a host of molecular imaging modalities including micro-positron emission tomography, bioluminescence and fluorescence, micro-computerized axial tomography, ultrasound, photoacoustics, intravital microscopy, magnetic resonance imaging (MRI), and Raman spectroscopy. Our ultimate goal is to marry new insights in cell and molecular biology with those in biomedical engineering to advance the field of molecular imaging. In particular, we focus on cancer biology and have developed several reporter genes to study cell trafficking models, gene therapy models, transgenic models, and other oncogenic processes in vivo. Imaging of biologic therapies with engineered proteins for cancer cell surface targets are another focus. Assays to interrogate cells for mRNA levels, cell surface antigens, protein-protein interactions, protein phosphorylation, and intramolecular folding are also under active development. We also have a large focus on nanotechnology-enhanced molecular imaging and have created novel nanoparticle imaging probes for photoacoustic, Raman, ultrasound, and multimodality imaging strategies. In these and other examples, we characterize our imaging agents in cell cultures and small animal models of human disease before progressing to larger animals and human clinical trials. Of particular interest is the combination of in vivo imaging data with measurements of serum protein levels for even greater insight into disease state. We actively collaborate with many other academic research teams including faculty in the Departments of Electrical Enginering, Chemical Engineering, Chemistry, Materials Science, Pediatrics, Urology, Gastroeterology, and many others.



Targeted nanoparticles.



Raman-guided intraoperative surgery using MPRs. Kircher and Gambhir. Nature Medicine 2012.

Molecular Imaging of Nociception and Inflammation Laboratory

Sandip Biswal, MD

http://mips.stanford.edu/research/minil.html

Chronic pain sufferers are unfortunately limited by poor diagnostic tests and therapies. Our lab is interested in using multimodality molecular imaging techniques to study nociception and neuronal inflammation as a means of improving objective, image-guided diagnosis and treatment of chronic pain generators. Deepak Behera, DNB continues to admirably lead and manage the lab, juggling a number of projects, collaborations and students. He has been able to garner a number of publications and awards for the lab during this past year. Our recently-graduated medical student, Eric Davalos, MD, continued our collaborations with Garry Gold, MD and Brian Hargreaves, PhD, to help develop improved isotropic MR approaches for MR Neurography. We also welcomed Radiology Resident, Andreas Loening, MD, PhD, to our lab; he has been instrumental in developing diffusion tensor imaging (DTI) of the peripheral nervous system. We continue our exciting collaborations with Justin Du Bois, PhD, William Parsons, BS, John Mulcahy, PhD, Frederick Chin, PhD, Aileen Hoehne, PhD, Bin Shen, PhD, Michelle James, PhD and David Yeomans, PhD, studying the role of voltage-gated sodium channels in neuropathic pain using PET-MRI and radiolabeled guanidinium toxins. Important collaborations with the Stuart Goodman Lab continue to thrive as we continue to examine the role of mesenchymal stem cells and macrophages in the prosthetic-induced osteolysis and in fracture models. Another collaboration with Bin Shen, PhD, Michelle James, PhD, and Frederick Chin, PhD, has led to interesting results with the use of a sigma-1 receptor radioligand in neuropathic pain models. We are hopeful that our research will advance to clinical trials with FDA-approved and novel tracers in the coming year.

Lab Members (left to right): Dr. Sandip Biswal, Dr. Deepak Behera, Dr. Eric Davalos, Dr. Andreas Loening

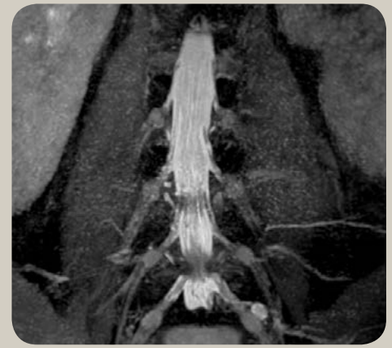


Figure 1. MIP image of a CUBE data set showing the lumbar plexus in a human subject. Nerve roots, dorsal root ganglia and peripheral nerves can be easily identified using this isotropic MR imaging approach.

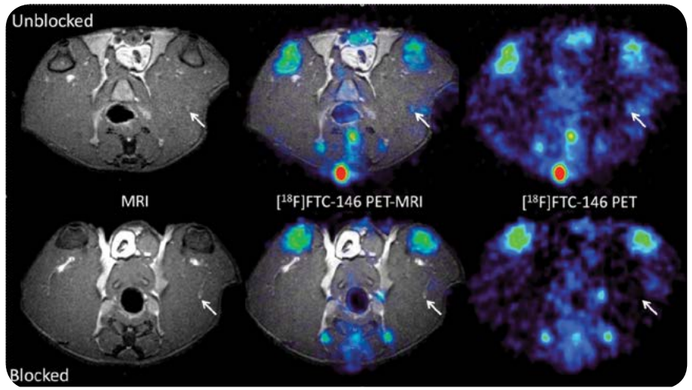
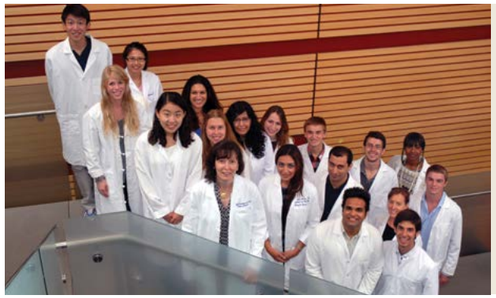


Figure 2: [18F]FTC-146 PET-MR transverse image through the thigh of a rat model of nerve injury and neuropathic pain. Increased [18F] FTC-146 uptake is identified in the sciatic neuroma (white arrow) compared to the contralateral normal sciatic nerve. This approach will be helpful in identifying nerve injury and potential sources of pain.



Translational Tumor and Stem Cell MR Imaging Laboratory (Daldrup-Link Lab)

Heike Daldrup-Link, MD

http://daldrup-link-lab.stanford.edu/

We develop non-invasive imaging techniques that can generate detailed information about specific cells in the body. We focus on applications for imaging stem cells, immune cells and various cell types in cancers. Our goal is to improve tumor detection, diagnose tumor characteristics linked to poor prognosis, monitor tumor cell-targeted therapies and stem cell therapies for tissue regeneration.

Stem Cell Imaging: We have developed several novel and immediately clinically translatable approaches for MR imaging of stem cells transplants (Radiology 2012, Nanomedicine 2012, PLOS one 2012). We are also evaluating an immune rejection of stem cell transplants via intravenous injection of an FDA-approved iron supplement, in vivo labeling of RES macrophages and tracking of the migration of iron labeled macrophages into failed or rejected stem cell transplants with MR imaging (Fig.1). We have initiated a team research project in collaboration with the Gambhir, Napel, Paulmurugan, Rao, and Rubin labs to integrate a panel of immune cell imaging tests for non-invasive in vivo assessment of transplant rejection. In collaboration with the pediatric nephrology team, the kidney transplant team, the Moseley lab and the Nishimura lab, we have initiated a clinical trial to evaluate nanoparticle-enhanced MR imaging approaches for detection of macrophage infiltrations in kidney transplants that may indicate rejection.

Tumor Imaging: We are developing the novel iron oxide nanoparticle compound GEH121333 in collaboration with GE Global Research for tumor MR imaging, specifically for detection of tumor necrosis and tumor associated macrophages (TAM), which are linked to poor prognosis. In collaboration with the Coussens lab (OHSU), we are evaluating new approaches to improve the delivery of nanoparticles and other macromolecules to tumors via inhibition of the type I TGFβ receptor Alk5 (expressed in vascular tissue), which leads to enhanced tumor microvascular permeability. Via an investigational new drug application and a collaboration with the Moseley lab and the pediatric oncology team, we have started clinical evaluations of the iron supplement ferumoxytol (Feraheme) as an alternative MR contrast agent to gadolinium chelates for local and whole body staging of malignant lymphomas and malignant sarcomas. We work with the Pediatric PET/MR working group on defining indications and developing optimized techniques for PET/MR scans of children with cancers (Fig. 2).

Our research team is shown above. Our team members have the curiosity and ambition to develop and explore these novel imaging tools and they have the determination to overcome obstacles along the way. In 2012, trainees in our group were awarded with a MedScholars stipend (Rostislav Castillo), the Berdon Award from the Society for Pediatric Radiology (Rosalinda Castaneda), three World Molecular Imaging Travel Awards (Celina Ansari, Aman Khurana, Hossein Nejadnik), an RSNA Young Investigators Molecular Imaging Travel Award (Qiaoyun Shi) and the Research Trainee Prize of the Radiological Society of North America (Hossein Nejadnik).

Lab Photo: From left: Back Row: Issac Lam, Qiaoyun Shi, Jessica Donig, Ramsha Khan, Fanny Chapelin, Graham Beck, Ross Castillo, Syreeta Crawford. Middle Row: Lonnie Kurlander, Su Hyun Hong, Olga Lenkov, Celina Ansari, Hossein Nejadnik, Laura Pisani, Daniel "Rocky" Owen. Front Row: Heike Daldrup-Link, Aman Khurana, Christopher Klenk.

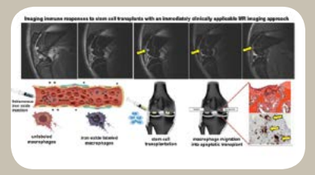


Figure 1. Imaging immune responses to stem cell transplants with an immediately clinically applicable MR imaging approach, using intravenously injected iron oxide nanoparticles as an in vivo macrophage label. Macrophage migration into failed transplants can be visualized by a negative (dark) T2-signal (arrow).

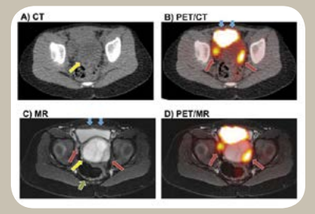


Figure 2. A) Unenhanced CT scan shows a mass in the pelvis (yellow arrow). B) Overlay of an 18F-FDG PET scan improves delineation of the urinary bladder (blue arrows) and two hypermetabolic tumor nodules (red arrows). C) T2-w MR scan provides further improved anatomical information, delineating a T2-hyperintense cystic, multiseptated tumor component (yellow arrow) between bladder and rectum (green arrow). D) Fusion of the 18F-FDG PET with the MR scan provides improved delineation of the hypermetabolic tumor nodules, particularly the small nodule to the right of the mass. Note slight mismatch of urinary bladder shape due to sequential data acquisition.

Molecular Imaging Instrumentation Laboratory (MIIL)

Craig Levin, PhD

http://miil.stanford.edu/

Dr. Levin's laboratory is interested in the development of advanced instrumentation and software algorithms for in vivo imaging of molecular signatures of disease in the clinic and in small laboratory animal research. The goals of the instrumentation projects are to advance the sensitivity and spatial, spectral, and/or temporal resolutions as far as physically possible. The algorithm goals are to understand and model the physical system comprising the subject tissues, radiation transport, and imaging system, and to provide the best available reconstructed image quality and quantitative accuracy. The work involves computer modeling, position sensitive sensors, readout electronics, data acquisition, image formation, signal/image processing, and data/image analysis algorithms, and incorporating these innovations into practical imaging devices. The ultimate goal is to introduce these new imaging tools into studies of molecular mechanisms and treatments of disease within living subjects in the clinic and in preclinical research.

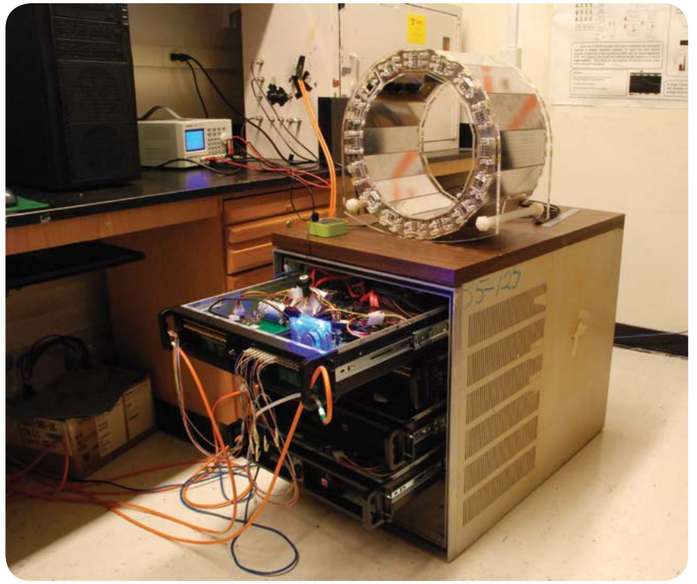


Figure 1. The world's first "electro-optical" PET system under construction. The system will be inserted into a 3T MRI system for simultaneous PET/MRI brain imaging. The PET scintillation detector signals are transmitted out of the MRI system via telecommunication-grade optical fibers instead of electrical cables in order to reduce the electrical footprint of the PET insert inside the MRI system and to facilitate RF transparency in order to minimize mutual interference between the two modalities.

Lab Photo: Members of the Molecular Imaging Instrumentation Laboratory

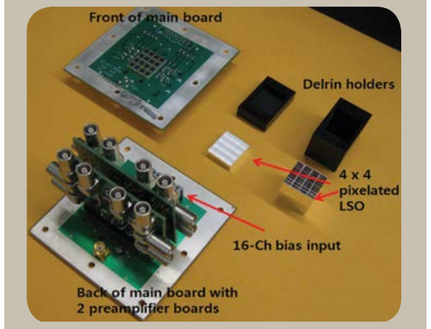


Figure 2. Components of the world's first 511 keV photon detector array module for PET capable of achieving 200 picoseconds coincidence time resolution over all array elements (Commercially available time-of-flight PET detector arrays achieve >600 ps time resolution): From top left: silicon photomultiplier array mounted onto a printed circuit board (PCB) used to interface with the 16 sensor pixels; Lutetium oxyorthosilicate (LYSO) scintillation crystal arrays; Low noise and fast preamplifier board to readout the 16 detector channels.

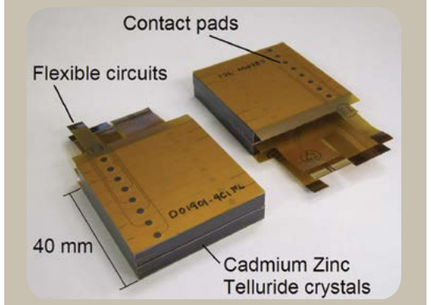


Figure 3. A new type of non-scintillator 511 keV photon detector for PET made from the high Z, high density semiconductor material know as cadmium zinc telluride (CZT). The detector comprises slabs of CZT material, with an electrode pattern deposited on either face to enable position sensitivity of 511 keV photon interactions in the crystal. The electrode signals are read out using thin flexible circuits.

Cellular Pathway Imaging Laboratory (CPIL)

Ramasamy Paulmurugan, PhD

http://mips.stanford.edu/research/cpil.html

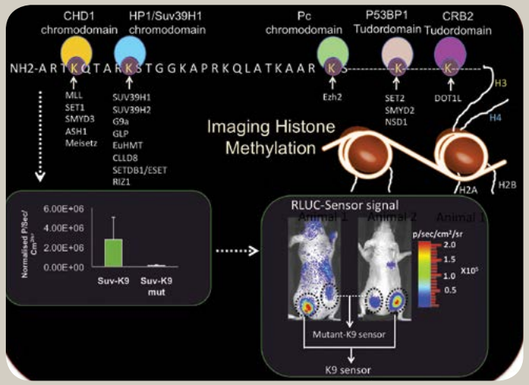
The main focuses of our lab are 1) to develop new molecularly targeted therapies for various sub types of breast cancers (triple negative (TNBC) and receptor positive tamoxifen resistant phenotypes), 2) to understand the molecular mechanism of tamoxifen resistance in breast cancer, 3) to develop non-invasive molecular imaging assays to measure histone methylations in cells at different cellular diseases, 4) to study Nrf2-Keap1 interaction to monitor antioxidant chemoresistance in cancer chemo- and radio- therapies and, 5) to develop ultrasound-microbubbles mediated targeted delivery of microRNAs for advanced cancer therapy.

Breast cancer is a highly heterogeneous disease, and there is a growing body of evidence that this heterogeneity occurs at both genetic and phenotypic levels. Although breast cancer research has improved the efficacy of therapies, especially for the treatment of a sub-type of breast cancer that is estrogen receptor positive (endocrine and antibody based immunotherapies), the increase in the incidence of the receptor negative phenotype and the development of receptor positive tamoxifen resistant phenotype keep the mortality rate very high. Our lab mainly focuses on developing strategies to improve breast cancer therapy while understanding the molecular mechanism of drug resistance to circumvent the problem and to improve the therapeutic efficacy. We are mainly interested in studying the pathways regulated by estrogen receptors (ERα and ERβ) and Nrf2 (Nuclear factor (erythroid-derived 2)-like 2) to develop our therapeutic interventions.

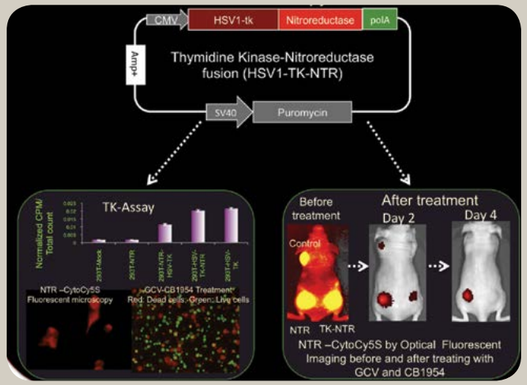
MicroRNAs are small regulatory RNAs expressed by cells to control gene expression. MicroRNA expression is completely dysregulated in cancer. Inhibition or restoration of microRNA functions have been reported to play significant roles in cancer-related events in cells, thus potentially heralding a powerful approach to create a new generation of molecularly targeted anti-cancer therapies. The functions of endogenous microRNAs can be successfully blocked by delivering antisense oligonucleotides, which are complementary to endogenous microRNAs (AntagomiRs). MicroRNAs such as microRNA-21, microRNA-335, and microRNA-10b play crucial roles in breast cancer, either by acting as tumor suppressors (microRNA-335) or as oncogenes (microRNA-21 and microRNA-10b). The finding that individual microRNAs target several hundred genes, regulate associated pathways involved in cellular pathogenesis, and target microRNAs for the functional maintenance of cellular genes, further underscores the emerging importance of microRNA-mediated regulation in breast cancer. Ultrasound (US) can be used for image-guided delivery of drugs with microRNAs for therapeutic interventions in cancers. Our lab is developing microRNA mediated targeted therapy specifically for breast cancers, which has no therapy available currently.

The epigenetic mechanisms, including DNA-methylation, histone acetylation, and histone methylation, are important for cellular development, differentiation, proliferation, and apoptosis. In addition to their roles in normal cellular processes, epigenetic mechanisms are believed to be capable of responding to different chemical and physical agents, possibly leading to altered biological pathways associated with cellular diseases. Recent developments demonstrating the importance of epigenetic processes as cellular targets, and the development of small molecule modulators with therapeutic efficiency, have further highlighted the need to develop advanced molecular imaging strategies capable of imaging different epigenetic processes in living animals. We are currently working on developing molecular imaging assays to image histone methylation by employing split reporter protein complementation strategy, and evaluating small molecule therapeutic agents that modulate histone methylation in living animals.

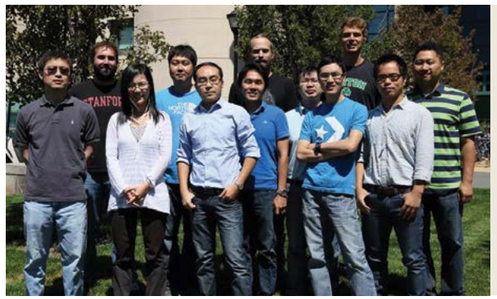
Lab members (l-r, standing): Ramasamy Paulmurugan, Kira Foygel, Rammohan Devulapally and Thillai V. Sekar. Left side: Carolina Ornelas and Rashi Ojha; Right: Angie Koo and Ivaylo Bahtchevanov



Writers and Readers of Lysine Methylation



Dual therapeutic reporter gene fusion for imaging cancer gene therapy



Cellular and Molecular Imaging Lab (CMIL)

Jianghong Rao, PhD

http://raolab.stanford.edu/

The focus of our research is on the development of novel medical imaging probes to monitor specific biological events such as progression of cancer, and bacterial or viral infection. Using chemical, biological, physical, and engineering tools, we are making advances in the field of diagnostic imaging via optical, MRI, PET and photoacoustic modalities. We also employ our imaging strategies for point-of-care applications. In general our projects fit into one or more of the following major interconnected lines:

Imaging enzyme activity *in vivo*. We are employing both small molecule probes and nanoparticle-based nanosensors to image the activity of proteases such as matrix metalloproteinases (MMPs), caspases, and furin, as well as poly (ADP-ribose) polymerase 1 (PARP-1), in cancer cells. Using a biocompatible reaction between cysteine and cyanobenzothiazole developed in our lab (Nature Chem. 2010, Angew. Chem. Int. Ed. 2011), we have created a versatile platform that allows formation of self-assembled nanoparticles or polymers upon activation by target enzyme. This strategy has led us to the development of activatable fluorescence and photoacoustic imaging probes to detect furin activity in vivo (in collaboration with the Gambhir lab). We are currently developing caspase-activatable fluorescence imaging probe, MRI imaging probe (in collaboration with the Rutt lab and Daldrup-Link lab) and PET imaging probe (in collaboration with the Chin lab and Felsher lab), which can be translated to clinical applications to monitor cancer patients' responses to chemotherapy.

Near-infrared (NIR) nanoparticles for in vivo imaging. We have developed self-luminescing nanoparticles using fluorescent semiconductor quantum dots (Nature Biotech. 2006). In an alternative approach, we have achieved our second generation of self-luminescing nanoprobes using organic polymer-based particles, which are highly stable in mouse serum and exhibit strong luminescent NIR emission without external excitation (Nature Comm. 2012, accepted). This novel design of nanoparticle can be useful in optical in vitro diagnostics and in vivo imaging. We have used the nanoparticles for lymph node mapping and imaging of glioblastoma tumors in mice. We have also developed a NIR nanoparticle-based probe for imaging of reactive oxygen and nitrogen species (RONS), termed NanoDRONE, in vivo. This imaging probe allows in situ and real-time detection of RONS that are associated with bacterial infection, inflammation and tumor therapy.

Development of point-of-care strategies for infectious diseases. We have recently developed rapid diagnostic tests that are important in the fight against tuberculosis and can be applied in resource-limited settings. A fluorogenic probe can be specifically activated by BlaC, an enzyme secreted by tubercle bacilli (TB), enabling detection of live pathogen in unprocessed human sputum in less than 10 min using a smart phone (Nature Chem. 2012). Currently, we are extending the strategy to chromogenic imaging that allows observation of TB activity with just naked eye.

Protein Engineering and Aptamer Selection. Using in vitro evolution (SELEX), we have selected a protein chaperone-like RNA molecule that can recover the fluorescence of genetically engineered "dark" superfolder green fluorescent protein (sGFP) in living cells by the stabilization of protein folding during translation. The chaperone-like RNA aptamer and its development could be a useful strategy for various purposes in the biotechnology field, such as RNA imaging.

Rao group (left to right): J. Rao, A. Shuhendler, L. Cui, K.H. Lee, K. Pu, S.S. Tee, M. Palner, H. Xie, D. Ye, G. Tikhomirov, Y.J. Cheng, J. Jeon

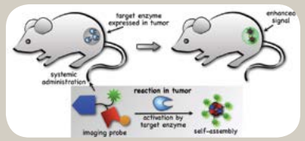


Figure 1. Enzyme-activatable probe for tumor imaging.

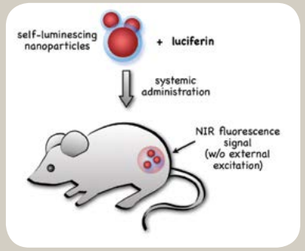
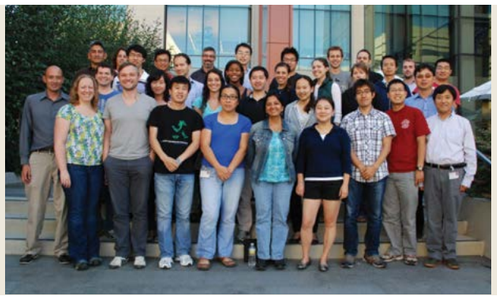


Figure 2. Bioluminescence probe for tumor imaging.

Figure 3. Detection of TB using smart phone.

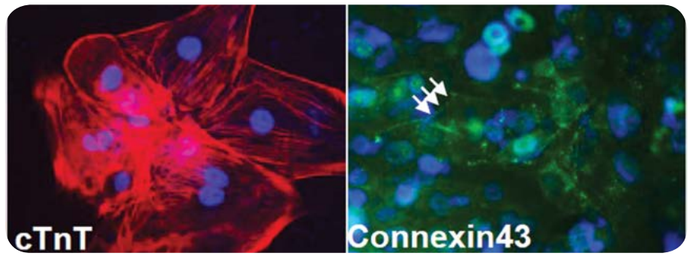


Cardiovascular Cellular & Molecular Imaging Lab

Joseph Wu, MD, PhD

http://wulab.stanford.edu/

Ischemic heart disease is the number one cause of morbidity and mortality in the United States. The repeated ischemic insults can lead to congestive heart failure, which is the leading cause of hospital admissions for people aged 65 years and over. In the next decade, cardiovascular diseases will likely be targeted at the basic cellular and molecular levels. The Cardiovascular Cellular & Molecular Imaging lab (http://wulab.stanford.edu) combines expertise in molecular and cell biology, cardiovascular physiology, and molecular imaging. We work on the biological mechanisms of adult stem cells, embryonic stem cells, and induced pluripotent stem cells. We use a combination of gene profiling, tissue engineering, physiological testing, and molecular imaging technologies to better understand stem cell biology in vitro and in vivo. For adult stem cells, we are interested in monitoring stem cell survival, proliferation, and differentiation. For ESC, we are currently studying their tumorigenicity, immunogenicity, and differentiation. For iPSC, we are working on disease modeling, drug screening, and cell therapy. We also work on development of novel vectors and therapeutic genes for cardiovascular gene therapy applications. The eventual goal is to establish molecular imaging as a platform for translational research in cellular and gene therapies for ischemic heart disease in the 21st century.



The Wu Lab group photo.

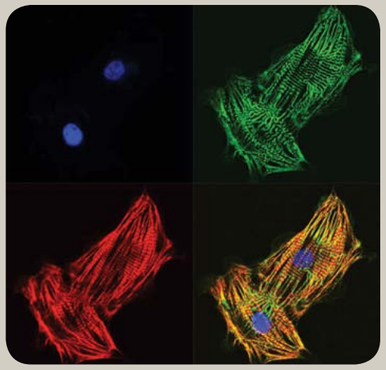


Figure 1. Images of human induced pluripotent stem cell-derived cardiomyocytes generated from the skin of a patient with hypertrophic cardiomyopathy.

Figure 2 (left) Differentiation of human induced pluripotent stem cells into cardiac cells.

Translational Molecular Imaging Lab (TMIL)

Jürgen Willmann, MD

http://mips.stanford.edu/research/tmil.html

The Willmann laboratory is a group of scientists with backgrounds that span from cell and molecular biology, chemistry, pharmacology, electrical engineering, nuclear medicine, to radiology (Figure 1). Our goal is to develop and test novel molecular imaging strategies for improved detection and monitoring of cancer and inflammatory diseases. Also, we design and optimize novel image-guided therapeutic approaches for spatially controlled treatment of diseases with minimal side effects. We focus on new techniques with high potential for rapid clinical translation. The following is a summary of three research projects in the Willmann lab.

Early Detection of Breast and Pancreatic Cancer with Ultrasound Molecular Imaging

Ultrasound already fulfills many criteria as an ideal non-invasive imaging modality for early cancer detection: 1) it is widely available at modest cost, 2) it does not expose patients to ionizing radiation, and 3) it has a very high spatial and temporal resolution. In the Willmann lab, we develop novel molecularly targeted ultrasound contrast agents to molecular targets that are differentially expressed in cancer such as pancreatic and breast cancer compared to benign disease or normal tissues (Figure 2).

Non-invasive Monitoring of Inflammation with Molecular Imaging

Chronic inflammatory diseases such as inflammatory bowel diseases (IBD) require regular and accurate monitoring for appropriate clinical patient management. While clinical scores often poorly correlate with the disease's activity, novel IBD drugs such as immunosuppressants and immunomodulators with potential substantial side effects have further increased the need for techniques to accurately quantify disease activity. In addition, since multiple follow-up exams are needed, often over many years, monitoring should be noninvasive and, above all, patient-friendly. A simple technique that meets all these requirements is not yet available. In the Willmann lab, we develop novel non-invasive imaging strategies for accurate and objective quantification and monitoring of inflammation at the molecular level (Figure 3).

Group Photo: back row (l-r): Ferdinand Knieling, Sunitha Bachawal, Morgan Wang, Steve Machtaler, Tzu-Yin Wang; Front row (l-r): Alice Gardner, Jürgen Willmann (PI), Katie Wilson

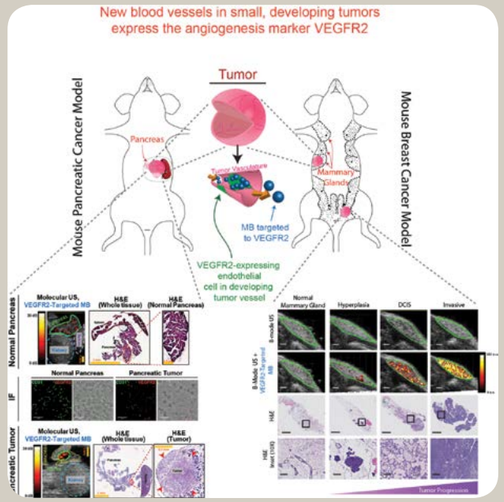


Figure 2

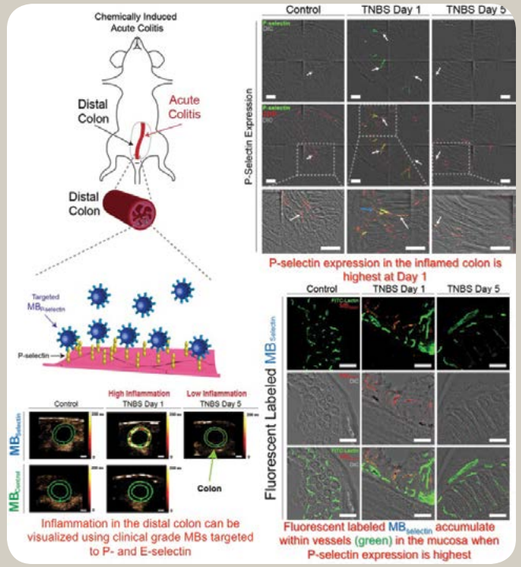


Figure 3

Improved Drug Delivery using Image Guidance

Through a process termed "sonoporation," selective insonation of tissue with ultrasound actuates local formation of transient cell membrane microperforations, enhancing blood vessel wall permeability and facilitating the ingress of therapeutic agents into cells. The putative primary mechanism for sonoporation is acoustic cavitation, whereby gas bodies oscillate and eventually collapse, releasing the energy necessary to induce transient cell membrane permeabilization. Ultrasound-mediated drug delivery has shown to be markedly enhanced in the presence of microbubbles, which serve as exogenous cavitation nuclei and reduce the ultrasound energy threshold for sonoporation to occur. In the Willmann lab, we develop and optimize ultrasound equipment, microbubble and nanoparticle design to generate a clinically translatable platform for image-guided drug delivery (Figure 4).

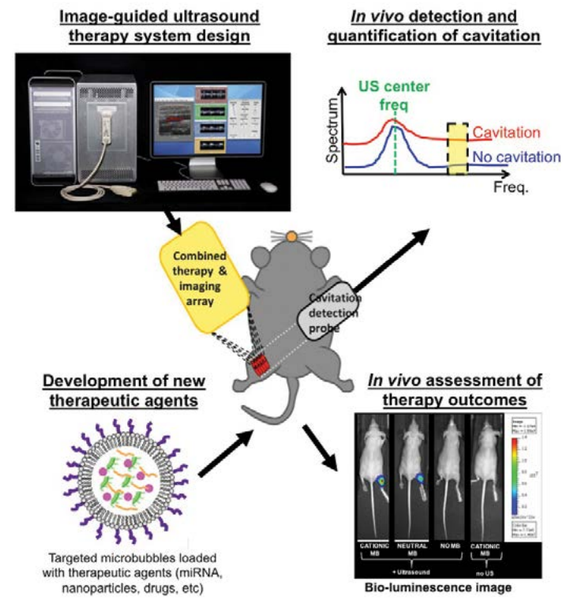


Figure 4

RSL Overview

Radiological Sciences Laboratory
Director: Gary H. Glover, PhD

http://rsl.stanford.edu/

Back row, left to right: Richard Kimura, Rammohan Devulapally, Kai Cheng, Seema Sharma, Linda Kullolli, Ataya Sathirachinda, Jelena Levi, Mark Stolowitz, Bree Mitchell, Eva Bajorek, Parag Mallick, Dario Amodei; Front row, left to right: Anath 'Srini' Srinivasan, Paul Ramasamy, Bonita Crabbe, Lingyun Xu, Kira Foygel, Jean Stevens, Maria Arampatzidou, Thillai Sekar Veerapazham, Sharon Pitteri, Ken Lau

The Lucas Center has been home to the Radiological Sciences Laboratory (RSL), a section of the Radiology Department since the building's dedication in 1992, and in conjunction with the Electrical Engineering Department has hosted the Center for Advanced MR Technology, an NIH-funded National Research Resource since 1995. The Center also houses a cyclotron and radiochemistry labs as well as other wet labs for the Molecular Imaging Program led by Dr. Sanjiv Gambhir. The Center's state of the art imaging facilities support research of the RSL and others in the Radiology department as well as hundreds of on-campus and extramural researchers as a core facility. The Center has always been, and remains an exciting and lively nexus for fundamental imaging research.

The Radiological Sciences Laboratory

With the very recent arrival of Dr. Jennifer McNab, the RSL now comprises 10 faculty, approximately 45 graduate and postdoctoral students, approximately 30 scientific staff and 5 administrative assistants, as well as the Lucas Center/RSL Administrative Services Director, Donna Cronister. These numbers represent a small increase in trainees over 2011.

The faculty serve in a wide variety of advisory roles to government and foundation agencies such as the NIH and in policy-making positions for international scientific societies such as the ISMRM and RSNA. Many of our faculty, scientific staff and students have garnered prestigious awards for their exceptional research achievements. Some of the faculty and their students' activities of the past year are noted here.

Achievements of 2012

Kim Butts Pauly:

- Named to the Council of Distinguished Investigators of the Academy of Radiology Research
- Serves on the board of ISTU (International Society for Therapeutic Ultrasound)
- Member of the Academy of Radiology Research
- Member, editorial board of Journal of Therapeutic Ultrasound, in addition to boards for JMRI and MRM
- Rachelle Bitton received Magna Cum Laude Merit Award for the 20th Annual ISMRM
- Mike Marx -- Outstanding TA award

Rebecca Fahrig

- Named to the Council of Distinguished Investigators of the Academy of Radiology Research.
- Student MiHye Shin's abstract is a finalist in the Young Investigators competition of the ASME Applied Mechanics Division and she has also received the Haithornthwaite Foundation Travel Award to attend the conference.
- She is now a Charter Member of NIH review panel BMIT-A.

Jennifer McNab:

Jennifer joined the RSL faculty in October 2012, coming from a postdoc position at MGH. Her research interests are in imaging of tissue microstructure using diffusion and structural imaging, with particular emphasis on high-field applications. We are excited by the added breadth that she will bring to the RSL, and look forward to working with her on many projects.

Norbert Pelc:

- Elected to National Academy of Engineering
- Selected as chair of Bioengineering
- Yuan Yao did an internship at GEHC CT
- Adam Wang defended and graduated, and is now a postdoc at John Hopkins
- Paper: Wang AS and Pelc NJ. Synthetic CT: Simulating; Med Phys 38, 5551-62, 2011 was highlighted as an Editor's Pick.

Gary Glover:

- Research Associate Priti Balchandani concluded her K99/R00 NIH fellowship and accepted a faculty position at Mount Sinai Hospital in New York. She will build a new research program based on their 7T magnet, and will have an adjunct position with our lab.
- Ranked number 73 (out of 5,926,582 entries) in academic.research.microsoft.com's listing of "top authors in medicine", based on the H-index of citations.

The National Center for Advanced MR Technology at Stanford (CAMRT)

The CAMRT is a National Biotechnology Research Resource, sponsored by the NIH's NIBIB with Dr. Glover as PI. The Center was initiated in 1995 as a close collaboration with Electrical Engineering, with the broad goal of developing and making available a spectrum of cutting edge MR imaging research tools for scientists who would otherwise not have access to such tools, as well as to train students and others in MRI. Over the years that goal has remained, as research projects have been introduced, matured and been replaced with new developments and opportunities. The grant is now in its 18th year of continuous funding. During it's last 5 year renewal review in 2010 it received a perfect score (10) from the study section.

Outstanding progress has been made in all five of the core technology development areas that include RF pulse design, reconstruction methods (John Pauly, EE Department, core director), hardware (Brian Rutt, core director), body MRI techniques (Brian Hargreaves), neuro MRI (Gary Glover, with Mike Moseley and Roland Bammer contributing), and spectroscopic imaging development (Dan Spielman).

Bammer Laboratory

Roland Bammer, PhD

http://rsl.stanford.edu/

The general research focus of the Bammer lab is to develop novel MRI acquisition and reconstruction methods for clinical neuroimaging. Currently, our research program is primarily concentrated around improving pediatric neuroimaging as well as various studies on the adult side. We also provide support for Lucas Center users who are interested in advanced diffusion imaging, perfusion imaging or angiographic MRI applications.

A major goal in our laboratory is to reduce motion- and distortion-sensitivity of MRI by development of various sophisticated methods, such as stereo-vision and RF tracking in concert with real-time MRI. Motion correction can improve the diagnostic quality of MR images, reduce the number of repeat studies, and decrease or eliminate the need for sedation/anesthesia.

The Bammer lab also maintains a major focus on the development of high-resolution MRI methods for diffusion-weighted and susceptibility-weighted imaging of the brain and spine. These methods are highly valued for their utility in the diagnostic work-up of traumatic, oncologic, psychiatric, developmental, or neurovascular abnormalities.

Our lab also continues to develop MR imaging sequences and analysis tools to study vasculature on the macroscopic (angiography) and microscopic (perfusion) level. For example, with our collaborators from the Stanford Stroke Center, we have developed software tools that can identify, based on CT perfusion or MR perfusion/diffusion image patterns, those patients who might benefit from reperfusion stroke therapy. With our collaborators from neuro-oncology, we have developed tools to better describe blood-brain-barrier leakage and tumor vascularization prior, during, and after chemoradiation therapy or treatment with antiangiogenic agents.

Thanks mostly to generous support from NIH, the Bammer Lab continues to grow; allowing us to attract and retain, extraordinary talent. This year Drs. Eric Aboussouan (Barrow Neurological Institute), Alexander Brost (Erlangen University), Natalie Han (Vanderbilt University), and Eric Peterson (Marseille) joined our group. Dr. Julian Maclaren, an international authority on real-time motion correction, joined us also this year as a research associate (University of Freiburg). For most of this year, we also had two extremely talented, young visiting researchers in our lab: Christoph Seeger (Erlangen University) and Sjoerd Vos (University of Utrecht). During the summer break we had a star high school student, Colin Man, from the highly competitive Stanford Institutes of Medicine Summer Research (SIMR) Program working with us. Out of approximately 2,000 junior and senior high school applicants, only 50 are admitted to this program.

Two of our female colleagues, Anh Tu Van and Arryani Tipirneni, left our lab this year. Arryani is currently taking care of her parents after a tragic car accident, and Anh got married and followed her sweetheart to Munich.

We also had two very junior additions to our lab. Arda Aksoy is Murat and Didem Aksoy's first son, and Rafael is Rafael O'Halloran and Erin Girard's first son. Congrats!

Group Photo: top row- l to r: Roland Bammer, Christoph Seeger, Melvyn Ooi, Heiko Schmiesdeskamp, Julian Maclaren and Daniel Koppeinig; 2nd Row: Lanzie Rivera, Sjoerd Vos, Rafael O'halloran, Natalie Han; Bottom row: Eric Aboussouan, Eric Peterson, Samantha Holdsworth, Murat and Didem Aksoy, Anh Van Tu, Alexander Brost

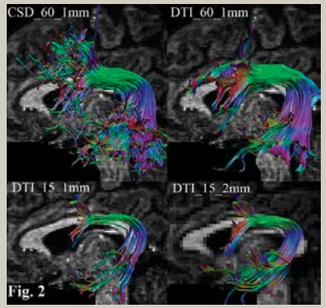


Figure 1. Diffusion-weighted MRI (DWI) angular resolution

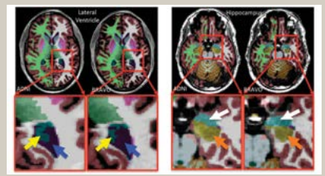


Figure 2. FreeSurfer segmentation output for two subjects to show visual differences in volumes between ADNI and BRAVO.

MR-guided Focused Ultrasound and Cancer Interventions

Kim Butts Pauly, PhD

http://kbplab.stanford.edu/

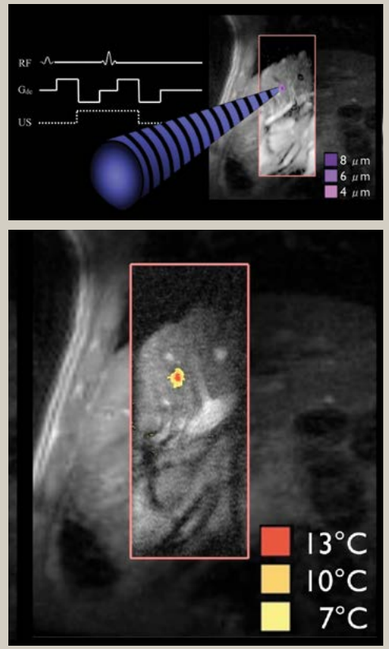
Ultrasound energy can be focused to a point deep within the body without damage to overlying tissues. We continued to participate in the palliation of painful bone metastases with MR-guided focused ultrasound led by collaborators Pejman Ghanouni and David Hovsepian. In addition, we advanced the guidance techniques for focused ultrasound treatment of diseases in the liver, prostate, breast, and brain.

In the liver, we compared our real-time MRI steering of the ultrasound beam during free breathing to breathholding and found that in two metrics, the difference between the two groups of sonications was insignificant. Our collaborative project with Graham Sommer and Chris Diederich on MR-guided high intensity ultrasound ablation in the prostate with transurethral ultrasound applicators tested methods for feedback and control of the treatment. The real-time integrated thermometry/diffusion acquisition for monitoring thermal ablation in the prostate demonstrated that ADC changes are apparent 30-60 seconds after a sufficient thermal dose threshold was reached. Our imaging of the breast included shear-wave assessment of ablated ex vivo breast tissue.

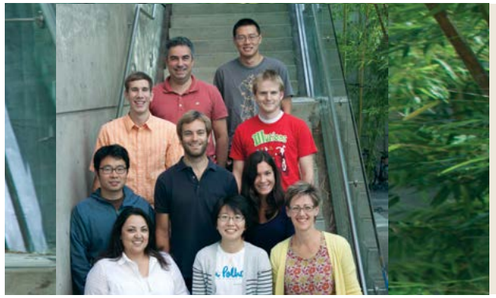
In the brain, we demonstrated methods for MR-guided focusing in the presence of phase aberrations based on acoustic radiation force imaging. In collaboration with Bill Newsome in Neurobiology, we have been investigating neuromodulation with focused ultrasound and demonstrated parameter tradeoffs in the rodent model. One of the more interesting aspects is that as the ultrasound frequency increases, the intensity of the ultrasound needed to stimulate the animal increases.

Lastly, our P01 on MR-guided cancer interventions served as a collaboration focal point with Raffi Avedian in Orthopedic Surgery, Garry Gold, Pejman Ghanouni, Bruce Daniel, Graham Sommer in Radiology, John Pauly and Greig Scott in Electrical Engineering, Donna Bouley in Comparative Medicine, and Chris Diederich at UCSF.

Group Photo: Ron Watkins, Elena Kaye, Pejman Ghanouni, Andrew Holbrook, Urvi Vyas, Viola Rieke, Patrick Ye, Rachelle Bitton (in front of Patrick), Ronnie Instrella, Randy King, Juan Plata, Hyo-Seon Yoon, Mike Marx, and Kim Butts Pauly



Focused ultrasound



X-Ray Guidance of Interventional Procedures

Rebecca Fahrig, PhD

http://zeegolab.stanford.edu/

Our group conducts research with the broad goal of improving the x-ray guidance of minimally invasive procedures, including guidance of radiation therapy. The zeego@Stanford Lab houses a new state-of-the-art robotic clinical C-arm fluoroscopy system (Siemens zeego®, official launch October 2012), which was purchased with American Recovery and Reinvestment Act (ARRA) funding through an NIH Shared Instrumentation Program. The previous C-arm CT system (Siemens Artis dTA, Axiom Lab) has been used for a number of in vivo investigations outlined below. The Advanced X-ray Imaging Lab is used for hardware and software development including table-top digital x-ray imaging, conebeam CT, new detector development and MR-compatible x-ray tubes.

Software investigations have the primary goal of improving the image quality of C-arm CT reconstructions. In the past year, our flexible, open-source framework for C-arm CT reconstruction has been used to reconstruct images of human in vivo knees in standing position (collaboration with Dr. G. Gold and Dr. A Maier, U. Erlangen-Nurnberg). This new approach may provide a more sensitive measure of early osteoarthritis progression. The challenge is to obtain high-resolution images of cartilage deformation under realistic use conditions. The same software framework will enable testing of new, ultra-high-resolution detector hardware for C-arm CT on the zeego@Stanford.

Clinical imaging protocols developed in the Axiom lab have focused on liver blood volume and liver perfusion, with new results showing excellent agreement with measurements obtained on a clinical CT system (collaboration with Dr. N. Kothary). Earlier work demonstrating accurate quantitative cerebral blood flow in a swine model is now in clinical evaluation (collaboration with Dr. Michael Marks). These projects were also in collaboration with Siemens AX.

In hardware developments, design and optimization of an MR-compatible rotating anode x-ray tube continue, as do our simulations of new designs for an MR-compatible linear accelerator. The Stanford-Varian collaboration is in its third year; this project has the clinical goal of removing artifacts due to high-density materials such as fillings and hip implants in radiation therapy treatment planning. A high-efficiency detector for MeV beams has been designed and a prototype is under construction. A new laser-based measurement system is being used to further optimize the properties of the detector.

Group Photo: (center) Andreas Keil (Clockwise from top right) Meng Wu, Geoff Nelson, Kelly Blum, Rebeca Fahrig, Mi Hye Shin, Marlys Lesene, Jang Hwan Choi, Cameron Hinkel, Dragos Constantin (missing) Waldo Hinshaw

Figure 1. The new zeego@Stanford lab opened October 2012, with a new state-of-the-art robotic C-arm fluoroscopy and CT imaging system. The lab is available for NIH-funded projects.

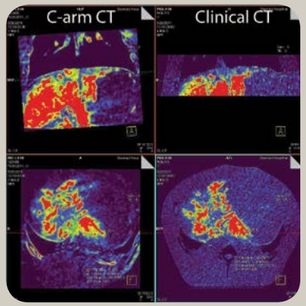


Figure 2. A quantitative study comparing C-arm CT and clinical CT for the measurement of blood flow in the liver of swine following embolization has recently concluded. Good agreement was obtained between the two imaging modes in spite of the slower rotation time of the C-arm system. Translation of this work into the clinic may have a significant impact on monitoring of ablation-based therapies in the treatment of hepatic carcinoma.

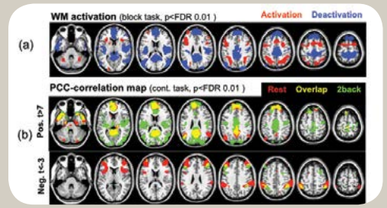
Functional Neuroimaging

Gary Glover, PhD

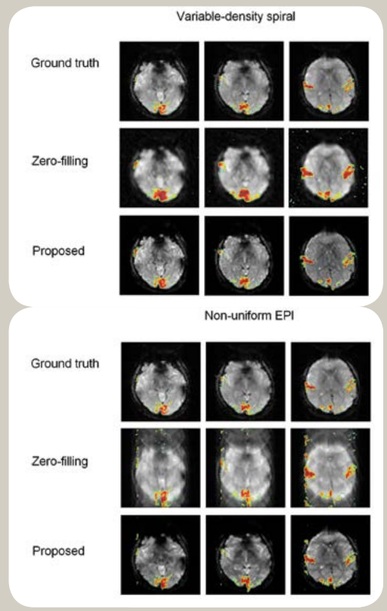
http://rsl.stanford.edu/glover/

The functional MRI group continues to develop and optimize methods for the acquisition of functional MR imaging data. Projects include the development of fMRI methods that exploit higher signal to noise ratio of 3D methods and exploring alternative contrast afforded by spin echo acquisitions as opposed to the traditional gradient-recalled echo methods. In addition, we continue to contribute to the NIBIB-funded Biotechnology Technology Resource (P41) Center for Advanced MR Technology. The following are several highlights of scientific progress.

Postdoc Qingfei Luo has made excellent progress on spatiotemporal reconstruction of concurrent EEG/fMRI data. This technique combines EEG, which has high temporal resolution but poor spatial resolution, with fMRI, which has the opposite characteristics. Using a beamformer approach, Qingfei has been able to reconstruct Evoked Potential maps localized to relevant brain regions using fMRI as a spatial prior. Hien Nyugen, a 2nd-year postdoc in the group, has developed a sparse reconstruction method that greatly improves the spatial resolution of undersampled fMRI data. A manuscript is in preparation. EE grad student Jingyuan Chen is examining network connectivity and is using novel methods to look at the networks' relationships to continuous tasks, which are thought to modulate attention and executive controls states. Bioengineering student Haisam Islam is studying Sodium brain signals for their possible use in demonstrating neural activity, exploiting the difference in NMR properties of intracellular and extracellular Sodium. He has also been developing 3D spiral methods that could have a very rapid acquisition time.



Steady-state 2-back Working Memory Modulation of Spontaneous Low-frequency Functional Connectivity within the Brain Default-mode Network



Functional activation maps for 3 slices overlain on the averaged functional images, obtained from ground truth, zero-filling method, and proposed method with the variable-density spiral (undersampling factor 3.2) and non-uniform EPI (undersampling factor 3.6).

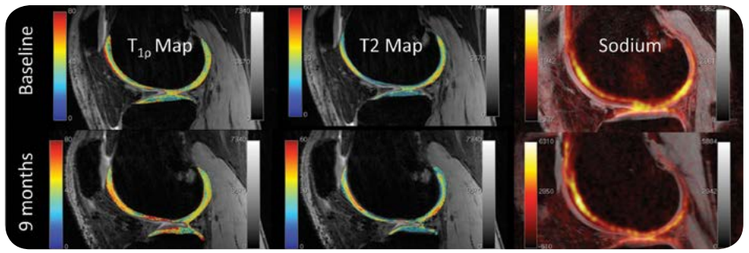
The JOINT Group

Joint and Osteoarthritis Imaging with Novel Techniques

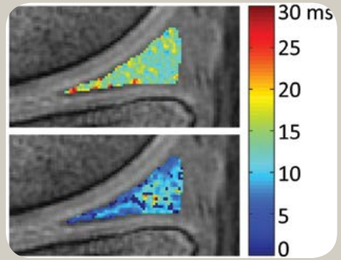
Garry Gold, MD

http://radiology.stanford.edu/patient/clinical_sections/musculoskeletal/

Dr. Gold, with longstanding collaboration ties to Radiology Lucas Center faculty, is PI on two NIH-funded research projects (R01 and K24) for the study of osteoarthritis and to mentor new investigators in the treatment and diagnosis of this disease. Dr. Gold is also PI on an Arthritis Foundation grant, and a large multi-investigator industry funded project to develop advanced MR application. Through his research and basic science collaborations, Dr. Gold has been able to introduce a number of new solutions for musculoskeletal imaging into clinical use. These include improved MR imaging around metallic implants, isotropic 3D imaging, and sodium MRI for detection and characterization of osteoarthritis. Dr. Gold's background and training in Electrical Engineering and as a practicing radiologist makes him an ideal collaborator for faculty, postdocs, graduate students, and undergraduates who are interested in discussing and understanding biomedical imaging limitations and requirements for clinical applications. We have strong collaborative ties with the Departments of Electrical Engineering, Mechanical Engineering, Human Biology, Orthopaedic Surgery, and Bioengineering, contributing to the success and evolution of our primary research goals. We actively seek to further educate and train our research team members through various means including clinical scanning, translational hardware development, abstract and peer-reviewed publications, presentations at major conference venues, and in-house didactics. We believe that a diversely educated and experienced team will translate into further advances in musculoskeletal imaging.

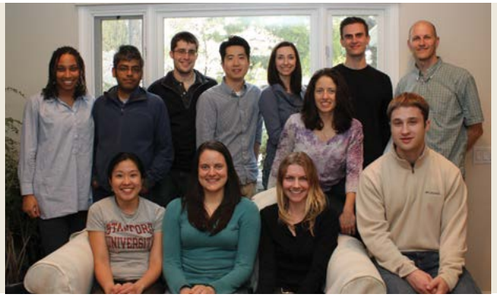


JOINT group from left to right: Kambiz Ansari, Saikat Pal, Joe Hubbard, Stephen Matzat, Caroline Jordan, Eric Davalos, Min-Sun Son, Uche Monu, Garry Gold, Lauren Shapiro, Ernesto Staroswiecki, Hillary Braun, Brian Hargreaves, Emily McWalter, Brai Sveinsson, Mai Nguyen, Melissa Vogelsong, Pauline Worters



T2 and T2* relaxation time mapping of the meniscus using a rapid multiecho DESS sequence.

T1ρ maps, T2 maps and sodium are overlaid on proton DESS images at baseline (top row) and 9 months (bottom row) after ACL reconstruction. Recent data suggests that patients with a torn ACL may display significant changes in T1ρ and T2 relaxation times and sodium concentration in the ACL-injured knee.



Body MR Imaging Laboratory

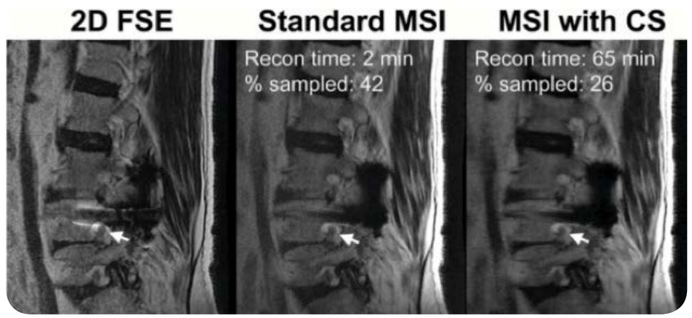
Brian Hargreaves, PhD

http://bmr.stanford.edu

The body MR imaging group works with clinicians at Stanford Hospital and scientists at GE Healthcare and in Electrical engineering to apply MRI to abdominal imaging, musculoskeletal imaging, breast imaging, and cardiovascular imaging. More information is at http://bmr.stanford.edu.

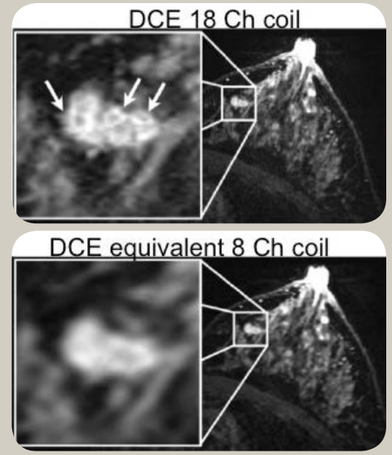
This year we celebrated two PhD degrees earned by Dr. Ernesto Staroswiecki and Dr. Anderson Nnewihe, both of whom are now working in industry. We said farewell to Drs. Kyung Sung and Pauline Worters, both research scientists who had tremendous impact on both research and clinical scanning, and wish them well at UCLA and GE Healthcare. Graduate student Brady Quist was awarded a prestigious NSF fellowship, as well as an ISMRM student award. Bragi Sveinsson was given an RSL award for Outstanding Student Service to RSL. Our major R01 grant on High-Resolution Whole-Breast MRI scored well and will successfully be renewed through 2016. Work on this grant has dramatically improved the reliability and resolution of our clinical breast MRI protocol. Finally, our group was also awarded a grant to work with GE Healthcare to continue to advance clinical MRI near metallic implants.

We welcome graduate students Evan Levine and Umit Yoruk, both in Electrical Engineering. Evan is working on compressed sensing techniques for accelerated imaging in the body, while Umit is working on MRI assessment of regional renal function. Most recently, Dr. Daehyun Yoon has also joined our group as a Postdoctoral fellow after graduating from University of Michigan where he worked on RF pulse design for parallel imaging, amongst other areas.

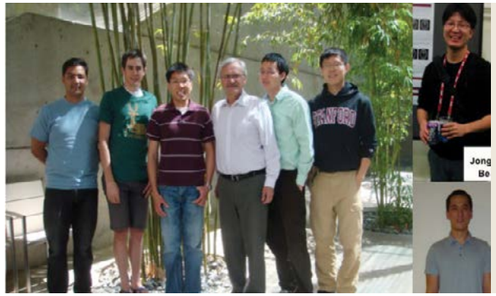


MRI normally assumes a narrow band of resonance frequencies. Near metal implants, the varied frequencies lead to failed fat suppression, signal loss, and distortion. Sampling an extra dimension allows reduction of artifacts, but takes more time. However, compressed sensing methods can enable reduced scan times with excellent artifact correction, as demonstrated in the spine.

Group Photo: back row (l-r): Uche Monu, Manoj Saranathan, Brady Quist, Kyung Sung, Emily McWalter, Kitty Moran, Bragi Sveinsson, Brian Hargreaves; front row: Pauline Worters, Kristin Granlund, Caroline Jordan, Evan Levine. Missing: Marcus Alley, Daehyun Yoon, Umit Yoruk. Grant Collaborators: Bruce Daniel, Garry Gold, Shreyas Vasanawala, Kate Stevens



Novel breast coil images (top) show better morphological detail in tumors than standard coil images (bottom), including lesion shape, borders and heterogeneity.



Inverse Geometry CT and Conventional CT

Norbert Pelc, ScD

http://rsl.stanford.edu/

Our research is directed toward the development of technology and applications of computed tomography (CT). The long-term aim of this work is to push the limits of CT performance, to improve dose efficiency, and to aid in the development of new applications. Intrinsic in these goals is the need to understand the basic limitations in current systems and, when physically possible, to develop solutions to effectively address them.

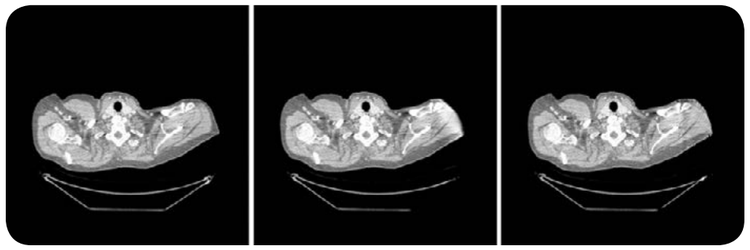
For many years we have been working on a project to develop a CT system with an "inverse geometry", using a wide array of sources rather than a single point source, in collaboration with GE Global Research. This year, thanks to NIH funding from the American Recovery and Reinvestment Act, we completed construction of an experimental system with 32 sources arranged in two rows. Jongduk Baek is analyzing the initial data from this unique system.

The main disadvantage of inverse geometry is the complexity of the source array. One of the potential benefits of the use of multiple sources is reduction of radiation dose from the ability to control the illumination beam. Scott Hsieh came up with an ingenious way to achieve comparable control of the x-ray beam in a conventional CT design by using a much simpler mechanical approach. We have demonstrated the potential of this approach using computer simulations and, with the help of Mark Peng, have now built a test unit to further explore this opportunity (Fig. 1). Scott is also conducting research to improve the image quality of CT when the object is wider than the x-ray fan beam (Fig. 2).

Yuan Yao continued his work on x-ray filtration in dual energy CT. He also conducted a comparison of the dose efficiency of "blended" dual energy images vs. single energy CT for liver imaging (Fig. 3). This is the first step in his longer-term work toward modeling CT imaging of liver tumors.

Adam Wang completed his dissertation research on information extraction in CT, especially in spectral CT. One technology with significant potential to improve CT performance is photon-counting detectors, which process individual photons rather than the combined contributions from thousands of them. However, their response is imperfect, especially when the count rate is high. Adam Wang studied the impact of different types of performance limitations of these detectors and showed that further improvements are needed before system benefits would be obtained. Paurakh Rajbhandary is continuing work in this field, researching the best way to process the spectral data.

On a personal note, Jongduk Baek is now an Assistant Professor at Honsei University in his native Seoul, Korea. We also said farewell to Adam Wang this year. He is now a postdoctoral fellow at Johns Hopkins University. We wish them both well.



Group Photo: (left to right) Paurakh Rajbhandary, Eric Gibbons, Adam Wang, Norbert Pelc, Scott Hsieh, Yuan Yao. Top-right: Jongduk Baek. Bottom-right: Mark Peng.

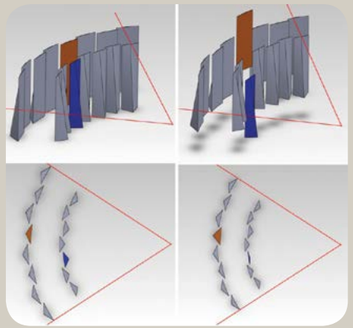


Fig. 1: Perspective and cross-sectional views of the dynamic bowtie. Red lines show the boundaries of the x-ray beam. (Left) Wedges are in axial positions to provide uniform attenuation across the beam. (Right) Orange and blue wedges were translated (through the beam) to change the attenuator path-length.

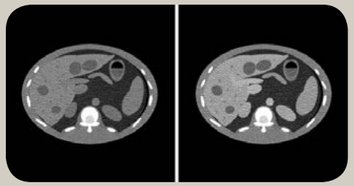
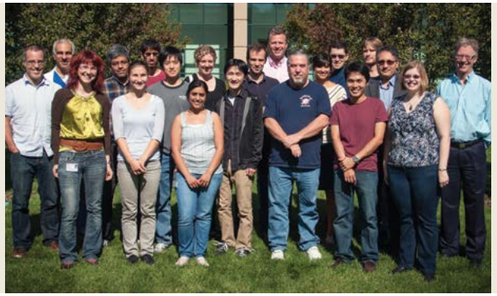


Fig. 3: Simulated liver image (left) pre-contrast and (right) post-contrast.

Fig. 2: (Left) Original image with no truncation. (Middle) Projections were truncated on the right side and corrected with a published method. (Right) Data corrected with our method.



High Field Magnetic Resonance Program

Brian Rutt, PhD

http://highfieldmr.stanford.edu/

The mission of the High Field Magnetic Resonance Program is to develop the 7 Tesla whole-body magnetic resonance imaging (MRI) facility at Stanford. This facility will serve as a platform for cutting-edge imaging research and development, as well as for radiological and neuroscience research. The scientific scope of high field MR research spans the range from fundamental biology to patient-based clinical imaging research. The High Field MR Program is directed by Brian Rutt, PhD, and has recently been augmented through the recruitment of Jennifer McNab, PhD. A number of other Radiology and non-Radiology faculty and their research groups are already involved in the program. The group approach is interdisciplinary, bringing together researchers from the specialties of physics, engineering, bioengineering, biology, physiology, radiology, neurology, psychiatry, and psychology.

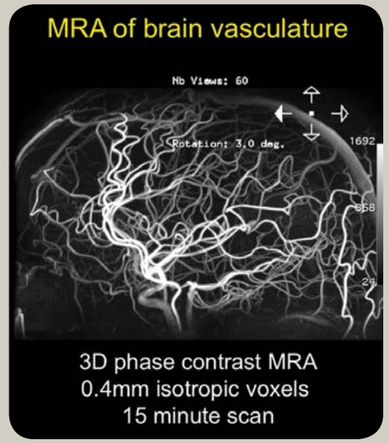
Major technology development directions that will be enabled by this next-generation 7T MRI platform include parallel transmit technology for mitigating B1 inhomogeneities (that presently limit the use of high magnetic field MRI in any organ system), advanced perfusion and diffusion imaging, and MR spectroscopic imaging (MRSI) of the proton (1H) as well as non-proton nuclei, in both brain and musculoskeletal systems. The goals of the high field MR research program are to develop software and hardware methods to improve 7T MRI, specifically to achieve extremely high spatial resolution, iron and metabolite sensitivity, and tissue characterization.

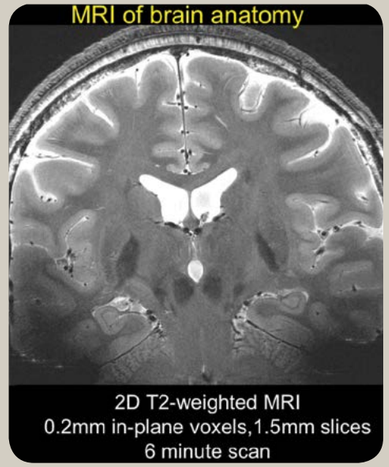
Major users of the high field MR facility represent interdisciplinary laboratories directed by international leaders in imaging research. Projects and research foci have already been established in the following areas: parallel transmit and RF pulse technology; MR spectroscopy and multi-nuclear imaging, high resolution and high sensitivity MRI for imaging brain development, neurodegeneration, and psychiatric disorders; musculoskeletal and breast MRI; cognitive neuroscience and neurovascular imaging.

Recent faculty recruit, Jennifer McNab, will add further depth and diversity to the high field program with a laboratory focused on developing 7T micro-structural and functional neuroimaging methods with applications to brain plasticity and recovery.

Collaborations with the Neuroradiology and Musculoskeletal MR sections of the department, as well as with other departments both within the School of Medicine (Neurology, Neurosurgery, Pediatrics, Psychiatry) and outside (Electrical Engineering, Bioengineering, Applied Physics and Physics) have been established to date.

Group Photo: (left to right): Ives Levesque, Michael Zeineh, Simone Winkler, Manoj Saranathan, Kalina Jordanova, Mihir Pendse, Jonathan Lu, Mansi Parekh, Jennifer McNab, Jason Su, Thomas Tourdias, Adam Kerr, Ron Watkins, Prachi Pandit, James Rioux, SuiSeng Tee, Thomas Grafendorfer, Mehdi Khalighi, Kim Brewer, Brian Rutt





In Vivo Magnetic Resonance Spectroscopy and Multinuclear Imaging

Daniel Spielman, PhD

http://rsl.stanford.edu/

The focus of our laboratory is the development of novel magnetic resonance imaging (MRI) and spectroscopy (MRS) methods for the improved measurement of metabolism in vivo in order to better understand tissue and organ function in both health and disease. The primary applications are in disease detection, treatment monitoring, and drug development. During the past year, our research has been in three distinct directions.

First, the technical development of ultrahigh field (7T) proton imaging and spectroscopy of the brain continues to focus on the design and evaluation of novel adiabatic RF excitation pulses for addressing the magnetic field inhomogeneities encountered at 7T and the development of new pulse sequences to exploit novel contrast mechanisms. Highlights of this work include an innovative adiabatic B1 shimming algorithm for multiple channel transmit, the development and testing of a self-refocused adiabatic pulse for 7T spin echo imaging, an improved adiabatic pulse design method yielding robust slice-selection in combination with fat (or water) suppression while maintaining a short overall pulse duration. Dr. Priti Balchandani, working under her NIH K99/R00 grant entitled "High Resolution Magnetic Resonance Imaging and Spectroscopy of Epilepsy at 7T", has been leading these efforts; she has recently accepted a faculty position at Mt. Sinai Medical Center in NY. While we will certainly miss Priti at the lab and around the Lucas Center, we wish for her the very best in this important step forward in her career.

Second, under an ongoing program in the development of volumetric 1H MRSI at 1.5 T and 3.0 T, funded through an NIBIB Bioengineering Partnership grant (EB000822), we have undertaken a multi-site evaluation of a volumetric echo-planar 1H spectroscopic imaging sequence and associated automated data reconstruction software, developed several new short echo time spectroscopic imaging pulse sequences for significantly improved sensitivity, and are currently initiating a clinical study, in collaboration with Dr. Michael Zeineh, using this sequence to evaluate patients with traumatic brain injury.

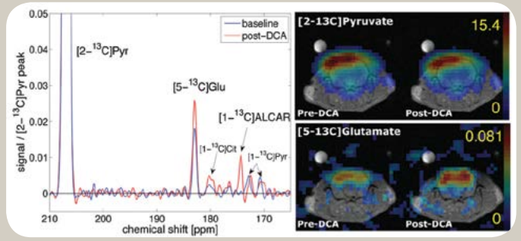


Figure 1. Mitochondrial metabolism in the rat brain using hyperpolarized [2-13C]pyruvate. The downstream metabolic products of [5-13C]glutamate, [1-13C]acetylcarnitine (ALCAR), and [1-13C]citrate are all detectable. The fate of acetyl-CoA brain was further investigated by infusing dichloroacetate, which upregulates pyruvate flux to acetyl-CoA. We believe of [5-13C]glutamate will yield the best measure of oxidative phosphorylation.

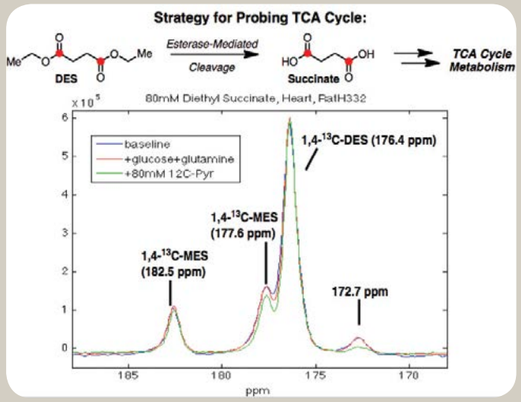


Figure 2. 13C-Diethysuccinate-Based Probe of TCA Cycle Metabolism. Above: making of acids as ethyl esthers allows for diethylsuccinate (DES) to efficiently cross cell membranes and enter the mitochondria. Cleavage of the ethyl groups by readily available esterases yields succinate, which can directly enter the TCA cycle. Below: in vivo spectrum from rat heart following the bolus injection of hyperpolarized 13C-labeled DES shows peaks from the two mono-esters (177.6 ppm and 182.5 ppm) and a yet to be identified resonance at 172.7 ppm. The 172.7 ppm peak was not seen in in vitro studies and is likely a downstream metabolic product. These peak assignments contrast with similar spectra published in the literature in which the mono-ester peaks were incorrectly identified as TCA-cycle intermediates.

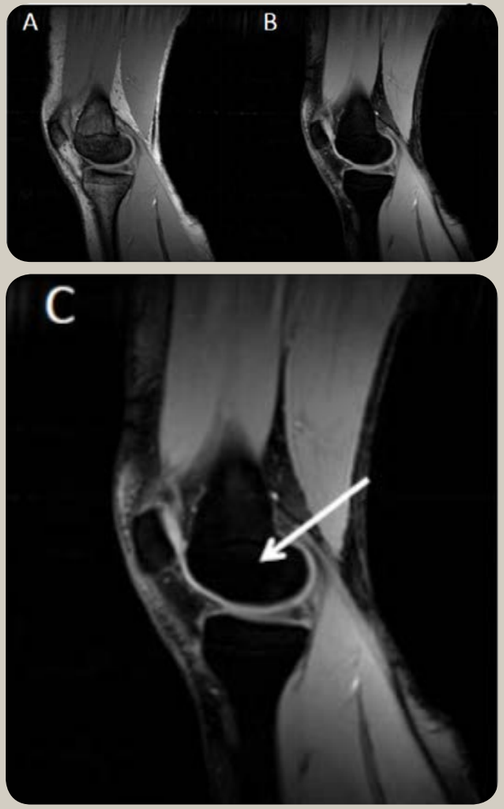


Figure 3. Knee images obtained using (A) a standard GRE sequence and an improved Slice-selective Tunable-flip AdiaBatic Low peak-power Excitation (STABLE-2) RF pulse designed with a null on the lipid resonances, set to (B) the nominal B1 at prescan and (C) 25% above nominal B1

Third, our efforts in the area of hyperpolarized 13C MRS and MRSI continue to move rapidly forward. Hyperpolarized 13C is a promising new technology capable of directly probing key metabolic pathways by providing unprecedented increases in signal-to-noise ratio for these in vivo measurements. Over the past year we have successfully developed several novel MRSI pulse sequences and associated metabolic modeling tools including the use of hyperpolarized [1-13C]-pyruvate for the study of liver, heart, and brain metabolism in the normal rat and in a C6 rat glioma model, hyperpolarized [2-13C]-pyruvate for the investigation of mitochondrial acetyl-coA trafficking, and investigations into the feasibility of using 13C-labeled di-ethyl-succinate for the measurement of oxidative phosphorylation. The hyperpolarized 13C MRS work is funded under NIH grants R01EB009070 "Dynamic Metabolic Imaging of Hyperpolarized Substrates", R01AA018681 "Metabolic Imaging of the Cardioprotective Effects of Alcohol and ALDH2 Activators", P41EB015891 "Center for Advanced Magnetic Resonance Technology at Stanford", a Department of Defense award "In Vivo Imaging of Branched Chain Amino Acid Metabolism in Prostate Cancer", and most recently a Stanford BioX grant (in collaboration with Dr. Larry Recht of the Department of Neurology and Neurological Sciences) entitled "Exploiting the Warburg Effect in Glioma using Hyperpolarized 13C-pyruvate Magnetic Resonance Spectroscopy".

Finally, we have received an outstanding score on a NIH Shared Instrument Grant "Hyperpolarizer for 13C MR Metabolic Imaging of Human Subjects and Animal Models" for the purchase of the next generation polarizer. If funded, we hope to site the new polarizer during the upcoming year at the Lucas Center on the 3T scanner also slated to become Stanford's first MR/PET system, thus establishing a new state-of-the-art metabolic imaging laboratory.

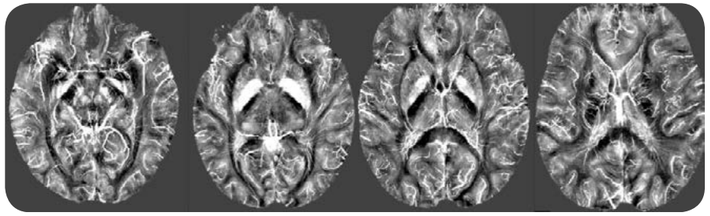
Clinical Center for Advanced Neuro Imaging (CFAN)

Greg Zaharchuk, MD, PhD and Michael Moseley, PhD

http://radiology.stanford.edu/research/labs.html

Our advanced neuroimaging MR routinely map and measure brain form, flow, and function. Our expertise in advanced imaging in a large number of diseases in patients, the Clinical Center For Advanced Neuro Imaging (CFAN) is built upon a large framework of funded NIH grants from the RSL, Lucas Center, and Stanford Stroke Center faculty dedicated to bringing the best MRI techniques into everyday clinical use. Based within the Lucas Center in the Radiological Sciences Laboratory, we drive key clinical areas of neuroimaging focusing on disease processes in stroke, brain tumors, and cerebrovascular diseases using diffusion MRI (DWI), tissue perfusion mapping (PWI), as well as the new field of mapping the brain connectivity, DTI, and susceptibility-weighted MRI (SWI). CFAN also develops and uses high-resolution quantitative diffusion tensors and perfusion maps to explore and map complex brain structure and function in active mental tasking to reveal new key findings in the developing and aging brain function for blood flow, tissue integrity, and for cognition.

Under the CFAN umbrella, researchers from the Stanford Stroke Center, Departments of Neurology Neurosurgery, Psychiatry and Psychology, Duke University, Lucille Packard Children's Hospital, Palo Alto VA Medical Center and many collaborators work together in adapting cutting-edge imaging for neurocognition's toughest problems. Drs. Zaharchuk, Moseley, Christen, Qiu, and Zun lead an active team adapt novel methods for breakthrough protocols for quantitating collateral blood flow in cerebrovascular disease; altered CNS blood flow in MS, Moyamoya, TIA, stroke, and cerebral vascular diseases of the pediatric to aging brain. We provide our international research and clinical colleagues with new ways to approach the brain's most complex problems.



CFAN Group Photo: First Row (Left to Right), Wesley Zun, Wendy Ni, Greg Zaharchuk, Second Row: Tom Brosnan, Thomas Christen, Mike Moseley. Third Row: Jordan Michael Nechvatal, Deqiang Qiu Bottom Row: Georges Hankov, Shangpeng Feng, Caleb Folkes.

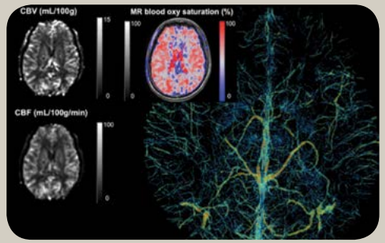


Figure 1. Multi-parametric quantitation of cerebral blood volume (CBV), cerebral blood flow (CBF), MR tissue oxygen saturation (max 100% brain oxygen) and the corresponding vascular oxygenation patterns (background).

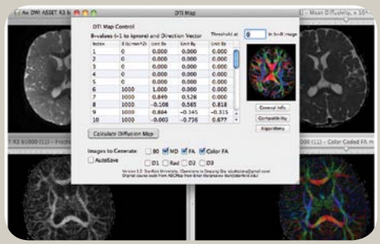


Figure 2. CFAN Osirix-developed application plug-in for rapid analysis and visualization of white matter structure and integrity. This is used together with our High-Order Tensor (HOT) quantitation models.

Figure 3. Quantitative Susceptibility Mapping for rapid assessment of brain form (inherent composition), flow (vascular iron), and function (tissue oxygenation) from a single exam.

4

5

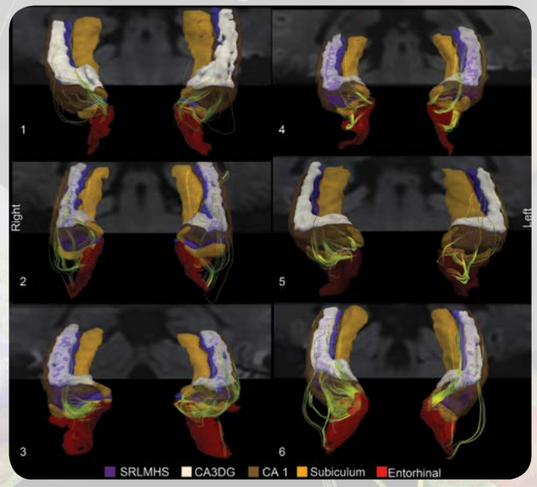
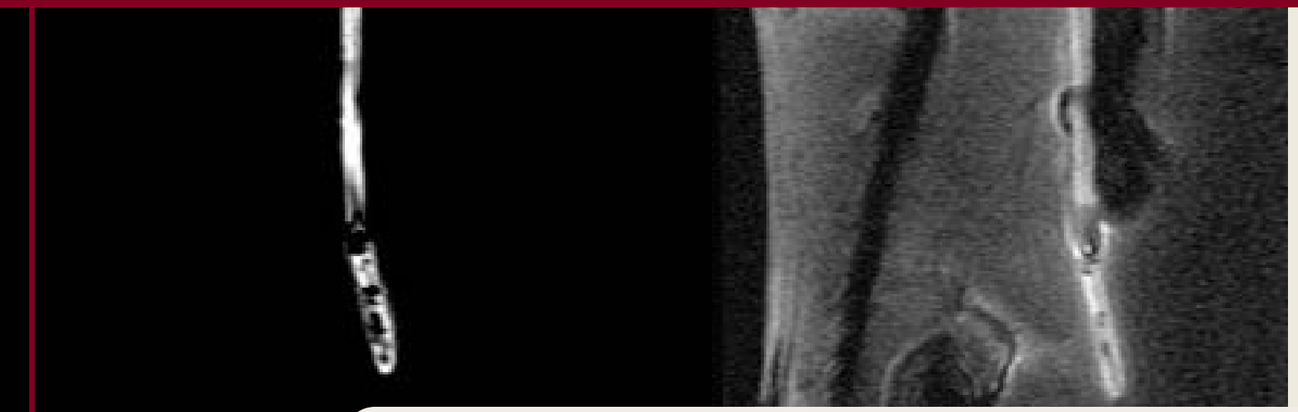


Image this page provided by Dr. Micheal Zeineh. Tractography parameter optimization. In one subject, tracts are depicted with anisotropy thresholds of 0.02, 0.05, and 0.1 as well as minimum tract lengths of 10 and 20 mm, all utilizing a curvature threshold of 40°.

6

Centers and Programs



A highlight from Core B, the Hardware Engineering Core. A new toroid coupling method for visualization converts a catheter into a transmit/receive insulated dipole antenna. As a micro-power transmitter/receiver, the device is sharply defined (left). Alternatively, using the body coil to transmit and receive (right), the device is visible within the esophagus of a porcine animal model. This approach enables multiplexing device transmit for interventional MRI procedures.

MR-guided Cancer Interventions

Director: Kim Butts Pauly, PhD

This project, initially funded by the National Cancer Institute (NCI) in 2011, develops and tests controlled minimally invasive thermal ablation techniques for the treatment of cancers that are attributed to a quarter of cancer deaths. Our overall goal in this project is to provide precise imaging, feedback, and control of the shape and size of thermal lesions to improve treatment options for these patients. Built upon the foundation of the Stanford Schools of Medicine and Engineering, the Stanford Cancer Center, and collaborators from UCSF and HeartVista, this program brings together five projects: 1) MR-guided HIFU of soft tissue tumors, 2) Minimally Invasive MRI-Guided Management of Prostate Disease, 3) MR-Guided Precision Thermal Therapy of Retroperitoneal Tumors, 4) MRI Methods for Guiding Focused Ultrasound in the Brain and 5) MR-guided RF Ablation. The five projects have many common requirements for programmatic and infrastructure support, which have been consolidated into cores. An engineering core will support Projects 2-5 with control hardware and software, as well as improved device visualization. An Imaging Assessment and Histopathology Core will assist all of the projects with post ablation assessment imaging, correlation with histology, and statistical support. The outcomes of this PPG will be 1) improved minimally-invasive treatment options, 2) an increase in the basic science understanding of tissue response to thermal treatments, and 3) advances in engineering, both hardware and software, specifically for treatment of these cancers.

In addition to Dr. Kim Butts Pauly as the overall PI of this P01, other project and core leaders include:

Project 1, MR-guided HIFU of Soft Tissue Tumors, which is co-lead by Garry Gold, MD, Professor of Radiology and Raffi S. Avedian, Assistant Professor of Orthopedic Surgery. In this project, we are developing techniques to use MR-guided high intensity focused ultrasound (MRgHIFU) to treat soft tissue tumors of the extremities.

Project 2, Management of Prostate Disease, lead by Bruce Daniel, MD, Professor of Radiology. In project 2, we will develop MRI-compatible methods that marry micro-robotic technology with realtime 3T MRI to provide unprecedented control, haptics, guidance and monitoring for trans-perineal minimally invasive biopsy and cryoablation of focal, clinically significant prostate tumors.

Project 3, Thermal Therapy of Pancreatic Cancer, lead by F. Graham Sommer, MD, Professor of Radiology. In project 3, we will design and evaluate inserted ultrasound applicators and external transducer arrays for treating retroperitoneal tumors including pancreatic cancer.

Project 4, MRI Methods for Guiding FUS in the Brain, lead by Kim Butts Pauly, PhD, Professor of Radiology. In project 4, we will improve and evaluate MR imaging for focused ultrasound (FUS) treatments in the brain. This includes improved temperature imaging, calcification imaging, adaptive focusing algorithms to correct for phase aberrations from the skull, and assessment after thermal ablation.

Project 5, MR-guided RF Ablation of the Liver, lead by John Pauly, PhD, Professor of Electrical Engineering. In project 5, we will use MRI's intrinsic ability to map electromagnetic fields to visualize RF ablation and to use feedback to control RF ablation.

Core A, Imaging Assessment and Histopathology Core, directed by Donna Bouley, DVM, PhD, Professor of Comparative Medicine.

Core B, Hardware Engineering Core, directed by Greig Scott, PhD, Senior Research Engineer, Electrical Engineering.

Core C, Software Engineering Core, directed by Andrew Holbrook, PhD, Research Associate, Radiology.

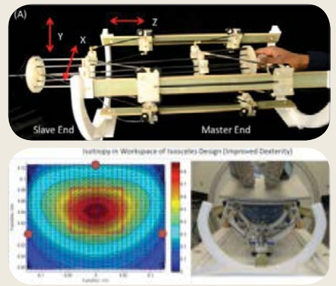


Figure 1. Project 2 highlights: Based on the parallel Delta mechanism, with sliding prismatic joints and gimbals (upper), our robotic manipulator enables 5 DOF remote manipulation with a safe, MRI-compatible mechanism. Workspace modeling predicts good isotropy (lower left) and high fidelity force transmission when using low friction sliders.

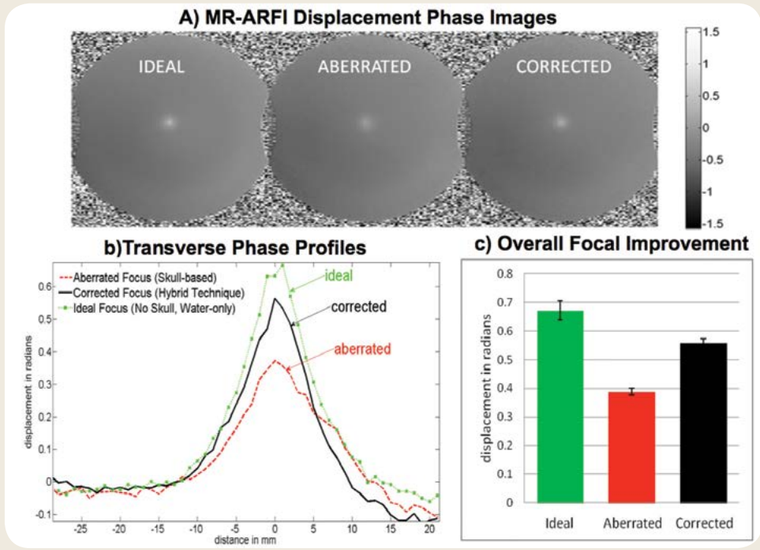


Figure 2. Project 4 highlights:.a) MR-ARFI displacement phase images for un- aberrated (ideal), aberrated, and corrected cases are shown. The hybrid simulation MR-ARFI technique used the aberrated image for estimating the corrections. The estimated corrections were subtracted from the applied aberrations and used to acquire the corrected image. b) Profiles through the focal spots are shown from the images in a. c) The maximum displacement at the focal zone is shown for the three cares for repeated experiments, with the standard deviations plotted using error bars.

Stanford CCSB Center for Cancer Systems Biology

Director: Sylvia K. Plevritis, PhD

The Stanford Center for Cancer Systems Biology (CCSB) is one of twelve NCI centers funded by the NCI's Integrative Cancer Biology Program to promote the integration of experimentation and biocomputation in the study of the molecular biology of cancer. The Stanford CCSB aims to discover molecular mechanisms underlying cancer progression that are driven by impaired cellular differentiation. Increasing evidence indicates that many cancers mimic like normal tissue by creating a hierarchy of cells at different stages of differentiation, and that the disease is maintained by a self-renewing cellular subpopulation. Our overarching goal is to provide a better understanding of the self-renewing properties of cancer that will enable us to identify molecular therapeutic targets and strategies to eradicate this disease, or to maintain it in a nonlethal state.

Our CCSB research program is organized around three distinct but related biological projects that are informed by novel biocomputational analytical core (Figure 1). The biological projects are designed to identify causal factors underlying impaired differentiation as a driver of cancer progression in several hematologic malignancies. Toward this aim, we believe that a network-based and multiscale viewpoint is needed. Increasingly, diseases such as cancer are recognized as resulting from disruption in the coordinated processes of a complex biological system. This systems biology viewpoint necessitates the incorporation of high throughput, high dimensional data, and development of computational methods specifically designed to its analysis. For computational analysis, we are developing three interlocking appproaches. First, we are developing methods to infer molecular regulatory networks that drive phenotypic processes such as differentiation. Second, we are developing new computational tools that identify and isolate underlying patterns of progression in cancer, which can then be related to underlying regulatory networks.

Finally, we are developing executable models are desirable so that it is possible to pose hypothetical "what if" questions to predict how, for example, a targeted intervention might affect the subsequent course of disease. These computational approaches are applied to the study of differentiation in a range of hematological malignancies. In fact, our Research Plan is divided among 4 research projects (see Figure 1). Project 1 is dedicated to developing novel computational methods, whose applications are deeply integrated into our three complementary experimental projects in AML (Project 2), FL (Project 3), and T-ALL (Project 4). Taken as a whole, the four projects provide a systems-level, network-focused view of the role of differentiation in cancer. Our integrative approach enable us to ascertain differences between these hematologic malignancies, and commonalities, which may generalize to other cancers.

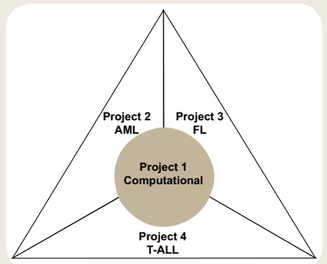


Figure 1. Organization of CCSB research projects.

The Stanford CCSB faculty brings clinical and basic cancer researchers together with researchers from mathematics, engineering, imaging sciences, and computer science to work on key questions in cancer biology. The CCSB core faculty include: PI Sylvia K. Plevritis, PhD, Associate Professor of Radiology; co-PI Garry Nolan, PhD, Professor of Microbiology & Immunology; Daphne Koller, PhD, Professor of Computer Science; David Dill, PhD, Professor of Computer Science; Ronald Levy, MD, Professor of Medicine (Oncology); Ravindra Majeti, MD, PhD, Associate Professor of Hematology; Dean Felsher, MD, PhD, Professor of Medicine (Oncology) & Pathology.

Our CCSB also maintains a Core for Data Integration, which is lead by Andrew Gentles, PhD, CCSB Scientific Program Manager and includes Rob Tibshirani, PhD, Professor of Health Research and Policy (Biostatistics) and Ramesh Nair, PhD. The purpose of this core is to facilitate interactions between computational projects and experimental projects, and to ensure timely dissemination of resources. This core also provides initial processing of complex data sets, and dissemination of results and computational tools. Several of our projects produce array-based data such as gene expression of bulk tissue and sorted cells. We perform consistent normalization for these datasets across projects. We also assist with access to public data repositories such as GEO and ArrayExpress, again providing consistent data normalization and processing for analysis. Three recent activities of our Core are listed below:

- We developed a computational pipeline for Next Generation Sequencing. We are developing computational pipelines for processing raw NGS data from CCSB experimental projects, including initial quality control and alignments, through to final variant (single nucleotide, structural, etc) calling for DNA sequencing and expression levels for RNA-seq.

- We developed a Data Portal based on the open-source Labkey system (http://www.labkey.org). In order to facilitate data dissemination between CCSB projects and to the wider scientific community, Our Data Portal provides project-oriented views of existing and "in-progress" datasets.

- We maintain a large resource of public cancer datasets, which have genomic profiles and associated clinical outcomes such as survival times. This resource, PRECOG (PREdiction of Clinical Outcomes from Genomics) comprises ~28000 patient samples across 40 malignancies and is utilized by all our experimental groups.

Our CCSB operations are led by Anita Samantaray, MPH, Program Manager, who also coordinates our outreach and education efforts. The Stanford CCSB produces education and outreach programs for students at all levels. Public outreach activities and research experiences enhance CCSB's impact in the bay area. We continue to offer annual symposia and monthly seminar series on campus to help educate scientists about cancer systems biology. The CCSB seminar series (http://ccsb.stanford.edu/events/seminars.html) is now in its second year and its Video Gallery can be viewed online (http://ccsb.stanford.edu/events/video_gallery.html). Our first workshop on next generation sequencing workshop was a success with over 100 in attendance, for more information, please see: (http://ccsb.stanford.edu/education/ngs.html).

In conjunction with the Stanford Cancer Biology PhD program, the Stanford CCSB is pleased to announce a new track focused on Cancer Systems Biology. A new course entitled, Principles of Cancer Systems Biology, will be offered this Spring (CBIO 243, 3 units). Our objective is to train a new generation of researchers in cancer biology who are adept at computational analysis of complex molecular data of cancer. With the emergence of high throughput (HTP) technologies that probe global DNA, RNA and protein expression as well as cellular state, we believe researchers need to consider a systems approach to cancer biology research that integrates experimental and computational methods in the synthesis and testing of new biological hypotheses. Our new program in Cancer Systems Biology will emphasize these principles. Students will learn now how to apply computational approaches to HTP data analysis to enable the discovery of molecular drivers and networks critical to cancer initiation, progression and treatment, and the discovery of novel methods for developing diagnostics and therapies. Students will work with researchers that investigate and develop mathematical formulations of known or conjectured signaling pathways that enable computer simulation of cellular and molecular dynamics. Students will be expected to derive biologically relevant computational predictions that are subsequently experimentally validated. Students with either a background in statistics, mathematics, engineering, computer science, a related quantitative field, or who have a primary background in biology and would like to acquire such quantitative skills and who desire to apply these skills to answering pressing questions in cancer biology are encouraged to apply.

Figure 5. Monocytes take up SWNTs within the circulation. In this IVM image white and gray arrows point to monocytes that have taken up SWNTs in the circulation (red blood vessels) of a living mouse with a tumor (green). Our data shows 100% of Ly-6C(hi) monocytes in blood have taken up nanotubes at 2 hours after SWNT injection, while <0.8% of Ly-6C(low) cells have done so.

Center for Cancer Nanotechnology Excellence and Translation (CCNE-T)

Director: Sanjiv Sam Gambhir, MD, PhD
Deputy Director: Demir Akin, DVM, PhD

Center for Cancer Nanotechnology Excellence and Translation (CCNE-T, P.I.: Prof. S.S. Gambhir) is a multi-institutional consortium, funded by National Cancer Institute, whose focus areas are early detection of cancers and their response to therapy. Towards the accomplishment of these missions, CCNE-T investigators capitalize on the latest Nanotechnology advancements and develop clinically translatable diagnostic devices and imaging tools.

In vivo self-assembling nanoparticles for imaging (Profs. B.K. Rutt and J. Rao, CCNE-T Project 1 leaders) : Magnetic resonance imaging (MRI) is a noninvasive, high spatial resolution imaging modality, which is used widely in clinical diagnostics. However, the relatively low sensitivity of MRI requires enhanced contrast agents to increase contrast between pathological and normal tissues. "Smart" MR contrast agents that can modulate their MR properties (relaxivity) resulting in signal amplification upon the interaction with a molecular target can greatly improve MR detection of specific molecular events. Our investigators developed a novel strategy for the formation of "smart" contrast agents, and demonstrated that this macrocyclization chemistry can lead to the formation and assembly of nanoparticles in vitro and in living cells under selected conditions and targeted cells.

Exquisitely selective delivery of single-walled carbon nanotubes (SWCNT) into a specific monocyte subset (Prof. S.S. Gambhir, CCNE-T, Project 4 leader, Dr. B.R. Smith, et al): Monocytes are immune effector cells with the potential to differentiate into macrophages and dendritic cells. They are implicated in both the pathogenesis and therapy of many diseases such as cancer. Yet the various subsets of monocytes have vastly different roles in cancer. Two blood monocyte subsets exist, one of which (Ly6Chi) tends to differentiate into a major subset of tumor-associated macrophages (TAMs). Using a nanoparticle to label this subset is advantageous because it can act as a multimodal carrier to deliver drugs and report its location. Furthermore, these nanoparticles are of great interest to the molecular imaging community due to their excellent tumor targeting, reporter, and therapeutic properties. Our data demonstrate that this exquisite specificity can be used for many applications in the imaging and therapy of cancers.

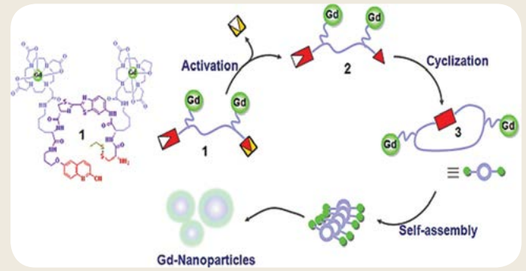


Figure 1. "Smart" MRI contrast agents that can self-assemble into Gd-nanoparticles in target cells.

Integrated intravital microscopy, electron microscopy, and mathematical modeling uncover surprising differences in extravasation between quantum dots and nanotubes in murine tumor models (Gambhir et al) : Extravasation is the only passive delivery method by which nanoparticles (NPs) may reach tumor interstitium for cancer imaging and therapy. Understanding this mechanism is critical to enable NPs to reach tumor cells and perform their function(s). The nano-molecular imaging field remains in its infancy and has had minimal mathematical support to guide it. Here we integrate experiments - intravital microscopy (IVM) of living mice and detailed electron microscopy (EM) of tumor vascular pore properties - with sophisticated fluid mechanics models to describe NP extravasation from vessels into tumor interstitium. We employ IVM to visualize how NPs extravasate and models to understand why. The models have the flexibility to model NPs of any shape/size in vasculature of any geometry. This will aid in NP design for optimal tumor uptake for imaging/therapy. This work also reveals the importance of combining experimentation with mathematical modeling to drive/optimize the field of NP use in living subjects.

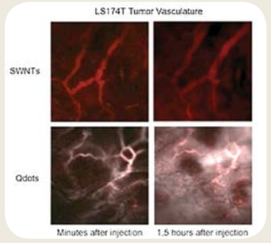


Figure 2. Intravital micrographs of LS174T tumors in mice injected with SWNTs and Qdots. Top images: no SWNTs have extravasated from the vasculature over 1.5 hours. Bottom images: qdots have extravasated from the vasculature within the same time period.

Visualization of lymphoma progression in a murine model using a novel lymph node internal window chamber (LNIWC) strategy (Gambhir Lab): Non-Hodgkin's Lymphoma is a heterogeneous and malignant form of lymphoma and mechanisms of tumor progression and metastases are poorly understood. Elucidation of this information may lead to better early detection and lymphoma patient management strategies. We reasoned that a multi-modal intravital fluorescence and bioluminescence imaging approach could be used to assess lymphoma progression in mouse models and successfully developed such a system. Our data indicate that imaging lymphoma progression using our newly developed approach is a powerful tool for elucidating lymphoma development in unprecedented detail and is already leading to new biological insights.

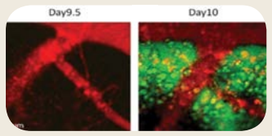


Figure 3. Efflux and influx of lymphoma cells shown in a murine model with IVM imaging. The inguinal lymph node of live mouse imaged using the internal window chamber technique at day 9.5 and 10 after i.v. injection of lymphoma cells (green). Blood vessels in inguinal lymph node are red. Note influx of cells between day 9.5 and 10.

Fabrication and Characterization of a Raman-Based Endoscopic Imaging Probe for Cancer Detection (Profs. C. Contag and S.S. Gambhir et al) : Endoscopic imaging is the standard of care and has been instrumental in decreasing the incidence of gastrointestinal cancers as an early detection procedure and screening method. However, with traditional white-light endoscopic tools, physicians still cannot efficiently and accurately distinguish between precancerous and benign lesions without biopsy and subsequent histopathology. We have developed a Raman-endoscopic probe that can be inserted into a conventional endoscope and has the potential to detect and quantify the presence of a multiplexed panel of 10 tumor-targeting surface-enhanced-Raman-scattering (SERS) nanoparticles. This approach would enable endoscopists to use molecular markers to distinguish between normal and cancerous tissues and to identify the otherwise hard-to-detect flat lesions that are easily missed during conventional endoscopy.

Better visualization of brain tumors and tumor borders during surgery using nanoparticles that have triple modality imaging capabilities (Prof. S.S. Gambhir et al) : The difficulty in delineating brain tumor margins is a major obstacle for better outcomes for patients with brain tumors. Current imaging methods are limited in sensitivity, specificity and spatial resolution. We have recently shown that a unique triple-modality magnetic resonance imaging–photoacoustic imaging–Raman imaging nanoparticle can accurately help delineate the margins of brain tumors in living mice both preoperatively and intra-operatively.

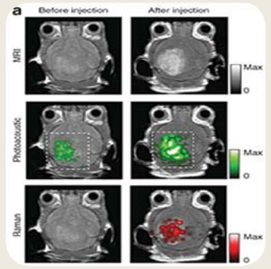
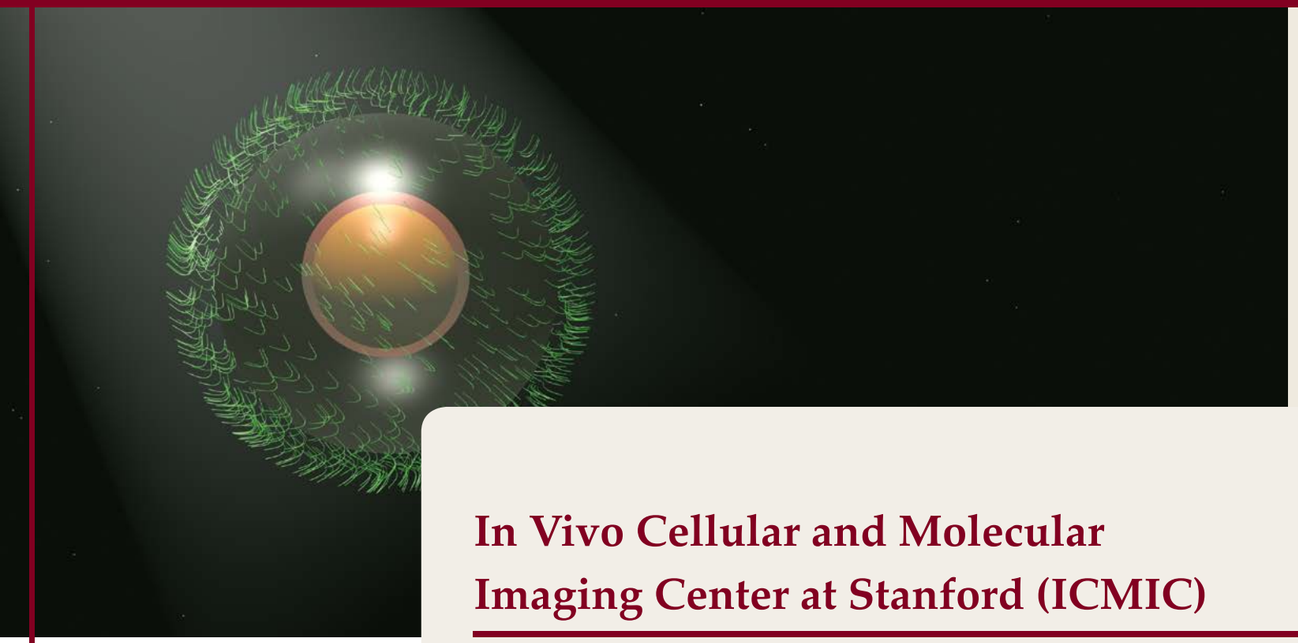


Figure 4. Visualization of a brain tumor by 3 imaging modalities: MRI, PAI, and Raman. This approach improves visualization of brain tumors, guides surgery and delineates tumor borders during surgery so that complete tumor removal can occur. Nature Med. 18, 829–834, 2012.



In Vivo Cellular and Molecular Imaging Center at Stanford (ICMIC)

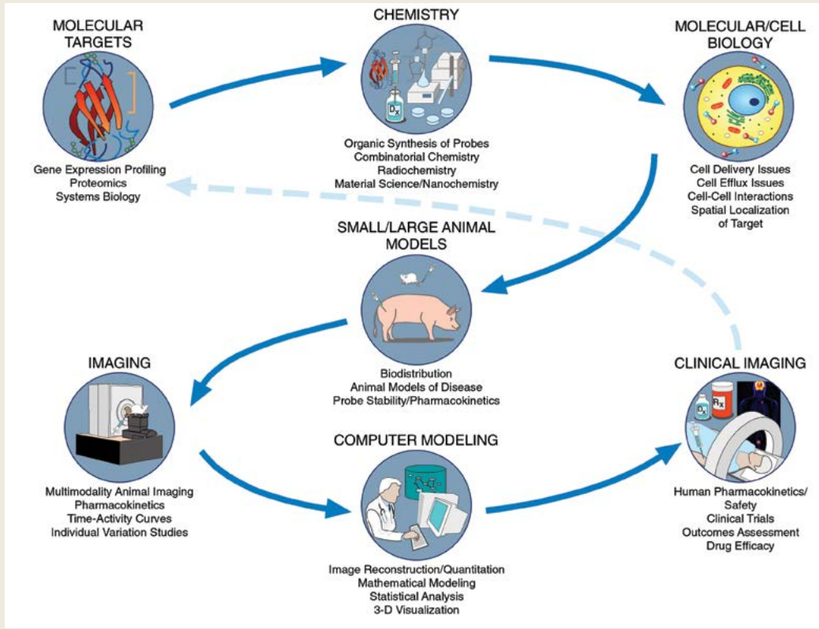
Director: Sanjiv Sam Gambhir, MD, PhD

The In Vivo Cellular and Molecular Imaging Center at Stanford (ICMIC@Stanford) is directed by Dr. Sanjiv Sam Gambhir, Professor of Radiology and Division Chief of the Nuclear Medicine Division, and co-directed by Dr. Chris Contag, Professor of Pediatrics and Director of Stanford Center for Innovation in in vivo Imaging (SCI3). Together, Drs. Gambhir and Contag form a highly unique leadership team that spans the diversity of disciplines involved in the field of multimodality molecular imaging. Drs. Gambhir and Contag also co-lead the Molecular Imaging Program at Stanford (MIPS), which currently has 26 full members (including Drs. Contag and Gambhir) from 8 different departments and 31 associate members from 17 different departments. All ICMIC faculty are all full members of the MIPS program. The ICMIC@Stanford provides a solid foundation for the Molecular Imaging Program at Stanford (MIPS).

While our early ICMIC efforts focused primarily on linking pre-clinical models of cancer with the clinical management of cancer, our overall vision today emphasizes the application and extension of molecular imaging to translational research and clinical applications. We will continue to exploit molecular imaging in the extraction of basic information from animal models and from pre-clinical studies; provide new information on tumor diagnosis, initiation, progression, and responses to therapy in these models; and develop new imaging technologies. Our Developmental Fund projects include projects from outstanding basic science cancer researchers who are newly integrating molecular imaging techniques into their programs. Our major goal for the ICMIC@Stanford in this five-year cycle has been to provide a foundation that allows and encourages the integration of molecular imaging into translational studies and into clinical cancer applications. Therefore, our research projects and developmental fund projects continue to be selected based on their ability to promote the interactions of basic cancer/molecular imaging researchers with clinical researchers in the translation of studies from animal models on cancer initiation, progression, diagnosis, staging, and response to therapy into clinical applications. In our research projects, we have assembled numerous physicians working in concert with molecular imaging scientists in order to further bridge our clinical and scientific community. This blending of individuals with expertise in treating patients and those with expertise in the research laboratory allows us to continue to accomplish our long-term vision of translating molecular imaging strategies into the clinic. We also form important scientific links to our NCI Funded CCNE U54 and NTR U54 programs through use of in vitro nanosensors and intraoperative microscopy, respectively. These links further accelerate our ability to bring important state-of-the-art solutions to cancer research and cancer patient care.

Our mission continues to focus on the growth of multimodality in vivo cellular and molecular imaging to study neoplastic disease and to forge stronger links between pre-clinical models and clinical cancer management through advances in multimodality molecular imaging. In addition to addressing key issues in cancer research from the level of oncogenesis to using imaging for optimizing anti-cancer therapies in pre-clinical models and in cancer patients, the ICMIC also maintains a dedicated interest in training future scientists and clinicians in the field. Overall, the ICMIC@Stanford is charged to accomplish the following aims:

- Maximize interaction among multidisciplinary investigators for a coordinated effort in molecular and cellular imaging of cancer
- Coordinate and manage the multidisciplinary programmatic cores and collaborative research efforts, and integrate these into the specialized research activities of the University for an effective research endeavor that pushes the envelope of scientific discovery
- Understand basic biological mechanisms of cancer that will lead to intervention strategies that will aid in the design and testing of innovative therapies that strike at the molecular foundation of oncogenesis and the minimal disease states that lead to relapse
- Maximize the use of the specialized resources and program strengths with integrated projects that aim to advance novel imaging approaches in oncology
- Provide training opportunities for students and scientists at all career levels to advance the field of in vivo cellular and molecular imaging, nationally and internationally



Molecular Imaging Research Chain. The figure shows the chain of events involved in going from molecular targets to clinical imaging. Not all areas of research will lead to clinical imaging; some are more focused on pre-clinical models. The Molecular Imaging Program at Stanford (MIPS) has many projects at all levels of the Molecular Imaging Research Chain; a very small number of those are included in the ICMIC@Stanford program.

Center for Biomedical Imaging at Stanford (CBIS)

Director: Kim Butts Pauly, PhD

The Center for Biomedical Imaging at Stanford, led by Dr. Kim Butts Pauly, PhD, continues to focus on its primary mission of education within the Stanford imaging community. The CBIS education goals are met through an Annual Symposium and a Seminar Series that includes local and invited speakers. Along with Dr. Butts Pauly, CBIS leadership includes an advisory board of the following Stanford faculty: Donna Bouley, DVM, PhD, Comparative Medicine; Sam Gambhir, MD, PhD, Radiology; Pierre Khuri-Yakub, PhD, Electrical Engineering; Michael McConnell, MD, MSEE, Cardiovascular Medicine; Norbert Pelc, PhD, Bioengineering and Radiology; Stephen Smith, PhD, Molecular and Cellular Physiology; and Anthony Wagner, PhD, Psychology.

The CBIS Annual Symposium attracts attendees across the campus and from neighboring institutions. CBIS also manages a Seed Grant funding program through which approximately five awards are made each year. Please visit the CBIS website for added information about our Advisory Board members, the Seminar Series, and further details of Seed Grant recipients' research (http://cbis.stanford.edu/).

2012 Annual Symposium:

A Two Day Symposium presented jointly with SCIEN (April 5-6, 2012)
Keynote Speaker: William Ralph Brody, MD, PhD, Uncommon Sense or Common Nonsense: Ideas That Will Never Work

2013 Annual Symposium:

The Power of Pixels (April 11, 2013 – 8am – 5pm)
Keynote Speaker: Mark Cohen, PhD, A unified theory of images?

2012 CBIS/SCIEN Symposium

CBIS Seed Funding

The Center for Biomedical Imaging at Stanford (CBIS) continues to pursue its mission dominated by education in the clinical, research, and educational arenas within the Stanford imaging community. This year our Annual Symposium was a two-day event sponsored by CBIS and the Stanford Center for Image Systems Engineering (SCIEN). This partnership blended the CBIS and SCIEN education missions with the somewhat divergent sub-interests of each center. While CBIS is primarily focused on biomedical imaging and translating technology and chemistry into clinical use, the SCIEN group is driven primarily by an engineering focus with partnerships to industry. In addition to our annual symposium, we continue to jointly sponsor symposia with the Cardiovascular Department, the ISIS Radiology group, Radiology Grand Rounds, and a Medical Imaging Seminar. As in the past, we also awarded 7 Seed Grants to CBIS members; these awards are shown below.

PI	Department	Seed Grant Project Title
Sandip Biswal, MD	Radiology	PET/MRI Image-guided Therapy of Peripheral Neuropathic Pain using a Sigma-1 Receptor Antagonist
Vinicio A. de Jesus, MD	Pulmonary	Optical Coherence Tomography as a Novel Tool in the Evaluation of the Pulmonary Circulation
Audrey Ellerbee, PhD	Electrical Engineering	3D Localization of Cell Positioning for Early Prediction of Embryonic Development to Blastocyst Stage
Edward E. Graves, PhD & Donna Bouley, PhD	Radiation Oncology and Comparative Medicine	New Course on Imaging Anatomy in Animal Models
Jan Skotheim, PhD	Biology	A Single-Molecule Approach to Cell Size Control
Justin L. Sonnenburg, PhD & KC Huang, PhD	Microbiology & Immunology	Development of Anaerobe--Compatible Fluorescent Microscopy Techniques to Study Gut--Resident Symbionts
Michael Zeineh, MD, PhD	Radiology	MRI to Assess for Longitudinal Brain Atrophy Associated with Concussive and Sub-concussive Forces

2012 CBIS/SCIEN Symposium

Facilities and Services

New Research Facilities

Technology and Innovation Park (TnI)

In Summer 2013, Stanford Radiology will be expanding with 50,000 square feet of new space in the Technology and Innovation (TnI) Park on Porter Drive in Palo Alto, just 3.5 miles from the Stanford School of Medicine. Comprised of four SOM buildings and three Stanford University administrative buildings, housing more than 2,000 people, Porter Drive will represent a true Stanford community in this off-campus location.

The opportunity to grow new programs in an academic research environment is dependent upon space. Facilities for people, specialized labs, along with custom tools and equipment is essential for new research. With the commitment of these new buildings comes the prospect of significant research growth for radiology. Porter Drive will become a focal point for Stanford with its high quality campus environment conducive to collaborative research, intellectual pursuits and recruitment. It also offers great flexibility to accommodate our evolving programs and SOM strategic vision.

SOM Departments to be housed in Porter Drive TnI Park include: Genomics, Sleep Center, and Radiology. Radiology will have space in three adjacent buildings, which will allow for the largest growth in the history of our Department. Two hundred seventy faculty, staff and students will be housed in the first two buildings which will include faculty from all of our research sections: MIPS, Canary Center at Stanford, ISIS and RSL.

Resources include state-of-the-art biology, chemistry and radiochemistry facilities, physics and engineering laboratory, and a small animal imaging facility. The Canary Center at Stanford is currently located at 1501 California Ave. It will be vacating these facilities and moving to Porter Drive in June 2013.

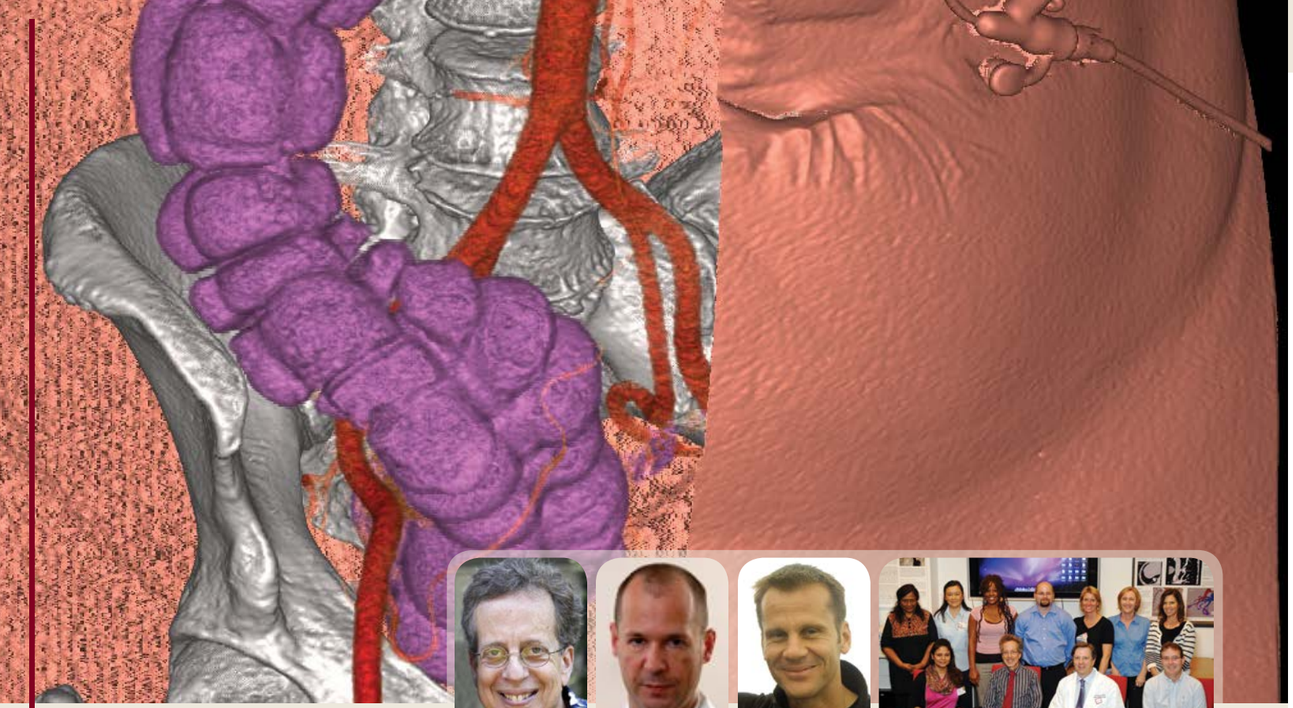
Along with Radiology, the new campus will include the Center for Genomics and Personalized Medicine and Stanford Genome Technology Center. Co-location of Genetics and Imaging will foster multidisciplinary collaboration and help us to fulfill our Department vision of facilitating the merging of genomics and imaging.

Radiology Construction and Expansion

In 2012 the Department of Radiology completed several major construction projects. The Lucas Center was extensively renovated to allow for the siting of two new 3T magnets and the upgrade of our 7T MRI. The construction included remodeling of magnet suites, control rooms, equipment, viewing and patient preparation rooms, and part of the lobby. Additionally we renovated a section of the second floor to create new offices and cubes, and remodeled our animal surgery suite and an adjacent office. These renovations will provide space for approximately 17 people and the upgraded facilities will allow us to continue to fulfill our research and education mission with cutting edge equipment.

In the Grant Building we remodeled the Fahrig Lab to install a new C-Arm fluoro/CT system which was acquired via a NIH instrumentation grant. The renovated lab opening was celebrated in October 2012 with a symposium on new C-arm imaging technology and an open lab. Merging and updating two rooms to a single dry lab, we also renovated space for our 3DQ Lab, which now houses six technologists. Our 3DQ Lab is housed in two locations on campus, the Clark Center and now the Grant building. The lab had been in the Lucas Center since its inception in 1996. Moving the lab to Grant allows for closer collaboration with the clinicians and also frees up much needed student desks in the Lucas Center.

In 2013 we have many new plans for construction and expansion beyond just Porter Drive. We are moving forward with renovations of space in the hospital for the Chairman's office and several faculty offices, and will be updating three to four areas of the Grant Basement to create new offices and student desks to support our growing faculty.



Stanford Radiology 3D and Quantitative Imaging Laboratory (3DQ)

Scientific Director: Sandy Napel, PhD
Clinical Director: Dominik Fleischmann, MD
Technical Director: Roland Bammer, PhD
Interim Lab Managers: Marc Sofilos, RT & Linda Horst, RT

CT Angiography of the Abdomen/Pelvis. Image shows relationship of bone (white), arterial vasculature (red), and contrast filled colon (purple). Inset: new leadership from left, Sandy Napel, Dominik Fleischmann, and Roland Bammer. 3DQ Lab Group Photo: Back row L-R: Kala Raman, Rhea Liang, Lakeesha Winston, Shannon Walters, Nancy Ware, Kristy Bogart, Linda Horst; Front Row L-R: Keshni Kumar, Sandy Napel, R. Brooke Jeffrey, Jr., Marc Sofilos; Not pictured: Debra Frank, Daniel Rubin, Caryn Damits

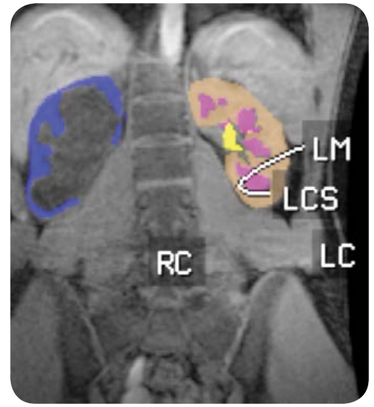
The Stanford Radiology 3D and Quantitative Imaging Laboratory (3DQ Lab) is guided by the mission of developing and applying innovative techniques for efficient display and quantitative analysis of medical imaging data. Since 1996, our clinical goal has been to deliver clinically-relevant alternative visualizations and measurements to radiologists and referring physicians in the Stanford and surrounding communities as rapidly as possible for the swift and accurate diagnosis, tracking, and treatment of disease; our educational goal is to disseminate knowledge so as to replicate our services at other institutions; and we continue to facilitate cutting edge research through our collaborations with faculty in Radiology and other Departments.

Progress

Clinical: Our average monthly volume of clinical cases has increased to over 1000 examinations per month. This past May, the lab celebrated the processing of our 100,000th exam since the 3DQ Lab's inception. We celebrated with an open house to all staff and referring physicians, and we were honored with a toast by our Chair, Sanjiv Sam Gambhir, M.D. Ph.D. The majority of our referrals continue to come from vascular surgery, cardiothoracic surgery, gastroenterology, cardiology, urology, reconstructive surgery, orthopedics, neurology and neurosurgery. We are also active in several clinical trials, providing quantitative assessments of response to treatment via volumetric analysis of cross-sectional imaging examinations, e.g., CT and PET. We recently began a process of revamping our protocols to allow more rapid processing of the most time critical cases. For example, we now are targeting the creation of clinically relevant visualizations for suspected stroke cases within 15 minutes of CT acquisition.

Education: We continue to provide training for outside physicians and technologists from around the world in 3D post processing, including quantitative analysis. Stanford researchers from engineering and medical departments have also been trained in processing and acquiring 3D images and data for research projects, including measurements of craniofacial deformities for reconstructive surgery, pulmonary vasculature volumes for 3D model fluid flow simulations for vascular surgery, and 3D modeling for multimodality small animal imagers. We are also collaborating with our colleagues in the Anatomy Department to provide processing of highly detailed datasets for medical student education.

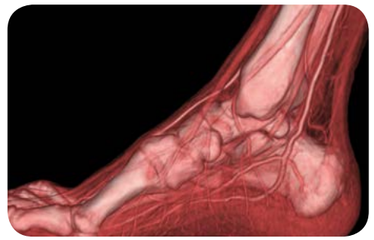
Research: The research arm of the 3DQ Lab hosts an annual average of 5 graduate students and post-doctoral scholars from various departments of the University, 2 clinical MD researchers, and our own radiologists. This year, led by Drs. Ghanouni and Vasanawala, we have added new processing protocols to facilitate interpretation and treatment planning using MR examinations of the liver and kidneys, particularly important in pediatric cases where radiation dose must be minimized. We are also continuing a project investigating the use of gaze-tracking to understand and to improve the detection of pulmonary nodules in volumetric CT scans.



Careful quantitative 3D analysis can be used to probe the function of the pediatric kidney to determine the relative function of the right and left kidneys and to determine if there is a blockage to urine flow. In this young child, the right kidney (left side of the image) is obstructed, compromising kidney function. This critical information indicates that surgery should be performed. RC (right cortex= blue), LC (left cortex= brown), LM (left medulla=pink), LCS (left collecting system= yellow).

Infrastructure

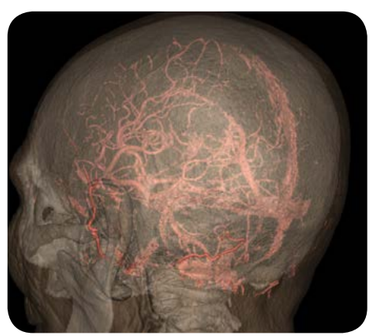
The last 12 months have been a time of transition for the Lab. While we maintained operations in the James H. Clark Center, we left our original space at the Lucas Center to begin operations in a new space created just for us in the Grant Building. This new location has proven to be an asset to the lab as it allows us to work in closer proximity to our radiologists in a space more compatible with teaching and training. In the Clark Center, a central area table invites professional collaboration, and student desks with moveable workspaces provide areas for independent research. The lab equipment consists of workstations and servers that are used for research and development for image and data storage. The lab also has remote PACS workstations that provide access to all Stanford medical imaging and reporting. During this past year the lab successfully moved away from individual workstations to a server/thin client model, enabling us to expedite the processing and sharing of data throughout the lab. These upgrades have allowed for flexible workspaces utilizing generic PC workstations, while providing access to all 3D and quantitative applications from these centrally located servers. During this evolution, we continue our excellent relationships with corporate developers of 3D workstations/servers (e.g., GE Healthcare, TeraRecon, and Vital Images), who site their hardware and software in the 3DQ lab in anticipation of our feedback. These relationships continue to ensure that we maintain the most advanced multi-dimensional analytical technologies available. In addition, the lab continues to support the use of the MEDIS QMass® and QFlow® analysis software, which allow for enterprise collaboration when measuring cardiac output and analyzing muscle mass. We also continue to use Angiovis software in the lab for both accurate and quick bone removal while generating curved planar reformations through the major blood vessels of the lower extremity.



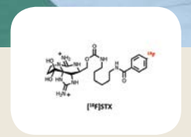
CT Angiography of the Lower Extremity. 3D reconstruction displays the bones and tendons of the foot as well as both arterial and venous anatomy.

Conclusion

The 3DQ Laboratory continues to function as an international leader in clinical care, teaching, and research in medical imaging analysis and quantification. The confluence of talented medical and engineering expertise with the most up-to-date equipment has been a consistent source of innovation in diagnostic, monitoring, and treatment planning approaches. During the coming year we plan to generate an influx of ideas from seasoned technologists and new leadership to position the 3DQ Lab for improved and continued contribution to the care of our patients.



CT Angiography of the brain. 3D reconstruction displays soft tissue, bone, and blood vessels.



Cyclotron & Radiochemistry Facility

Director: Frederick Chin, PhD

Cyclotron Lab Members, From left to right: Sandeep Apte, Stephanie Chen, Natasha Arksey, Bin Shen, Zheng "Ben" Miao, Murugesan Subbarayan, Frederick Chin, George Montoya, Hongguang "Simon" Liu, Aileen Hoehne, Michelle James, and Jongho Jeon. (Missing from photo: So-Hee Kim)

The Cyclotron and Radiochemistry Facility (CRF) develops and offers radiotracers for early detection and therapeutic monitoring of disease in both preclinical and clinical imaging settings. Our radiochemistry personnel (faculty, staff, and postdocs) continue to number around 30 people including the recent facility hiring of Natasha Arksey, M.S. and Stephanie Chen, B.S, in the past year. Additional instruments and upgrades were installed in 2011-2012 including a second FASTlab module (GE), two Multichannel Analyzer upgrades (Canberra), Medismart System upgrade (Rotem) and ten desktop PC upgrades (Dell) that control a variety of equipment in the CRF. Although the new Nuclear Medicine and Molecular Imaging Clinic at the Stanford Hospital opened in October 2010, the clinical radiochemistry lab, opening this year. This extra lab space will provide clinical-grade radiopharmaceuticals to meet essential clinical radiochemistry demands while abiding to current regulatory policies.

However, the existing CRF will continue to provide routine clinical tracers for use at Stanford Hospital. Fluorine-18 labeled fluorodeoxyglucose ([^{18}F]FDG) is still produced daily (5-days/week) and can also be made using either of our two GE FASTlab synthesizers with much higher yields relative to the previous module used. Nitrogen-13 ammonia (myocardial perfusion assessment) and fluorine-18 sodium fluoride (bone imaging) are also synthesized for the clinic as needed. In addition, our radiochemistry staff will continue to produce tracers for pre-clinical investigations and will maintain our [C-11]carbon dioxide, [F-18]fluorine gas and [F-18]fluoride ion production for all our research radiochemistry needs.

GE TRACERlab modules are the workhorses in the lab and perform the syntheses of our ^{18}F and ^{11}C-labeled radiotracers for collaborative research at Stanford and with pharma. These modules have enabled us to provide new radiotracers such as [^{18}F]FSPA-RQ (imaging neurokinin-1 receptors) for future human studies. Additional PET radiotracers that study the mechanisms and treatment of cancer as well as neurological disorders will soon become available to meet the increasing needs for performing preclinical ([^{18}F]CAIP, [^{18}F]saxitoxin, [^{18}F]FBR, [^{18}F]P3BZA) and clinical ([^{64}Cu] rituximab, GE/Piramal/Siemens compounds, [^{11}C]raclopride, [^{18}F]FTC-146, [^{18}F]AraG) research studies with PET.

The following table summarizes an updated list of radiolabeled compounds that are made in the CRF, excluding research compounds protected under confidentiality agreements (Bolded tracers = preclinical and clinical use; * = eIND or IND under preparation for clinical use).

Tracer	Use	Application
[^{11}C]Raclopride*	Imaging dopamine-2 receptors (D2R)	Monitoring D2R-related neurological disorders (i.e. Parkinson's Disease)
[^{11}C]PIB	Imaging αβ amyloid in brain	Monitoring progression of Alzheimer disease in brain
[C-11]N-methyl Spiperone	Imaging dopamine-2 receptors (D2R)	Monitoring D2R-related neurological disorders (i.e. Parkinson's Disease)
[^{18}F]CAIP	Imaging caspase-3 activity	Imaging apoptotic tumors
[^{18}F]FDG	Imaging tumor metabolism	Imaging tumors
[^{18}F]CBT	Prosthetic labeling group	Radiolabeling peptides with specific cysteine moiety
[^{18}F]AraG	Imaging agent for T-cells	Detection of disease of T-cell origin (e.g., HSV-1)
[^{18}F]FA-YF$_3$	Imaging folate receptors	Imaging tumors
[^{18}F]FAZA	Hypoxia imaging agent	Evaluating clinical-relevant hypoxia-directed cancer therapies
[^{18}F]FMISO	Hypoxia imaging agent	Evaluating clinical-relevant hypoxia-directed cancer therapies
[^{18}F]EF-5	Hypoxia imaging agent	Evaluating clinical-relevant hypoxia-directed cancer therapies
[^{18}F]Fluorouracil	Tumor imaging agent	Evaluating clinical-relevant cancer therapies
[^{18}F]Fluorobenzaldehyde	Prosthetic labeling group	1) Radiolabeling peptides for potential clinical use 2) Radiolabeled affibody for imaging of NER2neu
[^{18}F]Fluorobenzoic acid	Prosthetic labeling group	Radiolabeling peptides for potential clinical use
[^{18}F]Fluoropropionic acid	Prosthetic labeling group	Radiolabeling peptides for potential clinical use
[^{18}F]SFB	Prosthetic labeling group	Radiolabeling peptides for clinical use
[^{18}F]FBR	Imaging agent for TSPO receptors (formerly known as peripheral benzodiazepine receptors or PBR)	Monitoring neuroinflammation induced by stroke or radiotherapy
[^{18}F]FEAU	Imaging substrates expressing mutant HSV1-sr39tk	1) Monitoring gene therapies targeting cancer 2) Monitoring cell therapies
[^{18}F]FHBG	Imaging agent for tumors expressing HSV1-tk	Monitoring various cancer therapies
[^{18}F]FLT	Imaging agent for tumor cell proliferation	Monitoring various cancer therapies
[^{18}F]FPPRGD2 and derivatives (e.g., [^{18}F]FPRGD2, [^{18}F]FCBTPRGD2)	αvβ3 integrin imaging agent	Imaging tumor integrin expression
[^{18}F]FSPA-RQ*	Imaging neurokin-1 receptors	Imaging pain and anxiety
[^{18}F]FSPG	Imaging agent for cystine/glutamate exchanger	Imaging tumors
[^{18}F]FTC-146*	Imaging agent for sigma-1 receptor	Imaging agent for studying depression, Schizophrenia, Alzheimer's Disease, drug addiction, pain, and certain cancers (e.g., prostate, breast)
[^{18}F]FDopamine	Imaging dopaminergic neurons	Imaging peripheral dopaminergic neurons in tumors
[^{18}F]FDOPA	Imaging dopaminergic neurons	Imaging neuroendocrine tumors (cerebral glioma)
[^{18}F]FTC-129 and [^{18}F] FTC-177	Imaging VEGF-R2	Imaging angiogenesis
[^{18}F]MN-658	Imaging agent for tumors	Imaging tumors
[^{18}F]FU	tumor therapy	Imaging tumor therapy
[^{18}F]P3BZA	Imaging melanin	Imaging melanoma
[^{18}F]Saxitoxin	Imaging agent for voltage-gated sodium channels	Imaging agent for sodium channels linked to pain
[^{18}F]FBA-MG-DS	Imaging agent for tumors	Imaging tumors
[^{18}F]Annexin-V	Imaging cell apoptosis	Imaging tumors
[^{18}F]Sodium fluoride	Imaging bone	Imaging bone-related diseases
[^{18}F]PKR ligand	Imaging agent for prokineticin Receptor 1	Mapping PKRs in pain models
[^{18}F]Coumorin	CA IX enzyme in Tumor	Targeting Tumor Hypoxia
Other ^{18}F-labeled RGD peptides	$\alpha_v\beta_3$ integrin imaging agent	Imaging tumor integrin expression
[^{64}Cu]DOTA-rituximab	Imaging agent for human CD20 antigen	Imaging B-cell malignancies (e.g., Non-Hodgkin's lymphoma)
[^{64}Cu]DOTA-fibronectin domain	Imaging Integrins	Imaging tumor integrin expression
[^{64}Cu]DOTA Cystine Knot Peptide	Integrins: $\alpha_v\beta_3$, $\alpha_v\beta_5$, $\alpha_v\beta_6$, $\alpha_{iib}\beta_3$, and $\alpha_5\beta_1$ (so far)	Imaging tumor integrin expression
[^{64}Cu]anti-GPC3 Mab	GPC3 antigen on hepatocarcinoma	Imaging hepatocellular carcinoma

Lucas Center MR Systems:

3T1, 3T2, 3T3, and 7T Whole Body Magnets

Manager: Anne Marie Sawyer, BS, RT(R)(MR), FSMRT

Figure 1 (large image). The '3T1' at the Lucas Center is a G.E. Healthcare Discovery 750W MRI system.

Figure 2 (inset - left). The '3T1' 750W at the Lucas Center showing the new abdominal RF coil used in conjunction with the GEM coil located in the table under the patient.

Figure 3. (inset - left center) The '3T2' at the Lucas Center is a G.E. Healthcare Discovery 750 MRI system.

Figure 4. (inset - right center) The '3T3' at the Lucas Center is a G.E. Healthcare Discovery 750 MRI system.

Figure 5. (inset - right) The '7T' at the Lucas Center is a G.E. Healthcare Discovery 950 MRI system.

During 2012, the 3 Tesla #1 MRI system was replaced with a GE Healthcare 3 Tesla Discovery 750W MRI system and is currently operating at 23.x software (Figure 1). This MRI system operates with 32 RF receiver channels, a maximum gradient slew rate of 120 millitesla per meter per millisecond, and a maximum gradient amplitude of 33 millitesla per meter (3.3 G/cm). This 750W MRI includes the GEM RF coils in the patient table allowing for much lighter coils for the anterior portion of the body and the ability to use multiple coils required in whole body imaging (Figure 2.) This wide bore system (70 cm) is currently planned for a PET-MR insert.

During the last half of 2011, the GE Healthcare 1.5 Tesla MRI system was replaced with a GE Healthcare 3 Tesla Discovery 750 MRI system. The 3 Tesla #2 and #3 GE Healthcare Discovery 750 MRI systems are currently operating at 22.x software (Figures 3 and 4) with a planned upgrade to 23.x software later in 2012. The Insightec Focused Ultrasound System is installed at the 3T3 and being used to treat human subjects and animal models. The systems operate at a maximum gradient slew rate of 150 millitesla per meter per millisecond and maximum gradient amplitudes of 50 milliTesla per meter. The software and hardware currently allows the use of 32 channels at both 3T2 and 3T3 and multinuclear spectroscopy.

During last part of 2011 and early 2012, the 7T system was upgraded to the GE Healthcare Discovery 950 system (Figure 5).

Daily support in MR system operation and screening and safety is provided to all researchers including faculty, post-doctoral fellows, graduate students, and visiting scholars in the Lucas Center and Department of Radiology; researchers from other University departments such as Psychology, Psychiatry, Neurology, Neurosurgery, and Nephrology; and service center users from outside of the University.

Lucas Center MR Systems Training:

3T1, 3T2, 3T3, and 7T Whole Body Magnets

Manager: Anne Marie Sawyer, BS, RT(R)(MR), FSMRT

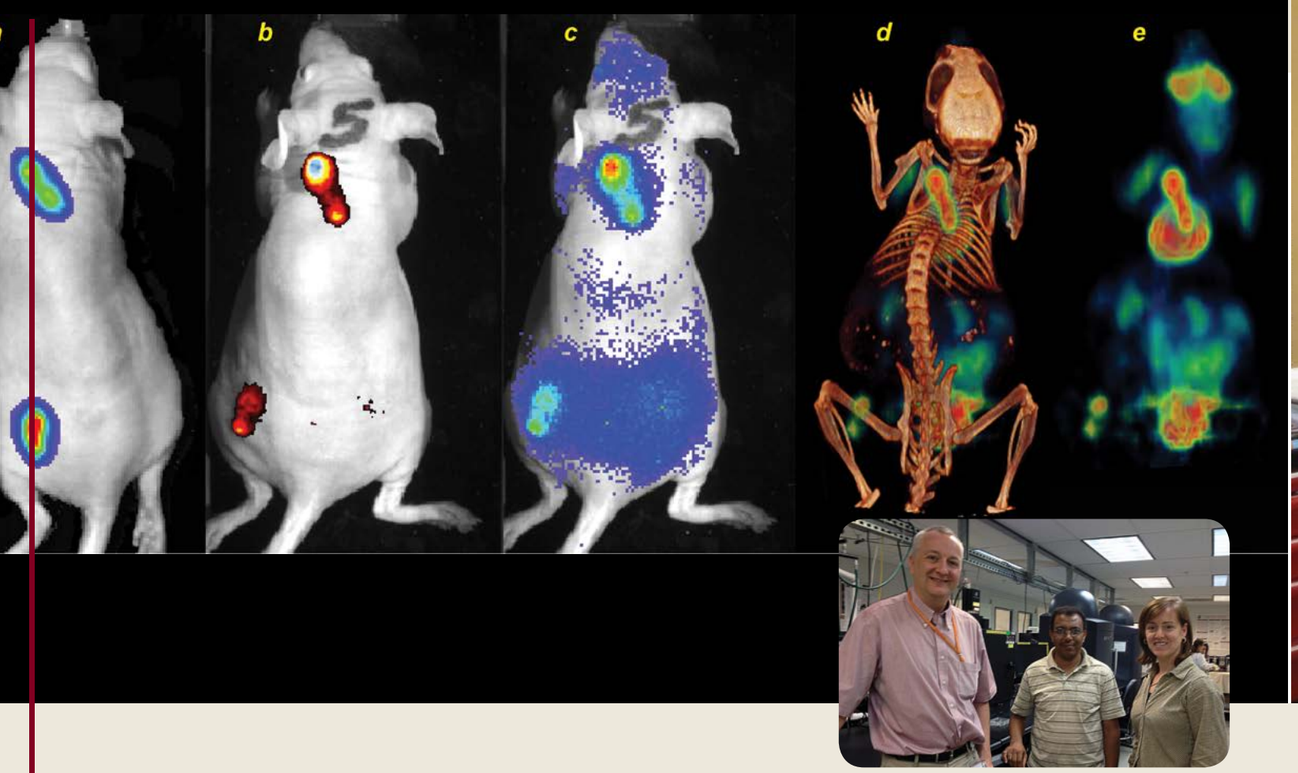
MRI safety training and system instruction have been provided to 297 new researchers including scientists and clinicians conducting experimental MRI studies at the Lucas Center over the last twelve months (Figure 1). Initial MRI safety training and the annual refresher course are required for all researchers assisting or conducting studies on any of the MRI systems at the Lucas Center. The annual MRI safety refresher course is required as an on-line tutorial and has provided renewal instruction to 305 researchers (Figure 2). The software tracks due dates for completion and reminds users through automatic emails. This ensures that all users and assistants are qualified to operate the MRI systems and satisfies Lucas Center and University requirements for safety. New users to the center receive MRI system software and coil instruction. MRI system and safety support is provided to the researchers 7 days a week, 24 hours a day to ensure that research endeavors are successful, generate valuable data, and, above all, are safe for the researchers, the human subjects and the MRI systems and components. MRI safety is an on-going concern as the MRI environment can be a potentially lethal setting without continuing education and persevering support.

The research environment generates many new yet prototype designs in RF imaging coils, imaging accessories, monitoring and response devices such as button boxes, eye trackers, and electroencephalogram (EEG) recorders, and sensory devices. Evaluation of these new devices is on-going to ensure that neither the image data, the safety of the human subject, nor the integrity of the MRI systems are compromised by the presence of these devices in the magnet room, in the bore of the magnet, or in the presence of an RF coil (Figure 3).

Figure 1. (large image) Karla Epperson and Kevin Epperson, MR Research Technologists, set up a scan subject for whole body research study using head and neck RF coils in conjunction with abdominal and peripheral vascular coils at 3T1.

Figure 2. (inset - center) MR safety page from website created by Magnet Manager, Anne Marie Sawyer, which includes the required annual safety and policy online training.

Figure 3. (inset - right) Chris Elkins and Eric Cherry from the Department of Mechanical Engineering prepare for a study at 3T1 with their specialized devices specially constructed to be used within the 3T magnetic field.



Small Animal Imaging Facility

Director: Tim Doyle, PhD

Inset: Tim Doyle, Frezghi Habte, and Laura Pisani

Image Above: Optical and PET-CT imaging of mice. Bioluminescent tumor cells on the back of a mouse (a) show similar distribution to the Cerenkov emission from 18F-FDG in a high-threshold image of the same animal (b). Full scale Cerenkov image (c) shows 18F-FDG activity located in the bladder and brain, which is clearly apparent from PET-CT (d) and PET only (e) images. Note that the Cerenkov image does not clearly show activity distribution in the heart, kidneys or brown fat pads near the shoulders.

Demand for access for small animal imaging by School of Medicine groups continues to be strong, indicating the importance of molecular imaging in today's research at Stanford. Almost 12,000 hours of imaging over the last year resulted in at least 88 publications with data obtained in this shared resource.

The upgrade to the high field (7 Tesla) MRI was completed at the end of August 2011, and has resulted in better image quality, as well as offering greater capabilities for users, due to different sizes of gradient inserts that allow larger animals to be imaged than was possible before the upgrade. We have also recently exchanged the Aspect low field (1 Tesla) MRI with a similar system from Bruker, which should also offer more options for imaging mice and rats. Thanks here to Professor Brian Rutt for coordinating this instrument loan.

Photo-acoustic imaging has also been introduced to the imaging core, thanks to Professor Sam Gambhir. The new VisualSonic LAZR system was installed for evaluation purposes by his group, and following extensive testing, several groups have now added this exciting new modality to their research projects. Taking advantage of acoustic waves generated by tissue illumination by low energy lasers, this modality holds interesting prospects in the clinical area, if pioneering studies on such instruments on small animals prove successful.

Cerenkov imaging in small animals has been used widely by Stanford groups since its first report in 2009 by groups from Millenium Pharmaceuticals and UC Davis. Several groups have explored the use of novel PET imaging agents, such as Zirconium-89, for imaging tracer distribution in small animals. Instruments in the small animal imaging facility were successfully used to determine the feasibility of endoscope-based imaging of this phenomenon. While whole animal Cerenkov imaging may have limited applications in pre-clinical research, endoscopic based applications may translate to the clinic, with possible use in Cerenkov image-guided surgical procedures.

Animal Model Management

Wendy Baumgardner, RVT, LATg
Yamil Saenz, DVM

Inset: Preparation and surgical areas.

Image Above: Wendy Baumgardner and Yamil Saenz setting up for a study in our new animal surgical suite in the Lucas Center.

In our continuing efforts to provide support to the Radiology investigative staff, we are entrusted with the responsibility of overseeing all animal model protocols within Radiology and for all other departments conducting research studies at the Lucas Center and the Grant building Axiom lab. Two research professionals, including a California Licensed Veterinary Nurse (RVT) and a California Licensed Veterinarian (DVM), with over 50 years of combined experience in animal research, support all animal model studies and ensure the health and welfare of the animal is always a top priority. Diligent care is taken during all procedures involving animal subjects; they are treated with the utmost respect, compassion, and professional care. Animal studies at the Lucas Center advance imaging and image-guided therapy procedures for human studies, and are treated with equal compassion in all research and medical imaging examinations.

All personnel working with animal models under approved Institutional Animal Care and Use Committee (IACUC) protocols have completed required training from the Stanford University Department of Comparative Medicine. In addition, specifically tailored "one on one" training for more advanced techniques are taught by the veterinary staff at the Lucas Center.

We realize that living subjects are needed to advance our knowledge, and to that end we ensure that proper respect for life is part of all research studies whether human or animal studies. Research conducted at the Lucas Center improves and aids in the development of new invasive and non-invasive procedures that utilize magnetic resonance imaging (MRI), high intensity focused ultrasound (HIFU), computed tomography (CT), CT/fluoroscopy, and positron emission tomography (PET). Clinical studies currently conducted at the Lucas Center include the study of cardiac and liver Radio Frequency (RF) ablation, myocardial infarction, liver and prostate cancers, neuromodulation with ultrasound, and structural neuroimaging of the brain. The techniques currently being explored at the Lucas Center contribute to more efficient and effective medical treatment for human illness and disease.

As part of the recent renovation of the Lucas Center and Axiom research facilities, our new surgical suite provides a state of the art facility including the technology for a surgical lighting system equipped with a precision High Definition camera and multi display flat screen panel. This will allow our investigators to conduct real time teaching with in vivo and inanimate models.

Faculty Honors

Faculty Honors

Roland Bammer, PhD
Associate Professor
Radiological Sciences Lab

Academy of Radiology Research Distinguished Investigator Award, 2012

Kim Butts Pauly, PhD
Professor
Radiological Sciences Lab

Academy of Radiology Research Distinguished Investigator Award, 2012

Andrei Iagaru, MD
Assistant Professor
Acting Co-Chief, Nuclear Medicine and Molecular Imaging

Elected to the American College of Nuclear Medicine as a Fellow, 2013

Ann Leung, MD
Professor and Associate Chair, Clinical Affairs
Thoracic Imaging

Named Department of Radiology Faculty of the Year, 2012

Heike Daldrup-Link, MD
Associate Professor
Pediatric Imaging (LPCH)

Academy of Radiology Research Distinguished Investigator Award, 2012

R.O.S.E. Award (Recognition of Service Excellence), Lucile Packard Children's Hospital, 2012

Bruce Daniel, MD
Professor
Body MRI and Breast Imaging

Academy of Radiology Research Distinguished Investigator Award, 2012

Craig Levin, PhD
Professor
MIPS

Academy of Radiology Research (ARR) Distinguished Investigator Recognition Award, 2013

Elected to the American Institute for Medical and Biological Engineering (AIMBE)

Sandy Napel, PhD
Professor and Co-Director of ISIS

Academy of Radiology Research Distinguished Investigator Award, 2012

Rebecca Fahrig, PhD
Associate Professor
Radiological Sciences Lab

Academy of Radiology Research Distinguished Investigator Award, 2012

Sanjiv Sam Gambhir, MD, PhD
Professor and Chair of the Department of Radiology
Director of MIPS

Distinguished Scientist Award from the Western Regional Meeting of the Society of Nuclear Medicine (WRSNM), 2012

Norbert Pelc, ScD
Professor and Chair of Bioengineering
RSL

National Academy of Engineering (NAE), 2012
Dr. Pelc elected for his role in developing algorithms and technologies for MRI, CT, and hybrid X-ray/MRI imaging.

Named Chair, Department of Bioengineering, Stanford University, 2012

Sylvia Plevritis, PhD
Associate Professor and Co-Director of ISIS

Academy of Radiology Research Distinguished Investigator Award, 2012

Garry Gold, MD
Professor and Associate Chair for Research
Musculoskeletal Imaging

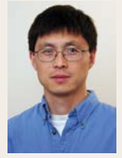
Named Associate Chair for Research, 2012

Academy of Radiology Research Distinguished Investigator Award, 2012

Robert Herfkens, MD
Professor and Associate Chair, Clinical Technology
Cardiovascular Imaging

Received Excellence in Clinical Service and Patient Care Award, awarded by Stanford Hospital Radiology Department, 2012

Academy of Radiology Research Distinguished Investigator Award, 2012



Jianghong Rao, PhD
Associate Professor
MIPS

Academy of Radiology Research Distinguished Investigator Award, 2012

Daniel Rubin, MD
Assistant Professor
ISIS (Information Sciences in Imaging at Stanford)

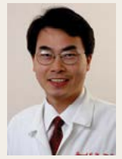
Elected to the American College of Medical Informatics (ACMI), 2012

Received "Most Awesome Advisor Award" from his students and trainees

Faculty Honors

Daniel Spielman, PhD
Professor
RSL

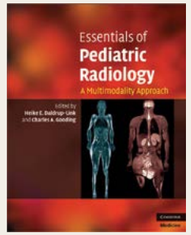
Academy of Radiology Research Distinguished Investigator Award, 2012



Joseph Wu, MD, PhD
Associate Professor
Radiology and Cardiovascular Medicine
MIPS

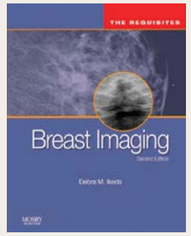
Elected to American Society Clinical Investigators, ASCI, 2013

Faculty Books

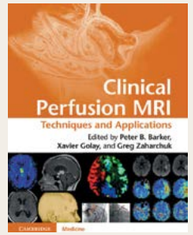


Daldrup-Link HE, Gooding C (Co-Editors): "Kinderradiologie: Bildgebende Verfahren in der Paediatrie" (the German Translation of the book: Essentials of Pediatric Radiology), Hans Huber Verlag, in press.

Federle MP, ed. "Specialty Imaging: Heptatobiiary and Pancreas." Amirsys, Salt Lake City, 2012.



Ikeda D., "Breast Imaging: The Requisites." 2nd Edition. Elsevier Mosby, St. Louis, MO, 2011.

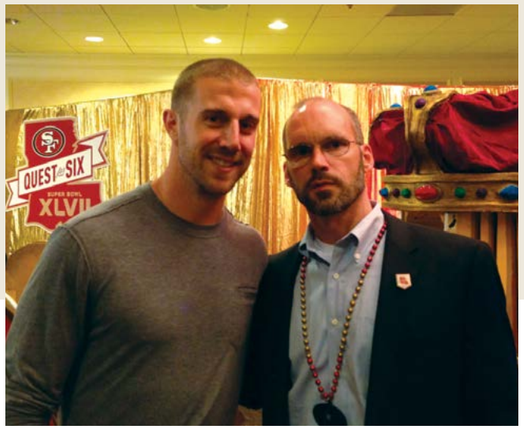


Barker PB, Golay X, Zaharchuk G, eds., "Clinical MR Perfusion Imaging: Techniques and Applications." Cambridge University Press 2013.

The People Connection

Our MSK Team on the Field

Drs. Garry Gold and Sandip Biswal on the sidelines of every one of Stanford Football's home games along with the technologists and sports med team.



Dr. Chris Beaulieu with 49ers quarterback Alex Smith in New Orleans before Super Bowl XLVII.

Dr. Garry Gold with Kerri Walsh (Olympic Gold Medal, Volleyball) on the sidelines at a Stanford Football game.

Dr. Chris Beaulieu with San Francisco Giants baseball pitcher Sergio Romo during a visit to the 49ers locker room after a recent game.

Did you know that our very own Dr. Chris Beaulieu is the team radiologist for the 49ers? He has performed special image-guided procedures for the club since 1996, and for the last 7 years has overseen Candlestick Park x-ray operations as well as most other imaging studies. Earlier this year, Dr. Beaulieu traveled to New Orleans during the Super Bowl to provide medical imaging and support to the team. In addition to the 49ers, Dr. Beaulieu, his MSK colleagues, and the excellent Stanford Hospital support staff provide imaging expertise to the Golden State Warriors as well as to all Stanford teams and innumerable community athletes. Thanks to the MSK section for their critical service to our high profile teams on behalf of the Stanford School of Medicine and Radiology department.

Pediatric Team Encourages Ultrasound at Home and Internationally

Improving Resident Training in Ultrasound to Improve Healthcare in Resource Poor Regions of the World

Dr. Erika Rubesova, faculty in Pediatric Radiology, and Dr. Benjamin Johnson, second year radiology resident, spend their after-hours focusing on innovative methods to evaluate ultrasound training and utilization in the United States and other countries. They are on a mission to improve resident ultrasound education and training by building collaborative partnerships with other countries where ultrasound is more broadly utilized, such as in Europe. In the U.S, the Radiologist's role in ultrasound acquisition has diminished over the past decade to the point that resident training is inadequate and more often bordering on nonexistent. Ultrasound diagnostic fidelity is very much dependent on the operator's level of expertise. The resulting variability in image quality, when combined with the increasingly higher resolution of CT and MRI, has led to increasing utilization of the latter modalities, with decreasing emphasis on maintaining ultrasound competence in current radiology trainees. As a result, other medical specialties such as obstetrics, surgery, and emergency medicine have begun to fill the void left by the radiological de-emphasis, with more and more trainees in these fields learning point of care ultrasound acquisition and interpretation as part of their resident education. Drs. Rubesova and Johnson believe it is important for radiologists to remain the experts of this modality, and guide research to introduce new ultrasound technology and applications into clinical use in the context of calls to reduce radiation exposure and lower medical costs.

Drs. Rubesova and Johnson are working toward offering a more comprehensive ultrasound training program for Stanford Radiology residents and promoting nationwide training awareness as their program expands. Complementary to their goal of providing residents with diverse and comprehensive training in ultrasound technique and interpretation, they are working to develop an elective rotation in East Africa where residents can apply their ultrasound skillset to improve healthcare in the developing world. Building imaging infrastructure in resource-poor regions is something that Dr. Johnson is passionate about and an area in which he has been working actively since medical school.

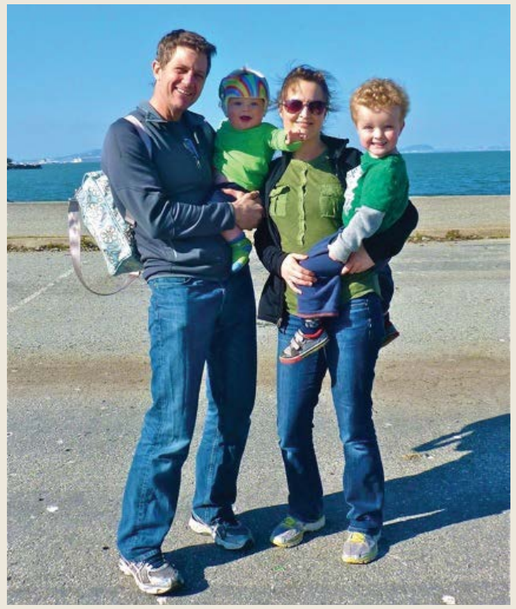
What are the Odds...

…that three radiology residents from the same North Dakota high school would match for the same radiology residency class, the same year, and at the same academic institution?

Stanford Radiology Residents Sarah Garaas, Marnie Kremer, and Jonathan Williams.

Three Fargo South graduates are members of a select group of nine residents at Stanford School of Medicine at the same time. Sarah Garaas, 1998, Marnie Kremer, 1996, and Jonathan Williams, 1997 are again 'classmates'. They had not been in contact for years and were unaware that they were all in medical school until they ran into each other while interviewing for residency. The residency match process is somewhat like a lottery. On the day they received their acceptance letters, it was quite a shock not only for the three of them, but also for our Department to learn that all three Fargo South graduates were going to be in the same program.

According to Terry Desser, MD, Residency Program Director, "There are 980 residency positions in Radiology offered nationwide. There are about 1300 radiology residency applicants. What are the chances that 1/3 of our residency class—let alone the SAME residency class—would be filled by graduates of the same Fargo North Dakota high school? You can do the arithmetic, but I would guess they are on par with the probability of winning the lottery."



The Roosevelts go to the beach with baby James (left).

Suzanne Roosevelt
Quality Improvement Manager, SHC Radiology

Jackie's granddaughter, Vivia, born March 6.

Jackie Walker
Financial Analyst

Ana Reshma (far right), from Bangalore, India, joins our family in 2012.

Gordon Shattock
CT and Department Technologist, SHC Radiology

Proud parents with Saum Gideon, having fun on a swing.

Pejman Ghanouni, MD, PhD
Assistant Professor, Body MRI

A boy and his father. Brandon Milo Yi.

Kendall Yi, MA
Faculty Affairs

Noemy with her 15 month old twins, Isabella and Sophia.

Noemy Quiroz
Administrative Assistant, SHC Radiology

Gray Hargreaves-July 2012, Newest member of the Body MRI Research Group

Brian Hargreaves, PhD
Associate Professor, RSL

Appendix

Angel Funding

The Department of Radiology and the Angel Funding Review Committee is pleased to announce 2012 Angel Funding for the following projects that include new partnerships within the Department, high risk projects, and first-in-man studies. Congratulations and wish you great success in your work and your newly established collaborations.

PI	Co-I	Project Title
Sandip Biswal, MD; Michael Moseley, PhD	Matthew Smuck, MD; Deqiang Qiu, PhD; Deepak Behera, DNB	Focused magnetic nanoparticle theranostics for chronic pain
Pejman Ghanouni, MD, PhD; George Segall, MD; Hong Yu, MD; David Hovsepian, MD		A feasibility study to evaluate the safey and initial effectiveness of MR-guided focused ultrasound surgery in the treatment of facetogenic lumbar back pain
Andrei Iagaru, MD	Arutselvan Natarajan, PhD; Erik Mittra, MD, PhD; Ranjana Advani, MD	Assessing response to treatment in non-Hodgkin's lymphoma patients using 64Cu-DOTA-Rituximab PET/CT
Nishita Kothary, MD	Sandy Napel, PhD; Sylvia Plevritis, PhD; Aya Kamaya, MD; Parag Mallick, PhD	Development of predictive models of vascular invasion in hepatocellular carcinoma
Jafi Lipson, MD; Sharon Pitteri, PhD	Sandy Napel, PhD; Sylvia Plevritis, PhD; Aya Kamaya, MD; Parag Mallick, PhD	A pilot study of correlative imaging, leukocyte telomere length, and circulating telomerase levels of patients with benign and malignant breast lesions
Andrew Quon, MD; Joseph Wu, MD, PhD	Andrei Iagaru, MD; Patricia Nguyen, MD	Indium-111 labeled stem cell imaging for monitoring myocardial stem cell therapy
Aya Kamaya, MD; Juergen Willmann, MD	George A. Fisher MD, PhD; Dimitre Hristov, PhD; Lu Tian, PhD	Early detection of treatment response in patients with colorectal cancer liver metastases using volumetric perfusion ultrasound imaging

Canary Funding

Sponsor	PI	Title
Dept of Defense	Cheng, Zhen	Peptoid-Based PET Probes for Prostate Cancer Imaging
NIH	Cheng, Zhen	VEGFR-2 Targeted Imaging
NIH	Paulmurugan, R.	Molecular Sensors for Imaging Histone Methylations in Living animals
Amer Soc for Mass Spec	Pitteri, Sharon	Mass Spectrometry-Based Identification, Quantitation, and Characterization Methods of microRNAs for Ovarian Cancer Early Detection
Labcyte, Inc.	Stolowitz, Mark L	High Throughput Biomarker Verification by MALDI-MS

Sponsor	PI	Title
SIIMS	Faruque, Jessica	Developing a Scalable Similarity Reference Standard for a Content-Based Image Retrieval
NIH	Napel & Plevritis	Tools for Linking and Mining Image and Genomic Data in Non-Small Cell Lung Cancer
NIH	Napel & Sommer	Advanced Techniques for Cancer Imaging and Detection
Georgetown	Plevritis, Sylvia	Comparative Modeling: Informing Breast Cancer Control Practice & Policy
MGH	Plevritis, Sylvia	Comparative Modeling of Lung Cancer Control Policies
NIH	Plevritis, Sylvia	Modeling the Role of Differentiation in Cancer Progression
NIH	Plevritis, Sylvia	Clinically-Relevant Regulatory Networks in the Lung Tumor Microenvironment
ACR	Rubin, Daniel L	Informatics Committee Chair
Beth Israel	Rubin, Daniel L	Small Imaging Informatics Pilot Project
Brigham & Women's	Rubin, Daniel L	Neuroimaging Analysis Center (NAC)
Emory U	Rubin, Daniel L	In Silico Research Center
GE Medical Systems	Rubin, Daniel L	Next-Generation PACS 2.0: Content-Based Image Retrieval in Centricity System
General Electric	Rubin, Daniel L	Annotation and Image Markup (AIM) Phase II - Integration with RA1000
General Electric	Rubin, Daniel L	Pathology Integration Investigator Initiated Study Agreement replaces Work Statement A-56.
NIH	Rubin, Daniel L	Computerized Quantitative Imaging Assessment of Tumor Burden
Northwestern U	Rubin, Daniel L	Annotations and Image Markup Project - Phase I and II
RSNA	Rubin, Daniel L	Enriching the RadLex Ontology to Enable Biomedical Imaging Research in Neuroimaging
RSNA	Rubin, Daniel L	NIBIB/DOD IAA RadLex Playbook "Expedited Development of Radiology Lexicon"
RSNA	Rubin, Daniel L	RSNA Imaging Sharing Project
RSNA	Rubin, Daniel L	RadLex NLP Project
Siemens	Rubin, Daniel L	Evaluation of radiology reporting concepts
UCSF	Rubin, Daniel L	Ontology-Based Integration of Human Studies Data
Vanderbilt	Rubin, Daniel L	Tool Support for Radiologist-Oncologist Workflow in Using Quantitative Methods to Assess Disease Response
Siemens	Rubin, Daniel L	Evaluation of radiology reporting concepts

Sponsor	PI	Title
NIH	Bieniosek, Matthew	Electro-optical Approach to Achieve Time-of-Flight PET/MRI for Cancer Imaging
Amer Assoc for Cancer Rsch	Bohndiek, Sarah	Molecular imaging and diagnostics for improved ovarian cancer management
AHA	Burridge, Paul	Molecular Mechanisms of Electrical Maturation of hiPSC-Derived Cardiomyocytes
NIH	Chen, Wen-Yi	Modeling Familial Dilated Cardiomyopathy Disease Mechanism Using Human iPS Cells
Intl Soc for Hrt & Lung Transp	De Almeida, Patricia	Patient Specific Induced Pluripotent Stem Cell-Derived Cardiomyocytes for Modeling Familial Dilated Cardiomyopathy
DOD	de la Zerda, Adam	Early Assessment of Breast Cancer Therapy Responses Using Photoacoustic Molecular Imaging
Doris Duke Fd	Gambhir	Molecular Imaging of Cancer with a Voltage Sensor
DOE	Gambhir, Cheng, Chin	Stanford Molecular Imaging Research and Training Program (SMIRTP)
AMI	Gambhir, Sam	Study Drug: Sodium fluoride F18 Injection
Bayer	Gambhir, Sam	Contract Manufacturing Agreement
Bayer	Gambhir, Sam	Open-label Study for an Exploration of Tumor Accumulation and Safety and Tolerability of the F-labeled PET/CT (Positron Emission Tomogrpahy) Tracer BAY 94-9392 Following a Single Intravenous Administration of 300 MBq
Ben & Catherine Ivy Fd	Gambhir, Sam	18F PPRGD2 PET/CT and MRI Evaluation of Response to Anti-Angiogenesis Therapy in Recurrent Glioblastoma Multiforme (GBM)
Ben & Catherine Ivy Fd	Gambhir, Sam	Next Generation Neuro-Oncological Imaging Strategies
Fred Hutch Cancer Ctr	Gambhir, Sam	Ovarian Cancer Early Detection Using Microbubble Contrast Enhanced Ultrasound (CEUS) Targeting Tumor Associated Angiogenesis
General Electric	Gambhir, Sam	Apoptosis Imaging and EGFR Therapy Selection and Monitorning-Phase 1
Hopkins	Gambhir, Sam	Role of Cellular Microrheology in the Metastatic Adhesion of Circulating Tumor Cells
Lung Cancer Rsch Fd	Gambhir, Sam	Differential Gene Expressions for FDG Avid Normal Tissue and Tumors
NIH	Gambhir, Sam	Reporter Imaging of Protein-Protein Interactions
NIH	Gambhir, Sam	In Vivo Cellular and Molecular Imaging Center @Stanford
NIH	Gambhir, Sam	Center of Cancer Nanotechnology Excellence Focused on Therapy Response
NIH	Gambhir, Sam	Imaging Cytolytic T Cells in Cancer Patients Using PET Reporter Genes/Reporter Probes
NIH	Gambhir, Sam	Center for Cancer Nanotechnology Excellence and Translation (CCNE-T)
NIH	Gambhir, Sam	New Tools for Prostate Cancer Detection and Prognostication
Sanofi-Aventis	Gambhir, Sam	Stanford-Sanofi -Aventis Research Collaboration
Schering	Gambhir, Sam	Collaborative Research Agreement: Project 1: Tumor Lymphangiogenesis Imaging Project 2: PET Imaging of Breast Cancer using Fructose Analogues
USC	Gambhir, Sam	Multi-Scale Complex Systems Transdisiplinary Analysis of Response to Therapy (MC-START)
AHA	Hu, Shijun	Transplantation and Imaging of Novel Cardiac Stem Cell Therapy
AHA	Huang, Mei	Novel Cardiac Gene Therapy with Minicircle Vectors

Sponsor	PI	Title
Burroughs Wellcome	Jokerst, Jesse	A biodegradable contrast agent for ultrasound-guided stem cell therapy
California	Lau, Frances Wing Yee	Electronics for High Resolution Breast-Dedicated PET
DOE	Levin, Craig	New Strategies for 0.5 mm Resolution/High Sensitivity Multi-Radionuclide Imaging
General Electric	Levin, Craig	Novel radiation detector capable of measuring the energy of individual x-ray photons at high flux rates
NIH	Levin, Craig	Advanced PET System Dedicated to Breast Cancer Imaging
NIH	Levin, Craig	Stanford Molecular Imaging Scholars (SMIS)
NIH	Levin, Craig	Enhancing Molecular Cancer Imaging with Cadmium Zinc Telluride PET
NIH	Levin, Craig	Preclinical Translation of New Scintillation Light Detection Concepts for PET
NIH	Levin, Craig	Photon Interaction Depth Encoded Time-of-Flight PET
Phillips	Levin, Craig	Exhibit B-6 Emission-based attenuation correction for PET
DOD	Rao, Jianghong	Enzyme-triggered Polymerization: a new platform for breast cancer imaging
NIH	Rao, Jianghong	QD-BRET nanosensors for protease detection and imaging
NIH	Rao, Jianghong	Nanotechnology for Multiplex Detection of Enzymes
Texas A&M	Rao, Jianghong	Development of Fluorgenic Probes for In Vivo Imaging of Tuberculosis
NIH	Smith, Bryan Ronain	How do Nanoparticles Target Cancer? An In Vivo Experimental/Mathematical Study
Susan Komen Fd	Van de Sompel, Dominique	New Strategies for Monitoring Response to Breast Cancer Therapy using Photoacoustic Molecular Imaging
DOA	Vandenbroucke, Arne	Commissioning and Characterizing a dedicated high resolution breast PET camera
Netherlands Org Sci Rsch	Vinke, Ruud	A Novel Time-of-Flight Positron Emission Tomography System Based on Monolithic Scintillation Detectors
Burroughs Wellcome	Wu, Joseph	Molecular and Cellular Mechanisms of Cardiac Regeneration
Mallinckrodt Fd	Wu, Joseph	Innovative Approach for Reprogramming Stem Cells for Regenerative Medicine
NIH	Wu, Joseph	Nanostructuring and Molecular Imaging of Engineered Cardiovascular Tissues
NIH	Wu, Joseph	09: Inducing Pluripotency with MiRNAs: New Paradigm Shift in Cell Reprogramming
NIH	Wu, Joseph	Molecular Imaging of Targeted Cardiac Gene Therapy
NIH	Wu, Joseph	Re-Education of the Immune System for hES Cell Tolerance
NIH	Wu, Joseph	Integrated Strategies for Novel Treatment of Myocardial Ischemia
NIH	Wu, Joseph	Molecular Imaging of Cardiac Stem Cell Therapy
NIH	Wu, Joseph	Molecular and Cellular Phenotype of Aging and ips Cells
Life Sci Rsch Fd	Ziv, Keren	Non-Invasive and Real-Time Monitoring of Stem Cells Using Photoacoustic Molecular Imaging in Living Mice

Sponsor	PI	Title
GE Healthcare	Barth, Richard A	Probe Evaluation
GE Healthcare	Barth, Richard A	LE9 User Interface
General Electric	Beaulieu, Christopher	Multi-Media Radiology Report
Sib Tech Inc	Blankenberg, Francis	Targeted Delivery of Lu-177 to tumor vasculature
GE Global Research	Daldrup-Link, Heike	Tumor Enhancement with GEH121333: Optimization for the Clinic (phase 2)
NIH	Daldrup-Link, Heike	Improved Drug Delivery to Tumors Using Novel Tissue Perfusion Approaches
NIH	Daldrup-Link, Heike	Stem Cell Tracking in Arthritic Joints: Clinical Translation
NIH	Daldrup-Link, Heike	Novel Imaging Approach to Monitor Chondrogenic Differentiation of iPS Cells
NIH	Daldrup-Link, Heike	Imaging of Tumor-Associated Macrophages with Ferumoxytol
Thrasher Rsch Fund	Daldrup-Link, Heike	Development of a Radiation Free Whole Body MR Imaging Technique for Staging Children with Cancer
UCSF	Daldrup-Link, Heike	Improved Drug Delivery to Tumors Using Novel Tissue Perfusion Approaches
NIH	Daniel, Bruce Lewis	High Resolution 3D diffusion-weighted breast MRI
SNIS	Do, Huy M.	Society of NeuroInterventional Surgery (SNIS) Fellowship Grant
Soc Pediatric Rad	Gawande, Rakhee	Whole Body Diffusion-weighted MR Scans for Cancer Staging in Pediatric Patients: A Radiation Free Alternative to FDG-PET
Arthritis Fd	Gold, Garry Evan	Sodium MRI of Post-traumatic Arthritis
General Electric	Gold, Garry Evan	Advanced MR Applications Development - Tiger Team Year 5
NIH	Gold, Garry Evan	MRI for Early Detection of Osteoarthritis
NIH	Gold, Garry Evan	Advanced MR Imaging of Early Osteoarthritis
	Herfkens, Robert J	PET-MR, Disease Based Patient Workflow and System Requirements
General Electric	Herfkens, Robert J	GE PACS System
Genentech, Inc.	Hofmann, Rusty	ATTRACT: Industry Portion
Wash Univ	Hofmann, Rusty	Pharmacomechanical Catheter-Directed Thrombolysis for Acute DVT-Attract Trial
WL Gore & Assoc.	Hofmann, Rusty	Evaluation of GORE VIABAHN Endoprosthesis with Heparin Bioactive Surface for the Treatment of Venous Occlusions and Stenoses
InSightec	Hovsepian, David	A Feasibility Study to Evaluate the Safety and Initial Effectiveness of ExAblate MR Guided Focused Ultrasound Surgery in the Treatment of Pain Resulting from Metastatic Bone Tumors with the ExAblate 2100
InSightec-TxSonics	Hovsepian, David	A pivotal study to evaluate the effectiveness and safety of ExAblate treatment of metastatic bone tumors for the Palliation of Pain in Patients who are not Candidates for Radiation Therapy
Grifols USA, Inc	Hwang, Gloria	Alpha-1 Antitrypsin Therapy for Acute Experimental Pancreatitis
Bayer Healthcare Pharmaceuticals, Inc.	Iagaru, Andrei	Radium-223 Chloride (Alpharadin) in Castration-Resistant (Hormone-Refractory) Prostate Cancer Patients with Bone Metastasis
ART, Inc	Ikeda, Debra M	SSC-311 Adjunctive Efficacy Study of the SoftScan Optical Breast Imaging System
Soc of GI Radiologists	Kamaya, Aya	Prognostic Value of Early Perfusion CT changes in colorectal liver metastases treated with bevacizumab determined study
Soc of Uroradiology	Kamaya, Aya	Photoacoustic Imaging of Bladder Cancer

Sponsor	PI	Title
Jennerex, Inc.	Kothary, Nishita N.	A Phase 2b Randomized Single-Blinded Trial of JX-594 (Vaccinia GM-CSF / TK-deactivated Virus) Plus Best Supportive Care Versus Placebo Plus Best Supportive Care in Patients with Advanced Hepatocellular Carcinoma Who Have Failed Sorafenib Treatment
Siemens	Kothary, Nishita N.	Advanced Applications in Interventions Radiology Addendum ID: SUMC -2010-AX-01
EKOS Corp	Kuo, William	Submassive and Massive Pulmonary Embolism Treatment with Ultrasound AcceleraTed Thrombolysis ThErapy: A Prospective, Single-Arm, Multi-center Trial of EkoSonic® Endovascular System and Activase for Acute Pulmonary Embolism
ev3 Neurovascular	Marks, Michael P	SWIFT-solitaire FR with the Intention for Thrombectomy Study
Micrus Endovascular	Marks, Michael P	Project: Clinical Evaluation of Virtual Stent - Software for Stent Planning of Intracranial Aneurysms
Micrus Endovascular	Marks, Michael P	VISSIT: Vitesse Intracranial Stent Study for Ischemic Therapy
Siemens	Marks, Michael P	C-arm CT Perfusion Imaging in Acute Stroke
Celgene	Quon, Andrew	E2408 PET Scan Review
Millennium Pharm., Inc.	Quon, Andrew	E2408 PET Scan Review
NCCN	Quon, Andrew	Evaluating Sunitinib Therapy in Renal Cell Carcinoma
NIH	Quon, Andrew	FLT-PET/CT for Therapy Monitoring of DLBCL
RSNA	Shin, Lewis K	RSNA Research Seed Grant
NIH	Sommer, F Graham	Precise MRI-Directed Sonic Ablation of Prostate Cancer
NIH	Sommer, F Graham	MRI - Guided Ultrasonic Ablation of Pancreatic Cancer
BioSphere Medical, Inc.	Sze, Daniel	PHASE 3 Prospective Randomized, Blinded and Controlled Investigation of Hepashere/Quadrasphere Microspheres for Delivery of Doxorubicin for the Treatment of Hepatocellular Cancer.
WL Gore & Assoc.	Sze, Daniel	Evaluation of the GORE TAG Thoracic Endoprosthesis for the Treatment of Complex Pathology of the Descending Thoracic Aorta
WL Gore & Assoc.	Sze, Daniel	Evaluation of the GORE TAG Thoracic Endoprosthesis - 45 mm for the Primary Treatment of Aneurysm of the Descending Thoracic Aorta
WL Gore & Assoc.	Sze, Daniel	An Evaluation of the GORE Conformable TAG Thoracic Endoprosthesis for the Primary Treatment of Aneurysm of the Descending Thoracic Aorta
WL Gore & Assoc.	Sze, Daniel	The GORE VIATORR TIPS Endoprosthesis versus Large-Volume Paracentesis for the Treatment of Ascites in Patients with Portal Hypertension (Early TIPS for Ascites Study)
GE Healthcare	Vasanawala, Shreyas	MR Imaging for Pediatric Populations- Pediatric Positioner Pad
GE Medical Systems	Vasanawala, Shreyas	Wireless Receiver Coil Transponders for MRI
NIH	Vasanawala, Shreyas	Rapid Robust Pediatric MRI
Bracco Diagnostic	Willmann, Juergen	Characterization of Focal Liver Lesions With Sonovue-Enhanced Ultrasound Imaging: A Phase III, Intrapatient Comparative Study vs Unenhanced Ultrasound Imaging Using Histology or Combined Imaging/Clinical Data as Truth
Bracco Diagnostic	Willmann, Juergen	Ultrasonic Molecular Imaging
Eli & Edythe L Broad Fd	Willmann, Juergen	Monitoring Inflammation with Molecular Ultrasound Imaging in Porcine IBD Model
NIH	Willmann, Juergen	Molecular Ultrasound for Early Breast Cancer Detection
NIH	Willmann, Juergen	Quantification and Monitoring Inflammation in IBD with Molecular Ultrasound
Siemens Med Solutions	Willmann, Juergen	Ultrasound Molecular Imaging in Large Animal Inflammatory Bowel Disease Models
NIH	Zaharchuk, Greg	Quantifying Collateral Perfusion in Cerebrovascular Disease

Sponsor	PI	Title
NIH	Balchandani, Priti	High Resolution Magnetic Resonance Imaging and Spectroscopy of Epilepsy at 7T
Apple Computer	Bammer, Roland	MRI of the Human Head and Ears
DOD	Bammer, Roland	Development of Diffusion Tensor Imaging (DTI) Phantoms to Enhance the Diagnosis of Moderate Traumatic Brain Injury (TBI)
NIH	Bammer, Roland	Advanced MR and CT Imaging for Understanding Acute Stroke Evolution and Predictin
NIH	Bammer, Roland	Short Axis EPI for Diffusion Tensor MRI at High Field
NIH	Bammer, Roland	Novel Acquisition Methods for Diffusion MRI
NIH	Bammer, Roland	Real-Time MRI Motion Correction System
California BCRP	Bitton, Rachel Rinat	MRI Guided Focused Ultrasound in Breast Cancer Treatment
Focused US Surg Fd	Butts Pauly, Kim	Phase aberration correction for transcranial MR-guided focused ultrasound using a hybrid simulation and MR-ARFI method
GE Healthcare	Butts Pauly, Kim	Neuromodulation for MR-guided Focused Ultrasound
GE Healthcare	Butts Pauly, Kim	MR-guided Focused Ultrasound Research: Improved MR Thermometry
NIH	Butts Pauly, Kim	MR-Image Guided Focused Ultrasound for Treatment of Liver and Renal Cancer
NIH	Butts Pauly, Kim	MRI Methods for Guiding Focused Ultrasound in the Brain
NIH	Butts Pauly, Kim	Magnetic Resonance Imaging-Guided Cancer Interventions
NIH	Fahrig, Rebecca	MR-Compatible Linac Gun for Robotic Linac Adaptation
NIH	Fahrig, Rebecca	C-Arm CT for Guidance of Cardiac Interventions
NIH	Fahrig, Rebecca	Ultrafast Tomosynthesis for Transbronchial Biopsy Guidance
NIH	Fahrig, Rebecca	Dual KV/MV Imaging for Metal Artifact Reduction
Siemens	Fahrig, Rebecca	Addendum to Cardiac Project
Siemens	Fahrig, Rebecca	Perfusion Supplement
Siemens	Fahrig, Rebecca	Pilot Study: A Pancreatic Model for Drug Discovery
Siemens	Fahrig, Rebecca	Image Quality Improvement/zeego
Siemens	Fahrig, Rebecca	Maximizing Zeego Flexibility
NIH	Glover, Gary H	Center for Advanced Magnetic Resonance Technology at Stanford
Univ of Minn	Glover, Gary H	Implementing the New WU-Minn HCP Pulse Sequences on the GE Platform
GE Company	Hargreaves, Brian	Advanced MRI Near Metallic Implants
NIH	Hargreaves, Brian	Magnetic Resonance Imaging near Metallic Implants
NIH	Hargreaves, Brian and Bruce Daniel	High-Resolution Whole-Breast MRI at 3.0T
NIH	Moseley, Michael E.	Microvascular Measures of Perfusion in Stroke Recanalization
GE Healthcare	Pelc, Norbert J	Advanced Computed Tomography (CT) Systems and Algorithms
NIH	Pelc, Norbert J	Inverse Geometry CT for Dose-efficient Volumetric Imaging

Sponsor	PI	Title
NIH	Pelc, Norbert J	Predoctoral Training in Biomedical Imaging at Stanford University
NIH	Rieke, Viola	MRI-guided Cardiac Focused Ultrasound Ablation
CIRM	Rutt, Brian	Development of single cell MRI Using Genetically-Encoded Iron-based reporters
NIH	Rutt, Brian	Next Generation 7T MRI Platform Upgrade with Parallel Transmit Capabilities
Dept of Army	Spielman, Daniel	In Vivo Imaging of Branched Chain Amino Acid Metabolism in Prostate Cancer
NIH	Spielman, Daniel	1H MRSI of the Human Brain at 7T
NIH	Spielman, Daniel	Metabolic Imaging of the Cardioprotective Effects of Alcohol and ALDH2 Activators
SRI International	Spielman, Daniel	Dynamic Metabolic Imaging of Hyperpolarized Substrates
Univ of Miami	Spielman, Daniel	Partnership for MR Spectroscopic Imaging Data Processing

ISMRM 2012 (May 5-11, Melbourne, Australia)

Addy, Grissom, Nishimuura	Interactive vs LTA Based Gradient Predistortion for Multidimensional Excitation
Addy, Wu, Nishimura	EPT Ghose Cofrrection with LTI k-s[ace Trajectory Estimation
Aksoy, Holdsworth, O'Halloran, Bammer	Combined RS-EPI and SAP-EPI for High Resolution Diffusion-Weighted Imaging
Aksoy, Ooi, Holdsworth, O'Halloran, Bammer	MR-based and Optical Prospective Motion Correction for High Resolution DWI with RS-EPI
Aksoy, Ooi, Watkins, Kopeinigg, Forman, Bammer	Combining Active Markers and Optical Tracking for Prospective Head Motion Correction
Alley, Hsiao, Saranathan	Reduction of Respiration Artifacts in 3D Phase Contrast Imaging with Intermittent Fat Saturation
Balchadani, Spielman, Pauly	STABLE-2: A shorter, more B0-insensitive option for adiabatic slice-selective excitation
Balchandani, Pauly, Spielman, Glover	Spin Echo and Adiabatic Spin Echo Motion Compensated Spiral functional MRI
Chan, Khalighi, Rutt	Experimental Validation of FDTD Magnetic Field Modeling in the Human Head at 7T
Chang, He, Duyn	Dynamics of BOLD fMRI time series: dependence on cognitive load and sensitivity to temporal pre-processing
Chang, Metzger, Glover, Walter	Dynamics of resting-state functional connectivity associated with heart rate variability
Chen, Rogers, Rutt	Infiltration contrast agent in tissue increases the MRI detectability of amyloid plaques in rabbit AD model
Cheng, Vasanawala, Alley, Cuningham, Pauly, Lustig	Butterfly Motion Ocrrectionusing Coil Arrays
Christen, Qiu, Ni, Hankov, Zun, Moseley, Zaharchuk	High-Resolution Quantitative Cerebral Blood Volume Imaging in Humans Using the Blood Pool USPIO Contrast Agent Ferumoxytol
Christen, Qiu, Ni, Schmiedeskamp, Bammer, Moseley, Zaharchuk	Steady-State abd Dynamic Susceptibility Contrast using USPIOs in Humans
Daldrup-Link	MR Imaging of Macrophages in Tumors and Stem Cell Transplants (Workshop)
de Rochefort, Lee, Polello, Darrasse, Ferrante, Rutt	Characterization and Compensation of Eddy Current Inducedd by Insertable dreMR Magnet
Granlund, Chen, Gui, Huo, LeRoux, Zur	Prescan Phase Correction for Off-isocenter 3D FSE Imaging
Granlund, Lipson, Kao, Ikeda, Hargreaves, Daniel	Clinical evaluation of 3D diffusion-weighted breast imaging with dual echo steady state (DESS)
Hankov, Christen, Schmiedeskamp, Bammer, Zaharchuk	Analysis of MR Signal Dynamics during Carbogen Inhalation using a Combined Spin- And Gradient-Echo (SAGE) EPI Sequence
Islam, Glover	Quadrature slice-encoding for reduced scan time
Istrella, Butts Pauly, Grissom, Rieke	Reduction of Motion Artifacts in MGuFUS in the Brain using Hybrid Thermometry
Johnson, Pauly	Fourier Reconstruction for O-space imaging
Keenan KE, Besier TF, Smith RL, Pauly JM, Delp SL, Beaupre GS, Gold GE.	T1p Dispersion in Articular Cartilage: Relationship toMaterial Properties and Macromolecules.
Kerr, Larson, Vigneron, Pauly	A Low-Power Asymmetrically-Selective Adiabatic Pulse
Kerr, Larson, Vigneron, Pauly	Minimum-Duration Abiabatic Spectral-Spatial Refocussing Pulses
Khalighi, Chan, Rutt	Parallel Ttransmit SAR Estimation using FDTD Modeling in the Human Head at 7T
Khalighi, Rutt, Kerr	Adiabat ic pulse design for Bloch-Siegert B1+ Mapping

ISMRM 2012 (May 5-11, Melbourne, Australia)

Khalighi, Zeineh, Rutt	Intensity Correction at 7T Using Bloch-Siegert B1+ Mapping
Kitzler, Noack, Su, Schmidr, Zienssen, Deoni, Rutt	Multi-Component Relaxation In Untreated Relapsing-Remitting Multiple Sclerosis
Kwon, Wu, Lustig, Nishimura	Parallel Imaging Using a 3D Concentric Cylinders Trajectory
Kwon, Wu, Shin, Cukur, Nishimura	Non-contrast-enhanced Flow-independent Peripheral Angiography ising a 3D Concentric Cylinders Trajectory
Lee, deRochefort, Ferrante, Rutt	Next Generation Delta relaxation EnhancedMRI with +0.36T delta B
Levesque, Su, Khalighi, Pauly, Rutt	kT-points RF Pulses for Pre-Compensation of B1+ Heterogeneity in DESPOT1
McWalter EJ, Sveinsson B, Staroswiecki E, Alley MT, Hargreaves BA, Gold GE.	Rapid 3D Quantitative DESS T2 and T2* Mapping in the Meniscus.
McWalter, Sviensson, Staroswiecki, Alley, Hargreaves, Gold	Rapid 3D quantitative DESS T2 and T2* Mapping in the Meniscus
Moran, Granlund, Daniel, Sveinsson, Staroswiecki, Alley, Hargreaves	Dual Echo Steady State Quantitative T2-mapping in the Breast
Moran, Hargreaves, Saranathan, Daniel	Evaluation of 3D Enhanced Echo Train T2-weighted Imaging for the Characterization of Breast Lesions
Nguyen MLH, Chen W, Gold GE.	Quantitative Assessment of Cartilage using CubeQuant.
Ni, Qiu, Christen, Schmiedeskamp, Bammer, Moseley, Zaharchuk	Cerebral MR Signal Changes Inducded by Ferumoxytol and Saline Dilution Boluses: Initial Human Experience
Ooi, Aksoy, Watkins, Bammer	High Precision Tracking of Un-Tuned Micro-Coils for Real-Time Motion Correction Applications
Pal S, Besier TF, Fredericson M, Beaupre G, Delp SL, Gold GE.	Patellar Maltracking is Related to Patella Height in Patellofemoral Pain Subjects: An Upright, Weightbearing MRI Study.
Pandit, Yu, Ronald, Rao, Rutt	Gadolinium-based "Smart" MRI Probes for Enzyne-targeted Cancer Imaging
Park, Hurd, Josan, Yen, Pfefferbaum, Mayer, Spielman	Differentiation of Flux and Isotopic Exchange using Co-administration of Hyperpolarized [2-13C]Pyr and [1-13C]Lac
Park, Josan, Yen, Hurd, Spielman, Mayer	Assessment of Dichloroacetate Effect on TCA Cycle Metabolism in Rat Brain In Vivo using MRSI of Hyperpolarized [2-13C]Pyruvate
Park, Recht, Josan, Jang, Merchant, Yen, Hurd, Spielman, Mayer	Metabolic Response of Glioma to Dichloroacetate Measured by Hyperpolarized 13C MRSI
Pauly	Butts Pauly, K, MR-Guided Focused Ultrasound, ISMRM Plenary Lecture, 2012
Plata, Holbrook, Prakash, Jones, Diederich, Sommer, Butts Pauly	Real-Time Interleaved Temperature and ADC Measurements For Early Assessment of Tissue Viability during Prostate
Qiu, Christen, Ni, Zaharchuk, Moseley	Characterization of Blood Pool Half Life of USPIO Contrast Agent Ferumoxytol in Humans
Qiu, Christen, Ni, Zaharchuk, Moseley	Vasculature Visualization using Blood Pool USPIO Contrast Agent Ferumoxytol in Humans
Qiu, Rex, Saranathan, Llober, Zaharchuk, Moseley, Yeom	Functional Blood Volume Imaging (fBVI) using Blood Pool Gadolinium Contrast Agent Gadofosveset Trisodium
Qiu, Yeom, Soman, Zaharchuk, Moseley	T1 Contrast-Based High-Resolution Cerebral Blood Volume Mapping (T1-BVI) Using Gadofosveset Trisodium in Humans
Qiu, Zaharchuk, Christen, Ni, Moseley	Enhanced fMRI Sensitivity using CBV based Contrast witht eh Blood Pool USPIO Agent Ferumoxytol in Humans
Quist, Hargreaves, Daniel, Saranathan	3D balanced SSFP Dixon imaging with Band-Reduction at 3T

ISMRM 2012 (May 5-11, Melbourne, Australia)

Rutt	Rutt B. Sensitivity, Quantification, New Sequences. ISMRM Workshop on MRI-Based Cell Tracking, 1 Feb 2012.
Saranathan, Rettmann, Hargreaves, Clarke, Vasanawala	High Spatio-temporal Resolution Dixon Imaging Sequence for Multiphasic Contrast Enhanced Abdominal Imaging
Saranathan, Rettmann, Hargreaves, Lipson, Daniel	High Spatio-temporal Resolution Breast Dynamic Contrast Enhanced MRI at 3T
Saranathan, Zeineh, Kerchner, Khalighi, Alley, Rutt	Optimized 3D Fast Spin Echo imaging at 7T
Schmiedeskamp, Straka, Christen, Zaharchuk, Bammer	Precision and accuracy of R2 and R2* estimation with spin- and gradient-echo EPI
Schmiedeskamp, Straka, Christen, Andrew, Nagpal, Recht, Thomas, Moseley, Zaharchuk, Bammer	Spin- and Gradient-echo PWI with correction for rT1- and T2(*) related contrast agent extravasation effects
Semadheera, Mayer, Josan, Yen, Darpolor, Park, Hurd, Luong, Xing, Spielman	Detection of Radiation Response of Prostate Cancer in TRAMP with Hyperpolarized 13C MRSI
Shapiro LM, Sveinsson B, Alley MT, Hargreaves BA, Gold GE.	Rapid Volumetric T2 Measurements in Muslce Pre- and Post-Exercise using Quantitative DESS.
Soman, Qiu, Moseley, Res, Barnes, Yeom	Evaluating pediatric neuropathies using multiple TE weighted susceptibility images using Multi Shot EPI Sequence
Son M-S, Levenston M, Hargreaves BA, Chen W, Goodman S, Gold GE	T1p and T2 Show Regional Variation in Degenerate HumanMenisci: Correlation with Biomechanics and Matrix Composition.
Stevens K, Do B, Gutierrez L, Worters P, Hargreaves BA, Koch K, Gold GE.	MRI Near Metallic Implants using a MAVRIC-SEMAC Hybrid at 3T.
Stevens, Do, Gutierrez, Worters, Hargreaves, Koch, Gold	MRI near Metallic Implants using a MAVRIC-SEMAC Hybrid at 3T
Su, Saranathan, Rutt	Accelerated Variable Flip Angle T1 Mapping via View Sharing of Pseudo-Random Sampled Higher Order k-Space
Sung, Nnewihe, Daniel, Hargreaves	Comparison of Wavelet Subband Decomposition for High-Frequency Subband CS
Sung, Saranathan, Quist, Vasanawala, Daniel, Hargreaves	Spatial and Temporal Behaviors in Rapid DCE MRI with and without Compressed Sensing
Sveinsson B, Alley MT, Gold GE, Hargreaves BA.	3D Diffusion Tensor Imaging in Muscle with DESS.
Sveinsson, Staroswicki, Granlund, Gold, Hargreaves	Mapping of T2 and ADC in Articular Cartilage with B1 Corrected DESS
Watkins, Caverly, Doherty	298 MHz Micro miniature 2KW Transmit Receive Switch for 7.0 Tesla TR Arrays
Worters, Sung, Stevens, Koch, Hargreaves	Compressed Sensing Multi-Spectral Imaging of the Post-Operative Spine
Zeineh, Holdsworth, Skare, Van, Atlas, Bammer	In vivo Ultra-High Resolution Diffusion Tensor Imaging of the Microscopic Pathways of the Medial Temporal Lobe Thermal Therapies
Zun, Hargreaveds, Zaharchuk	Improved Multislice Cerebral Blood Flow Imaging Using Velocity-Selective Arterial Spin Labeling
Zun, Hargreaveds, Zaharchuk	Near-Contiguous Spin Echo Imaging Using Matched-Phase RF and its Application in Velocity-Selective Arterial Spin Labeling

SNM 2012 (June 9-13, Miami Beach, FL)

Cao Q, Li C, Cheng Z	Macrophage as a potential tumor microenvironment target for imaging early response to anti-tumor therapy
Carpenter C., Liu H., Sun C., Pratx G., Cheng Z., Xing L.	FDG-Cerenkov image guided surgical margin detection
Davidzon G, Peng Z, Anand V, Zhou X, Quon A	Detection of bone marrow disease in lymphoma using computer aided segmentation and analysis
Davidzon G., Wakelee H., Neal J., Mittra E., Quon A., Iagaru A.	Utility of 18F FDG PET/CT in patients with advanced thymic neoplasms
Guo H., Dodd R., Do H., Quon A.	F18 NaF PET/CT of the spine for the pre-interventional evaluation of back pain
Holley D, Follett D, Mittra E	Variability and accuracy of two FDG quantification techniques: A combined phantom and pre-clinical study
Holley D, Stoffregen W, Follett D, Mittra E	Variability and accuracy of two common CT vessel quantification techniques and comparison with pathology
Iagaru A, Mosci C, Mittra E, Shen B, Chin F, Fischbein N, Gambhir S	18F FPPRGD2 in GBM: Imaging αvβ3 integrin levels as a biomarker of disease recurrence
Kumar M, Mosci C, Keu K, Iagaru A, Koglin N, Fels L, Bacher-Stier C, Chin F, Gambhir S, Mittra E	Evaluation of the 18F-labeled L-glutamate derivative 18F-FSPG (BAY 94-9392) in brain and head and neck cancer patients
Mosci C, Kumar M, Koglin N, Fels L, Bacher-Stier C, Smolarz K, Schwaiger M, Gambhir S, Mittra E	Characterization of physiological 18F-FSPG uptake in healthy volunteers: Kinetics and biodistribution
Mosci C., Akatsu H., Basina M., Dosiou C., Iagaru A.	The role of diagnostic 123I whole body scan prior to ablation of thyroid remnant in patients with papillary thyroid cancer
Muzio V., Fortunato M., Filannino A., Ardissone V., Levashova Z., Blankenberg F.	99mTc AnnexinV-128 for in vivo diagnosis of experimental collagen induced arthritis
Oh C, Shin J, Sunwoo J, Cheng Z, Jang E	Magnetic nanoparticles induced natural killer (NK) cell control to target tumor site
Olcott P, Kim E, Chinn G, Levin C.S.	Compressed sensing for the multiplexing of large area silicon photomultiplier PET detectors: Acquisition and calibration
Sampath S., Sampath S., Lutz A., Willmann J., Mittra E., Gambhir S., and Iagaru A.	Evaluation of NaF PET/CT, FDG PET/CT, combined NaF/FDG PET/CT and CT alone for detection of bone metastases
Shen B, Behera D, James M, Mavlyutov T, Ruoho A, Biswal S, Chin F	Visualizing peripheral sigma-1 receptor (S1R) expression in a neuropathic pain model
Takehana C, Mittra E, Quon A, Gambhir S, Iagaru A	18F FDG PET/CT in the management of patients with post-transplant lymphoproliferative disorder
Visith Keu K., Quon A., Blackburn B., Mittra E.	Simplified evaluation of osteomyelitis in the era of SPECT-CT: A pilot study
Withofs N, Martinive P, Scagnol I, Thonon D, Giacomelli F, Mievis F, Coucke P, Cataldo D, Gambhir S, Hustinx R	Preliminary results of [18F]FPRGD2 PET/CT imaging of integrin αvβ3 levels in patients with locally advanced rectal carcinoma
Withofs N, Signolle N, Nzaramba E, Thonon D, Léonard M, Aerts J, Waltregny D, Cataldo D, Gambhir D, Hustinx R	[18F]FPRGD2 PET/CT imaging of integrin αvβ3 in renal carcinomas: Correlation with histopathology
Zaman R., Carpenter C., Pratx G., Sun C., Xing L., McConnell M.	Development and quantification of a novel intravascular catheter-based radionuclide imaging system

RSNA 2011 (Nov 27-Dec 2, Chicago, Illinois)

Barth R	MSVP21-08: Imaging of Fetal Lung Masses
Behera D	SSG08-04: Imaging Painful Neuropathic Nerves Using A Novel Sigma-1 Receptor (S1R) Radioligand with PET-MRI
Behera D	SSQ09-09: Imaging Pain Generators Using PET-labeled Sodium Channel Toxin Derivatives and PET-MRI
Biswal	RSNA 2011 Refresher Course: Musculoskeletal Imaging in the Era of Molecular Medicine. Talk Title: "New Developments in Imaging for Musculoskeletal Pain."
Chan F	RC412C: Inflammatory Disease
Deshpande N, Lutz AM, Ren Y, Foygel K, Tian L, Pai R, Schneider M, Pasricha PJ, Willmann JK.	Quantification and Monitoring of Inflammation in Murine Inflammatory Bowel Disease using Targeted Contrast-enhanced Ultrasound Imaging. 97th Scientific Assembly and Annual Meeting of the Radiological Society of North America, November 27 - December 2, 2011, Chicago, Illinois.
Do B	LL-INS-TH7A: What Is My Miss Rate? Automating Quality Assurance by Using Natural Language Processing to Calculate Radiologist Performance from Unstructured Reports in the RIS
Faruque J.S., Rubin D.L., Beaulieu C.F., Kamaya A., Tye G.A., Napel S., et al.	A Scalable Reference Standard for Perceptual Similarity of CT Liver Lesions using Matrix Completion Techniques
Fischbein	12/2/11"Efferent Innervation of the Orbit." Refresher Course, 97th Scientific Assembly and Annual Meeting of the Radiological Society of North America, RSA, Chicago, IL.
Fischbein N	RC806C: Efferent Innervation of the Orbit
Fleischmann D	RC312: Incidental Cardiovascular Findings: Interactive Interpretation with the Experts (An Interactive Session)
Fleischmann D	RC812A: Aortic Dissection and Variants
Fleischmann D	RC812C: Intramural Hematoma and Penetrating Atherosclerotic Ulcer
Gambhir S.S.	MSRT41: Strategies for the Earlier Detection of Cancer
Gayer G	LL-GIE2752: Dropped Stones: When Do Dropped Gallstones and Dropped Appendicoliths Matter?
Gayer G	LL-GIE2772: The Infarcted Spleen: A Pictorial Guide to Differential Diagnosis
Gimenez F.J., Xu J., Liu T., Beaulieu C.F., Rubin D.L., Napel S., et al	Prediction of radiologist observations using computational image features: Method and Preliminary Results
Hsiao A	MSVP31-04: Stereoscopic 3D Volume-rendering of Shunts and Valvular Regurgitation with Parallel-imaging Compressed-sensing 4D Phase-contrast MRI
Hsiao A	MSVP31-05: Effectiveness of 4D-Phase Contrast MRI in the Assessment of Complex Flow after Y-graft Fontan Repair
Hsieh S	SSA20-02: Design for a Dynamic Bowtie Achieving a Piecewise-Linear Attenuation Profile
Jeffrey Jr R.B.	MSCU42A: Liver US
Jeffrey R.B.	RC110A: Appendicitis: A Strategy for Imaging in 2011
Kamaya A	LL-OBE2611: Postpartum Bleeding: Evaluation and Management
Kamaya A	LL-OBE2616: Physiology, Histology, and Imaging of Retained Products of Conception
Leung A	RC401: Case-based Review: Interstitial Lung Disease, Pulmonary Infection, and Acute Aortic Diseases (An Interactive Session)
Leung A	RC701B: STR/ATS Guidelines for Evaluating Pulmonary Embolism in Pregnancy
Lipson J	Title: "History: Lump - Imaging work-up of palpable abnormalities." Date: 11/30/2011 Forum: RSNA Case-Based Breast Imaging Refresher Course (Chicago, IL) Audience: 400 conference attendees (physicians)
Lipson J	MSCB41A: History: Lump

RSNA 2011 (Nov 27-Dec 2, Chicago, Illinois)

Moskowitz P	SAT04: Work-Life Balance: Survival Strategies for the Busy Radiologist
Napel S., Hoang C.D., Xu J., Gevaert O., Rubin D.L., Plevritis S.K., et al.	Computational And Semantic Annotation Of CT And PET Images And Integration With Genomic Assays Of Tumors In Non- Small Cell Lung Cancer (NSCLC) For Decision Support And Discovery: Method And Preliminary Results
Pelc N	PS50B: CT 2020
Plevritis S	MSVC31-14: Rapid Identification of Prognostic Imaging Biomarkers for Non-Small Cell Lung Carcinoma (NSCLC) by Integrating Image Features and Gene Expression and Leveraging Public Gene Expression Databases
Plevritis S.K., Gevaert O., Xu J., Hoang C.D., Rubin D.L., Napel S., et al	Rapid Identification Of Prognostic Imaging Biomarkers For Non-Small Lung Carcinoma (NSCLC) By Integrating Image Features And Gene Expression And Leveraging Public Gene Expression Databases
Ren Y, Fleischmann D, Foygel K, Molvin L, Lutz AM, Koong AC, Jeffrey RB, Tian Lu, Willmann JK.	SSG05-09: Antiangiogenic and Radiation Therapy: Early Effects on in Vivo CT Perfusion Parameters in Human Colon Cancer Xenografts in Mice
Rubin D	ICIW22: Decoding the Alphabet Soup (IHE, MIRC, RadLex, Reporting): Whirlwind Tour of RSNA Informatics Projects
Rubin D	LL-INE1168: An Automated Approach to Analyzing, Reporting, and Communicating Quantitative Imaging Results
Rubin D	LL-INS-MO5B: Extension and Application of RadLex to Annotation of Neuroimaging Data
Rubin D	LL-INS-TH5B: Using the Semantic Web for Radiology Decision Support of Focal Liver Disease
Rubin D	RC130: Informatics Support for Quantitative Imaging (Informatics: Advances)
Rubin D	RC130B: Informatics Approaches to Enable Quantitative Imaging in Real-world Radiology Practice
Rubin D	RC430B: RadLex Playbook: Standardized Terminology for Naming and Coding Imaging Procedures
Sampath S	LL-NMS-SU4B: Value of Combined 18F NaF and 18F FDG PET/CTvs CT Alone for Evaluation of Osseous Malignancy
Sampath SC, Sampath SC, Lutz AM, Willmann JK, Mittra ES, Gambhir SS, Iagaru A.	The Value of Combined 18F NaF and 18F FDG PET/CT Versus CT Alone for Evaluation of Osseous Malignancy. RSNA Annual Meeting, Chicago, IL. Nov 26-Dec 1, 2011
Stevens	Fluid collections and inflammatory change around the knee. RSNA, Chicago – November 2011.
Stevens K	LL-MKE2104: Medial Longitudinal Arch of the Foot: Anatomy, Pathology, Imaging, and Significance
Stevens K	SSA14-09: MR Imaging after Lumbar Spinal Fusion Using Slice Encoding for Metal Artifact Correction (SEMAC)
Sung K	LL-INE1187-WEA: Quantitative Dynamic Contrast-enhanced MRI Analysis Tool
Takaoka H., Funabashi N., Raman R., Fukushima K., Kobayashi Y., Napel S., et al.,	Detection of >75% Stenosis in Quantitative Coronary Angiography by Iodinate Contrast Opacification Gradients in Coronary Artery with Regard to Distance from the Ostium by 320-Slice Computed Tomography
Takaoka H., Funabashi N., Raman R., Fukushima K., Kobayashi Y., Napel S., et al.,	Detection of suture-break and stent-fracture after endovascular abdominal aortic repair using Multislice CT angiography: Impact of 3D reformation technique on detection compared with axial 2D image
Tye G	LL-GIE2821: A Practical Guide to Performing Perfusion CT of Solid Abdominal Tumors: How We Do It
Vasanawala S	RC713A: MR Imaging of Pediatric Liver Disease
Wu J	MSVM31-08: Hurdles of Pluripotent Stem Cell Therapy: Insights from Molecular Imaging
Wu J	MSVM31-10: Panel Discussion: Future of Cardiovascular Molecular Imaging
Xu J., Faruque J.S., Beaulieu C.F., Rubin D.L., Napel S.	A Comprehensive Descriptor of Shape: Method and Application to Retrieval of Similar Appearing Lesions in Medical Images

RSNA 2011 (Nov 27-Dec 2, Chicago, Illinois)

Xu J., Greenspan H., Napel S., Rubin D.L.	Automated Temporal Tracking And Segmentation Of Lymphoma On Serial CT Examinations
Zaharchuk G	SSA16-08: Perfusion Imaging of Transient Ischemic Attack

WMIC 2011 (Sept 7-10, San Diego, CA)

Ansari C, Castaneda R, Tikhomirov G, Rao J, Daldrup-Link H.	Development of a Novel Activatable Theragnostic Superparamagnetic Iron Oxide Nanoparticle. World Molecular Imaging Congress (WIMIC), San Diego 2011. WMIC proceedings 2011
Ansari C, Golovko D, Ruffel B, Castaneda R, Coussens L, Daldrup-Link H.	Clinically applicable USPIO detect tumor associated macrophages in breast cancer. World Molecular Imaging Congress (WIMIC), San Diego 2011. WMIC proceedings 2011
Bachawal SV, Jensen KC, Foygel K, Tranquart F, and Willmann JK.	Targeted contrast-enhanced ultrasound imaging using KDR-targeted microbubbles for early breast cancer detection in a transgenic mouse model. Abstract # P263
Chan C.T., Bradner J.E., Qi J., West N., Reeves R.E., Chiosis G.G., Paulmurugan R., Gambhir S.S.	Syntheses and Discovery of a Novel Class of Cinnamic Hydroxmates as Histone Deacetylase (HDAC) Inhibitors by Molecular Imaging of Heat Shock Protein 90 (Hsp90) Chaperone Interactions in Living Subjects.
Cheng K, Kothapalli SR, Liu H, Jiang H, Chen K, Levi J, Gambhir SS, Cheng Z.	Novel Gold Tripod Nanoparticles as Photoacoustic Molecular Imaging Agents for in vivo Cancer Imaging. Poster presentation at the World Molecular Imaging Conference, San Diego, CA, USA, Sept. 7- 10, 2011.
Fan-Minogue H., Chan C.T., Felsher D.W., Gambhir S.S.	A Quantitative High Throughput Molecular Imaging based Drug Screening Identifies an Anti-Protozoal Drug as an Anti-Cancer Agent for its Inhibitory Effect on the c-Myc Oncoprotein.
Garai E., Zavaleta C., Sensarn S., Liu J.T., Mandella M.J., Gambhir S.S., Contag C.	Fabrication and Characterization of a Raman-Based Endoscopic Imaging Probe for Cancer Detection.
Gawande R, Henning TD, Khurana A, Mandrussow L, Wendland M, Derugin N, Link TM, Daldrup-Link H.	MR Imaging of Ferumoxides Labelled Mesenchymal Stem Cells in Cartilage Defects: in vitro and in vivo investigations. World Molecular Imaging Congress (WIMIC), San Diego 2011. WMIC proceedings 2011
Gonzalez E., Olcott P.D., Levin C.S.	Multi-Isotope Positron Emission Tomography. Accepted for presentation at the 2011 World Molecular Imaging Congress, San Diego, CA, September 7-10, 2011.
Gu Y., Levin C.S.	Ultra-high Resolution Small Animal Positron Emission Tomography System with Adjustable Field-of-view Based on Novel 3-D Positioning Cadmium Zinc Telluride Detectors. Accepted for presentation at the 2011 World Molecular Imaging Congress, San Diego, CA, September 7-10, 2011.
Habte F, Ren G, Doyle TC, Cheng Z, Paik D.	Quantification evaluation of a simplified high throughput multiple-mice small animal PET/CT imaging. Poster presentation at the World Molecular Imaging Conference, San Diego, CA, USA, Sept. 7- 10, 2011.
Hackel B.J., Kimura R., Sathirachinda A., Chin F.T., Gambhir S.S.	18F-Labeled Cystine Knot Peptides for PET Imaging of Integrin αvβ6.
Hackel B.J., Sathirachinda A., Gambhir S.S.	Impact of Protein Hydrophobicity and Charge on Biodistribution and Tumor Targeting.
Hoppmann S, Hackel B, Liu H, Qi S, Gambhir SS, Cheng Z.	Protein Bioconjugates for PET Imaging of VEGFR-2. Poster presentation at the World Molecular Imaging Conference, San Diego, CA, USA, Sept. 7- 10, 2011.
Hoppmann S, Yang X, Wu S, Miao Z, Chua M, Cheng Z, So S.	Glypican-3 as a Target for the Detection of Hepatocellular Carcinomas using ImmunoPET. Poster presentation at the World Molecular Imaging Conference, San Diego, CA, USA, Sept. 7- 10, 2011.
Ito K., Smith B.R., Parashurama N., Yoon J., Song S.Y., Frieboes H., Cristini V., Miething C., Lowe S., Gambhir S.S.	Imaging of Lymphoma Cancer Progression in a Murine Model Using a Novel Lymph Node Internal Window Chamber Strategy.
Jokerst J.V., Gambhir S.S.	Small Silica Particles are an Alternative to Microbubbles for Ultrasound Tracking of Stem Cells in vivo.
Jokerst J.V., Kothapalli S.R., Tabakman S., Levi J., Gambhir S.S.	A Novel Multimodality Targeted Gold Particle for Concurrent Raman/Photoacoustic Imaging.

WMIC 2011 (Sept 7-10, San Diego, CA)

Khurana A, Nejadnik H, Gawande R, Derugin N, Pisani L, Daldrup-Link H.	In vitro and in vivo MR imaging of ferumoxytol labeled rat adipose derived stem cells in cartilage defects. World Molecular Imaging Congress (WIMIC), San Diego 2011. WMIC proceedings 2011
Kothapalli S.R., Bodapati S., Chan C.T., Khuri-Yakub B., Gambhir S.S.	Small Chromophores for Photoacoustic Labeling of Biologically Active Molecules.
Levi J., Kothapalli S.R., Bodapati S., Nielsen C.H., Dragulescu-Andrasi A., Chan C.T., Khuri-Yakub B., Gambhir S.S.	In Vivo Imaging of Protease Activated Photoacoustic Probe.
MA Pysz, I Guracar, K Foygel, and JK Willmann	In vivo Real-Time Quantification of Targeted Contrast-Enhanced Ultrasound Imaging Signal in Cancer. Abstract # T138
Massoud T.F., Paulmurugan R., Gambhir S.S.	Toward a Generalizable Intramolecular Complementation Strategy for Split-Reporter Gene Imaging of Protein Folding.
Namavari M., Yeol Song S., Sathirachinda A., Paulmurugan R., Gambhir S.S.	2'-Deoxy-2'-[18F]Fluoro-9-β-D-arabinofuranosylguanine and 3'-Deoxy-3'-[18F]Fluoro-9-β-D-xylofuranosylguanine as In vivo Probes for Imaging Gene Expression with PET.
Natarajan A., Gambhir S.S.	Development of 89Zr-rituximab immunoPET Tracer for Monitoring Lymphoma Therapy in a Humanized Transgenic Mouse Model.
Paulmurugan R, Sekar NM, Sekar TV	In vitro and In vivo delivery of AntagomiRs by Biodegradable Polymer Nano-carrier to Inhibit Tumor Metastasis and Invasion.
Ren G., Doyle T., Cheng Z., Gambhir S.S., Paik D.	High-throughput Multiple Mice Imaging on MicroPET and MicroPET-CT Scanners: Evaluation on Image Quantitation Effect.
Ren Y, Fleischmann D, Foygel K, Molvin L, Lutz AM, Koong AC, Jeffrey B, Tian L, Willmann JK.	Effect of Antiangiogenic and Radiation Therapy on CT Perfusion Parameters in Human Colon Cancer Xenografts in Mice. Abstract 294.
Sanjani S.S., Taghibakhsh F., Levin C.S.	A promising new PET block detector design for clinical PET/CT based on large-area tiling of silicon photomultiplier arrays. Accepted for presentation at the 2011 World Molecular Imaging Congress, San Diego, CA, September 7-10, 2011.
Sasportas L.S., Ghosh K.K., Cocker E.D., Burns L.D., Schnitzer M., El Gamal A., Gambhir S.S.	Quantitative, Dynamic, and Long Term In Vivo Imaging of Intravascular Circulating Tumor Cells in Awake Animals, with a Novel Miniature Mountable Fluorescence Microscope.
Shen B., Behera D., James M.L., Berganos R.A., McCurdy C.R., Gambhir S.S., Biswal S., Chin F.T.	[18F]FTC-146: A Novel Sigma-1 Receptor (S1R) Radioligand for Imaging Pain with PET-MRI
Smith B.R., Ghosn E.E., Tabakman S., Dai H., Gambhir S.S.	Exquisitely Selective Uptake of Single-Walled Carbon Nanotubes into a Specific Monocyte Subset in Living Mice.
Smith B.R., Shu H., Kempen P., Tabakman S., Dai H., Sinclair R., Shaqfeh E., Gambhir S.S.	Integrated Intravital Micrsocopy, Electron Microscopy, and Mathematical Modeling to Uncover Surprising Differences in Extravasation Between Quantum Dots and Nanotubes in Murine Tumor Models.
Spanoudaki V., Cui J.Y., Yeom J.Y., Levin C.S.	Evaluation of the Benefits of Photon Depth of Interaction Compensation for Time of Flight PET. Accepted for oral presentation at the 2011 World Molecular Imaging Congress, San Diego, CA, September 7-10, 2011.
Taghibakhsh F., Levin C.S.	A simple method to determine 511 keV photon interaction depth in individual scintillation crystals for high resolution PET. Accepted for presentation at the 2011 World Molecular Imaging Congress, San Diego, CA, September 7-10, 2011.
Wang H, Deshpande N, Ren Y, Willmann JK	Correlation between Targeted Contrast-enhanced Ultrasound Imaging and 18F-FDG PET in Murine Inflammatory Bowel Disease: a Preliminary Study. Abstract 264
Wang H, Ren Y, Pysz MA, Deshpande N, Foygel K, Pai R, Tranquart F, Willmann JK	Quantification and Monitoring of Angiogenesis by KDR-targeted Contrast-enhanced Ultrasound Imaging in Murine Colitis. Abstract 233

WMIC 2011 (Sept 7-10, San Diego, CA)

Xiong L., Shen B., Gambhir S.S., Chin F.T., Rao J.	[18F]YF3 Nanoprobes: Novel 18F-labeled Imaging Agents for Tumor Targeting.
Xu Y, Chang E, Liu H, Jiang H, Cheng Z.	"Monitoring Cancer Therapy with Cerenkov Luminescence Imaging. Oral presentation at the World Molecular Imaging Conference, San Diego, CA, USA, Sept. 7-10, 2011."
Xu Y, Huang W, Gang R, Qi S, Jiang H, Miao Z, Liu H, Lucente E, Barron A, Cheng Z.	A Novel StarPEG Platform for Bombesin Peptide Delivery to GRPR in Prostate Cancer. Poster presentation at the World Molecular Imaging Conference, San Diego, CA, USA, Sept. 7- 10, 2011.
Ziv K., Nuhn H. , Barron A.E., Gambhir S.S.	Building the niche: Developing a New Stem Cell Scaffold while Using Molecular Imaging for Evaluation of its Properties

SIR 2012 (March 24-29, San Francisco, CA)

Ganguly A., Kothary N., Blum K., Moore T., Deuerling-Zheng Y., Fieselmann A., Fahrig R.	"Measurement of Hepatic Perfusion Blood Volume Using C-Arm CT. Journal of Vascular and Interventional Radiology. Vol. 23, Issue 3, Supplement, Page S97, March 2012"
Hwang	Society of Interventional Radiology meeting 2012: Moderator and Organizer. Portal Interventions for Portal Hypertension. Categorical Course at Society of Interventional Radiology 37th Annual Scientific Meeting, March 2012, Workshop organizer and moderator, Patient Care III: Antiplatelets, Antihypertensives, Anticoagulants, and Glycemic Control in IR Suite. , Workshop speaker, Embolization II: Fundamentals.
Kothary	Moderator, Chemoembolization III (scientific session) 37thAnnual Scientific Meeting, Society of Interventional Radiology, San Francisco, CA
Kothary	Panelist, Research in IR. (Resident-in-Training scholarship program) 37thAnnual Scientific Meeting, Society of Interventional Radiology, San Francisco, CA
Kothary	Panelist, Women in IR (Resident-in-Training program) 37thAnnual Scientific Meeting, Society of Interventional Radiology, San Francisco, CA
Kuo	Catheter-based Lysis is Superior to IV Lysis and Surgery for Massive and Submassive PE Plenary Session Society of Interventional Radiology 37th Annual Scientific Meeting San Francisco, CA. March 2012.
Kuo	Lifesaving PE Therapy - An Interventional Decision Algorithm Categorical Course Society of Interventional Radiology 37th Annual Scientific Meeting San Francisco, CA. March 2012.
Kuo	Laser-Assisted IVC Filter Retrieval IVC Workshop Society of Interventional Radiology 37th Annual Scientific Meeting San Francisco, CA. March 2012.
Kuo	"Retrieving the Optional Filter That's No Longer Optional Venous Symposium Society of Interventional Radiology 37th Annual Scientific Meeting San Francisco, CA. March 2012."
Kuo WT, Robertson SW, Odegaard JI, Kothary N, Hovsepian D, Unver K, Louie JD, Sze DY, Hwang GL, Hofmann L.	Complex retrieval of fractured, embedded, and penetrating IVC filters: a prospective study with histologic and electron microscopic analysis. J Vasc Interv Radiol 2012; 23(3S): S26-7. Abstract presented at Society of Interventional Radiology meeting – March 2012.
Lam M.G., Louie J.D., Shah R.P., Goris M.L., Iagaru A., Ennen R.E., Sze D.Y.	Root cause analysis of gastroduodenal ulceration after Yttrium-90 radioembolization
Lam M.G., Nijsen F., Smits M., Rosenbaum C.E., Vonken E.P., Zonnenberg B., Huijbregts J., van den Bosch M., Shah R.P., Louie J.D., Sze D.Y.	Limitations of the BSA-based dose calculation for Yttrium-90 radioembolization.
Lam M.G., Shah R.P., Goris M.L., Iagaru A., Louie J.D., Sze D.Y.	Safety of repeated treatment with Yttrium-90 Radioembolization.
Louie	3/26-7/12 Acute DVT and Pulmonary Embolism Workshop at 37th annual meeting of the Society of Interventional Radiology. San Francisco, Ca

SIR 2012 (March 24-29, San Francisco, CA)

Louie J.D., Wang E.A., Broadwell S., Wible B.C., Arepally A., Nutting C., Bester L., Sze D.Y.	First in man experience with the surefire infusion system: a dedicated microcatheter system to eliminate reflux during embolotherapy.
Samuelson SD, Hofmann LV, Kothary N, Loh S, Louie JD, Kuo WT, Hovsepian D, Sze DY, Hwang GL.	Design and implementation of IR-specific features in an electronic medical records system. J Vasc Interv Radiol 2012; 23(3S): S128. Poster presented at Society of Interventional Radiology meeting – March 2012.
Samuelson SD, Jackson BA, Hubeny CM, Wong AA, Loh S, Wang DS, Shah RP, Kothary N, Hofmann LV, Hovsepian DM, Kuo WT, Hwang GL.	Cancer chemotherapeutics and anti-cancer drugs: a primer for interventional radiologists. J Vasc Interv Radiol 2012; 23(3S): S150. Poster presented at Society of Interventional Radiology meeting – March 2012.
Shah	Shah, Rajesh P. "Anticoagulation in the IR suite." 37th Annual Scientific Meeting of the Society of Interventional Radiology, San Francisco, CA. March 28, 2012.
Sze	"Plenary Session: Hot topics debates." Society of Interventional Radiology Annual Scientific Meeting, San Francisco, CA, March, 2012.
Sze	"Fundamentals of embolization." Society of Interventional Radiology Annual Scientific Meeting, San Francisco, CA, March, 2012.
Sze	"Advanced radioembolization workshop: Redistribution of flow." Society of Interventional Radiology Annual Scientific Meeting, San Francisco, CA, March, 2012.
Sze	"Management of portal hypertension: BRTO and BATO." Society of Interventional Radiology Annual Scientific Meeting, San Francisco, CA, March, 2012.
Sze	"New horizons in TIPS therapy: The changing role of the interventional radiologist in management of portal hypertension." Breakfast Symposium, Society of Interventional Radiology Annual Scientific Meeting, San Francisco, CA, March, 2012.
Unver K, Kothary N, Lam GJ, Hovsepian DH.	Lean Sigma in the IR Suite. J Vasc Inter Radiol 23 issue 3: S102 (Annual meeting, Society of Interventional Radiology, 2012)
Wang D.S., Louie J.D, Shah R.P., Kothary N., Sze D.Y.	. Prophylactic topically applied ice to prevent cutaneous complications of nontarget chemoembolization and radioembolization of liver tumors
Wang DS, Davalos EA, Hwang GL, Louie JD, Kuo WT, Shah RP, Hovsepian D, Hofmann LV, Sze DY, Kothary N.	Superselective transhepatic arterial chemoembolization for hepatocellular carcinoma in high risk patients as a bridge towards liver transplantation. J Vasc Interv Radiol 2012; 23(3S): S16. Abstract presented at Society of Interventional Radiology meeting – March 2012.
Wang DS, Louie JD, Shah RP, Kothary N, Sze DY.	Prophylactic Topically Applied Ice to Prevent Cutaneous Complications of Nontarget Chemoembolization and Radioembolization of Liver Tumors. J Vasc Inter Radiol 23 issue 3: S84 (Annual meeting, Society of Interventional Radiology, 2012)

IEEE: NSS/MIC 2011 (Oct 23-29, Valencia, Spain)

Bieniosek M. F. , Olcott P. D. , Levin C. S.	Time Resolution Performance of an Electro-Optical-Coupled PET Detector for Time-of-Flight PET/MRI (paper MIC9.S-157). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Chinn G., Levin C. S.	Algorithms That Exploit Multi-Interaction Photon Events in Sub-Millimeter Resolution CZT Detectors for PET (paper MIC18.M-52). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Cui J.-Y. , Chinn G. , C. S. Levin.	Fast and Accurate 3D Compton Cone Projections on GPU Using CUDA (paper MIC9.S-196). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Cui J.-Y. , Pratx G., Prevrhal S., Zhang B., Shao L., Levin C. S.	Measurement-Based Spatially-Varying Point Spread Function for List-Mode PET Reconstruction on GPU (paper MIC9.S-208). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Gonzalez E. , Olcott P. D. , Bieniosek M., Levin C. S.	Methods for Increasing the Sensitivity of Simultaneous Multi-Isotope Positron Emission Tomography (paper MIC18.M-2). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29

IEEE: NSS/MIC 2011 (Oct 23-29, Valencia, Spain)

Gonzalez E., Cui J.-Y., Pratx G., Olcott P. D., Bieniosek M., Levin C. S.	"Point Spread Function for PET Detectors Based in the Probability Density Function of the Line Segment (paper MIC21.S-327). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29."
Grant A. M. , Olcott P. D., Levin C. S.	All-Optical Encoding of PET Detector Signals (paper J1-5). Oral presentation at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Grimmer R. , Fahrig R. , Hinshaw W. , Gao H., Kachelriess M.	Empirical Cupping Correction for CT Scanners with Primary Modulation (ECCP) MIC21.S-66
Gu Y. , Levin C. S.	Studies of Electrode Design for a Sub-mm Resolution 3-D Position Sensitive CZT PET Detector (paper MIC5-5). Oral presentation at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Kim E., Olcott P. D., Levin C. S.	A New Data Path Design for PET Data Acquisition System: A Packet Based Approach (paper MIC18.M-176). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Lau F. W. Y., Vandenbroucke A., Reynolds P. D., Ho H., Innes D., Levin C. S.	"Signal Conditioning Technique for Position Sensitive Photodetectors to Manipulate Pixelated Crystal Identification Capabilities (paper NP5.S-126). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29."
Olcott P. D. , Chinn G., Levin C. S.	Compressed sensing for the multiplexing of signals from large area PET detector modules (paper MIC14-8). Oral presentation at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29
Reynolds P. D., Lau F. W. Y., Vandenbrouke A., Levin C. S.	"Study of Readout for Groups of Position Sensitive Avalanche Photodiodes Used in a 1 mm3 Resolution Clinical PET System (paper MIC15.S-26). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29."
Safari Sanjani S., Taghibakhsh F. , Levin C. S.	Energy and Time Characterization of SiPM Detector Blocks (paper MIC12.M-141). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Taghibakhsh F., Bieniosek M., Levin C. S.	Single-Ended Readout of Scintillation Crystal Elements Enables Photon Interaction Depth for High Resolution PET (paper MIC12.M-31). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Taghibakhsh F., Levin C. S.	Novel Techniques of Multiplexing Position Sensitive Solid State Photomultipliers for High Resolution PET (paper MIC18.M-214). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Vandenbroucke A. , Lau F. W. Y., Reynolds P. D., Levin C. S.	"Measuring 511 keV Photon Interaction Locations in Three Dimensional Position Sensitive Scintillation Detectors (paper MIC18.M-28). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29."
Yeom J. Y. , Spandoudaki V., Levin C. S.	Silicon Photomultiplier-Based Detector Array for TOF PET (paper MIC9.S-28). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29.
Zhai J., Vandenbroucke A., Reynolds P., Levin C.S.	"Functionality Test of a Readout Circuit for a 1mm3 Resolution Clinical PET System (paper MIC18.M-208). Presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October 22-29. "

SPR 2012 (April 16-20, San Francisco, CA)

Boe J, Newman B, Vasanawala SS, Chan FP	Frequencies and Patterns of Situs Discordance in Chest and Abdomen. SPR 2012.
Daldrup-Link	Apr 20, 2012 "Pediatric Molecular Imaging: Multimodality whole body imaging ". Invited lecture, Annual Meeting of the Society for Pediatric Radiology (SPR), San Francisco, US
Holdsworth S, Skare S, Yeom K, Aksoy M, Van A, Bammer R.	Diffusion tensor imaging (DTI) with retrospective motion correction for large-scale pediatric imaging"
Soman, Yeom, Barnes, Barth, Qiu, Moseley.	Evaluating Pediatric Neuropathologies Using Multiple TE Weighted Susceptibility Images Using Multi Shot Epi Sequence.

ASNR 2012 (April 21-26, New York, NY)

Bammer	Stroke Symposium: "DSC PWI in Stroke"
Bammer R, Andre J, Thomas R, Nagpal S, Recht L, Schmiedeskamp H	"Simultaneous Perfusion and Permeability MR Imaging in Brain Tumor Patients"
Holdsworth S, Skare S, Yeom K, Aksoy M, Newbould R, Van A, Barnes P, Bammer R	"Diffusion tensor imaging (DTI) with retrospective motion correction for large-scale pediatric imaging"
Van A, Holdsworth S, Bammer R.	"Elucidating Subresolution Microstructure with Oscillating Diffusion Gradient MRI"
Zaharchuk, Christen, Qiu, Ni, Schmiedlkamp, Bammer, Moseley.	Cerebrovascular and Functional Magnetic Resonance Imaging with the Blood Pool Agent Ferumoxytol: Initial Experiences in Normal Subjects.

ISC 2012 (Jan. 31-Feb. 3, New Orleans, LA)

Jadhav A.P., Jumaa M., Zaidi S., Salinas C.L., Zhu G., Lansberg M., Straka M., Bammer R., Albers G., Wintermark M., Wechsler L., Jovin T.	Correlation Between Diffusion-weighted Imaging (DWI) Lesion Volume And Alberta Stroke Program Early CT Score (ASPECTS) In Patients Undergoing Acute Stroke Intervention. International Stroke Conference (ISC), New Orleans, LA, 2012; (Platform Abstract 3427)
Kleinman J.T., Snider R.W., Aksoy D., Mlynash M., Fischbein N., Gean A.D., Eyngorn I., Venkatasubramanian C., Finley-Caulfield A., Bammer R., Wijman C.A.C. on behalf of the DASH investigators.	Is Intracerebral Hemorrhage-Associated Ischemia a Consequence of Blood Pressure Lowering? International Stroke Conference (ISC), New Orleans, LA, 2012; (Platform Abstract 2556).
Lansberg M.G., Straka M., Kemp S., Mlynash M., Wechsler L., Tudor J., Wilder M., Lutsep H., Czartoski T., Bernstein R., Chang C., Warach S., Fazekas F., Thai D., Inoue M., Tipirneni A., Hamilton S., Zaharchuk G., Marks M., Bammer R., Albers G.	Results of DEFUSE 2: Clinical Endpoints. International Stroke Conference (ISC), New Orleans, LA, 2012; (Platform Abstract).
Lansberg M.G., Straka M., Kemp S., Mlynash M., Wechsler L., Tudor J., Wilder M., Lutsep H., Czartoski T., Bernstein R., Chang C., Warach S., Fazekas F., Thai D., Inoue M., Tipirneni A., Hamilton S., Zaharchuk G., Marks M., Bammer R., Albers G.	MRI Patient Selection In Acute Stroke Trials: Implications For Sample Size. International Stroke Conference (ISC), New Orleans, LO, 2012; (Platform Abstract).
Mlynash M., Lansberg M.G., Straka M., Kemp S., Wechsler L., Tudor J., Wilder M., Lutsep H., Czartoski T., Bernstein R., Chang C., Warach S., Fazekas F., Thai D., Inoue M., Tipirneni A., Hamilton S., Zaharchuk G., Marks M., Bammer R., Albers G.	The Malignant MRI profile: Implications for Endovascular Therapy. International Stroke Conference (ISC), New Orleans, LO, 2012; (Platform Abstract).
Mylnash, Kemp, Lansberg, Wijman, Moseley, Albers	Performance Of Color ADC Maps As A Prognostic Tool In Comatose Post-cardiac Arrest Patients.
Straka M., Albers G., Lansberg M., Kemp S., Marks M., Wechsler L., Wilder M., Bammer R.	Fully-automated Identification of Acute Stroke Lesion Volumes with CT Perfusion. International Stroke Conference (ISC), New Orleans, LO, 2012; (Platform Abstract 2558).
Tipirneni A., Straka M., Lansberg M.G., Mlynash M., Bammer R., Albers G.W.	Novel Method for Quantification of Brain Edema in Ischemic Stroke. International Stroke Conference (ISC), New Orleans, LO, 2012; (Platform Abstract 2725).
Wijman C.A.C., Fischbein N., Gean A., Hanley D., Kase C.S., Nayarana R., Marks M., Bammer R., Moseley M.	Diagnostic Accuracy of MRI in Spontaneous intra-cerebral Hemorrhage (DASH). International Stroke Conference (ISC), New Orleans, LO, 2012; (Platform Abstract 3765).

ORS 2012 (Feb. 4-7, San Francisco, CA)

Besier T, Pal S, Draper C, Fredericson M, Gold GE, Delp S, Beaupre GS.	Cartilage Stress is not Elevated at 60° of Knee Flexion During Stair Climbing in Subjects with Patellofemoral Pain.
Jacobs K, Draper Ce, Beaupre GS, Besier TF, Gold GE, Fredericson M.	"Patellofemoral Pain: Classification by Physical Exam and Weight-Bearing MRI. “
Jordan C, Saranathan M, Bangerter NK, Hargreaves BA, Gold GE	Musculoskeletal MRI at 3.0T and 7.0T: Relaxation Times and Image Contrast.
Monu UD, Worters PW, Hargreaves BA, Gold GE.	"Radiofrequency Induced Heating On or Near Passive Metallic Implants at 1.5T and 3.0T. “
Pal S, Besier T, Draper C, Fredericson M, Delp S, Beaupre GS, Gold GE.	"Is Patella Alta More Prevalent among Maltracking Patellofemoral Pain Subjects? “
Son M-S, Goodman SB, Hargreaves B, Chen W, Gold GE, Levenston ME.	"Regional Variation of Short Echo Time T2 and T1rho Measurement in Menisci from Osteoarthritic Subjects. “
Sveinsson B, Staroswiecki E, Gold GE, Hargreaves BA.	Quantitative 3D Diffusion Musculoskeletal Imaging
Vogelsong M, Staroswiecki E, Pappas G, Hargreaves B, Han E, Friedlander A, Safran M, Gold GE.	"Quantitative MRI Detects Regional Variation in Knee Articular Cartilage of Healthy and Osteoarthritic Subjects. “

SPIE Medical Imaging 2012 (Feb 4-9, San Diego, CA)

Baek J and Pelc NJ	Data normalization method for a multisource inverse geometry CT system
Baek J, Uribe J, Harrison D, Reynolds J, Neculaes B, Inzinna L, Caiafa A, DeMan B, Pelc NJ	Initial results with a multisource inverse-geometry CT system,
Hsieh SS and Pelc NJ	A volumetric reconstruction algorithm for stationary source inverse-geometry CT
Wang A and Pelc NJ	A comparison of dual kV energy integrating and energy discriminating photon counting detectors for dual energy x-ray imaging
Wang A, Feng C and Pelc NJ	Image-based synthetic CT: simulating arbitrary low dose single and dual energy protocols from dual energy images
Wu H., Maier A., Fahrig R., Hornegger J.	"Spatial-temporal Total Variation Regularization (STTVR) for 4D-CT Reconstruction.
Proc. SPIE 8313, 8313-128(2012)."	
Yao Y, Wang A and Pelc NJ	Efficacy of fixed filtration for rapid kVp-switching dual energy x-ray systems: experimental verification

Other Presentations 2011-2012

Adamick JM, Baker NA, Chappell AR, Fisher JA, Fragoso G, Freund ET, Fritts M, Hahn-Dantona E, Harper SL, Hoover MD, Klaessig F, Klemm JD, Paik DS, Thomas DG,	"The National Cancer Institute (NCI) caBIG Nanotechnology Working Group (Nano WG)", Nanoinformatics 2011, December 2011.
Alexander M, Chowdhary A, Baxter B, Patel A, Zaidat O, Frei D, Do H, Moran C, Lopes D, Heck D, Albuquerque F, Britz, G, Dumont A, Khalessi A, Moyle H, Marks MP, Rossenwasser R.	Initial U.S. multi-center experience with Penumbra coil 400TM: A series of 30 cases. 11th Congress of the World Federation of Interventional Neuroradiology, Cape Town, South Africa, November 8-11, 2011. 11th Congress of the World Federation of Interventional Neuroradiology, Cape Town, South Africa, November 8-11, 2011.
Atlas, SW	“America’s Health Care and the Principles for Reform ” Hoover Institution Board of Overseers Annual Meeting Willard Intercontinental Washington Hotel Washington, DC 2/27/2012
Atlas, SW	“America’s Health Care and the Principles for Reform ” Hoover Institution Desert Conference Vintage Club Indian Wells, CA March 19, 2012
Atlas, SW	“Health Care Reform: Setting the Record Straight on America’s Health Care” Fall Retreat Hoover Institution 47th Annual Retreat Stanford, California 10/17/2011
Atlas, SW	“Health Care Reform: Setting the Record Straight on America’s Health Care” November Retreat Hoover Institution 48th Annual Retreat Stanford, California 11/17/2011
Atlas, SW	“Health Care Reform: Setting the Record Straight on America’s Health Care” Special Seminar Hoover Institution Stanford, California 11/8/2011
Atlas, SW	“Rheumatology and the Brain: The Role of Imaging” RDO Diagnostic Clinic Sao Paulo, Brazil 9/17/2011
Atlas, SW	Multiple Lectures: Atlas & Som: Neuroradiology of the Brain, Spine, Head & Neck Wynn Hotel and Resort Las Vegas, Nevada March 1-3, 2012
Bachawal S, Jensen K, Foygel K, Francois Tranquart F, Willmann JK.	Targeted contrast-enhanced ultrasound imaging using KDR-targeted microbubbles for early breast cancer detection in a transgenic mouse model. Poster. Symposium of Center for Biomedical Imaging at Stanford, Stanford, CA, USA; Apr 4-5, 2012. Abstract 61. Poster was highlighted.
Bachawal S, Jensen K, Foygel K, Tranquart F, Willmann JK.	Ultrasonic molecular imaging for early breast cancer detection. Poster. 5th Annual Cancer Institute Members Retreat at Quadrus Conference Center, Menlo Park, CA, USA; Apr 16, 2012
Bachawal SV, McKenney JK, Brooks JD, Gambhir SS, Willmann JK.	Angiogenesis Imaging using Targeted Microbubble Contrast Enhanced Ultrasound for Early Detection of Prostate Cancer. #30, September 14, 2011, 7th Early Detection Research Network (EDRN) Scientific Workshop, Herndon, Virginia, USA.
Bammer	Apr 2012 - ASPNR 50th Anniversary Lecture: “New and Emerging MR Technologies: DTI, PWI, SWI, Rapid MRI”
Bammer	Dec 2012 - DEFUSE 2 Investigator Meeting: “MRI Artifacts and Pitfalls in the DEFUSE 2 Acute Stroke Trial”
Bammer	Jan 2012 - Medical University Vienna: “Hybrid Imaging: Technical Trends in PET-MRI”
Bammer	Oct 2011 - ABMS - NIST Workshop at Stanford: “Quantitative Imaging - Magnetic Resonance Imaging”
Bammer	Sep 2011 - Mount Sinai: “Advances in Diffusion and Perfusion Imaging: New Opportunities for Quantitative Neuroimaging”
Barnes	Child abuse and the mimics: controversies in the era of evidence-based medicine. Cook County Public Defenders’ Conference, Oak Brook IL September 8-9, 2011.
Barnes	Fetal and neonatal brain imaging. “Perinatal Care: All About The Family” Annual Conference. VMC Foundation. Santa Clara Valley Medical Center, San Jose CA, November 3, 2011.
Barnes	Findley K, Barnes P, Moran D, Sperling C. Challenging shaken baby syndrome convictions in the light of new medical and scientific research. Integris Health Law & Medicine Lecture Series. Innocence Project. Oklahoma City University School of Law, Oklahoma City, OK, Sep. 21, 2011.

Other Scientific Meeting Presentations

Other Presentations 2011-2012

Barnes	Imaging of the pediatric brain, spine, and head & neck. National Association of Pediatric Nurse Advanced Practicioners (NAPNAP), San Francisco Bay Area Chapter. 2nd Annual Meeting, Stanford University, Stanford CA, October 29, 2011.
Barth	Barth RA, Imaging Appendicitis in Children. Society for Pediatric Imaging, Park City, UT, March 8, 2012
Beaulieu	"Interventional Sports Medicine" and "Who Wants to be a Millionaire: the MSK version (case conference)". Visiting Professor, Winthrop University Hospital, Long Island, NY. 11/18/2011.
Beaulieu	Introduction to Sports Medicine Imaging. HumBio 139 Stanford Undergraduate Course, 11/11/2011.
Beaulieu	Optimization of Multidetector CT for MSK Applications, and MRI of the Knee: Beyond the Ligaments and Menisci. UCSF Highlights in Radiology, San Francisco, CA, Oct 26, 2011.
Behera D, Parsons W, Hoehne A, Shen B, Yeomans D, Chin FT, Du Bois J, Biswal S.	(2011) Imaging Voltage-Gated Sodium Channels In Vivo in a Model of Neuropathic Pain. Poster presentation at the Bio-X Interdisciplinary Initiatives Symposium, Stanford University, Stanford, CA, Sept 26, 2011.
Besier TF, Pal S, Draper CE, Fredericson M, Delp SL, Quon A, Gold GE, Beaupre GS.	Correlating Mechanical Bone Stress with Metabolic Activity from PET: Implications for Chronic Patellofemoral Pain. 2012 European Congress on Computational Methods in Applied Sciences and Engineering.
Biswal	"Imaging Sodium Channels, Glucose Metabolism and Macrophage Trafficking in Inflammation" at the CNIC Conference "Vascular Inflammation, aging and imaging" held in Madrid, Spain on March 9-10, 2012.
Biswal	"Molecular Imaging of Pain and Nociception" at Chonnam National University Medical Center in Gwangju, South Korea on Oct. 26, 2011.
Biswal	"Molecular Imaging of Pain and Nociception" at Seoul National University/Yonsei School of Medicine, Seoul, South Korea on Oct. 27, 2011.
Biswal	"Molecular Imaging of Pain and Nociception" at the Molecular Imaging Symposium at Gachon Notational University, Gachon, South Korea on Oct. 28, 2011.
Biswal	"Molecular Imaging of Pain and Nociception" at the Reflex Sympathetic Dystrophy Society Translational Research Meeting in Albuquerque, New Mexico November 13, 2011.
Biswal	"Molecular Imaging: From Mice to Man" at Asan Medical Center, Seoul, South Korea on Oct. 26, 2011.
Biswal	Delivered 5 CME talks at 'Radiology Update' by CME Science in Kaua'i, Hawaii in March 2012.
Blankenberg	'"The Fourth Conference of the Arnold and Mabel Beckman Initiative for Macular Research (BIMR)" / January 26-28, 2012 Beckman Center of the National Academies of Science and Engineering, Irvine, CA.
Blankenberg	"Annexin V Imaging with Emphasis on the Heart" / Festschrift for Dr. H. William Strauss 3:45 – 4:15 PM Wednesday, February 1, 2012 Rockefeller Research Laboratories / Memorial Sloan Kettering Cancer Center NYC
Blankenberg	"RSNA WRITING A COMPETITIVE GRANT PROPOSAL 2012" / February 3 to 4, 2012 The Hyatt Lodge at McDonald's Campus Oak Brook, Illinois
Bögel M., Maier A., Hofmann H. G., Hornegger J., Fahrig R.	Diaphragm Tracking in Cardiac C-Arm Projection Data. Proc. BVM 2012. Germany, 2012, pp. 33-38. Springer. BVM (Bildverarbeitung fur die Medizin) 18-20 March, Berlin 2012.
Chan	Chan FP. (1) Evaluating Inconsistencies in Quantitative MRI (2) Non-Invasive Imaging for Single Ventricle Repair. NASCI, 2011.
Chan	Chan FP. (1) MR Imaging of Structural Heart Disease (2) MR Imaging of Valvular Heart Disease. Navy Imaging Symposium, 2011.
Chan	Chan FP. (1) How to Measure Cardiac Volume and Flow Parameters (2) MR Velocity Measurements in Valvular Disease (3) Post Operative Assessment of Congenital Heart Disease. 5th Congress of Asian Society of Cardiovascular Imaging, 2011.
Chan	Chan FP. (1) MR Protocol for Anatomical Assessment (2) Integrated Imaging Approach to Takayasu Arteritis. 9th SPR Hands-On Symposium on Pediatric Cardiovascular MR / 7th Advanced Course on Pediatric Cardiovascular Imaging, Toronto, 2011.

Other Presentations 2011-2012

Chan	Chan FP. Advanced Cardiac MR Imaging. SMRT President's Regional Educational Seminar, Stanford, 2011.
Chan	Chan FP. Cardiac MR Technical Advances. Japanese Tech Society, Stanford, 2011.
Chan	Chan FP. CT/MRI Which To Use When. IPR, 2011.
Chan	Chan FP. Imaging Congenital Bronchovascular Anomalies with CTA. ISCT, 2011.
Chan	Chan FP. MRI of Adult Congenital Heart Disease. AHA, 2011.
Chan	Chan FP. Pediatric Cardiac MRI. Pacific Coast Pediatric Radiology Association (PCPRA) 44th Annual Meeting, 2011.
Chan I, Sheahan D, Seaman D, Molvin LZ, Leung A, Fleischmann D.	Effect of Iterative Reconstruction and Reduced Radiation Dose on Image Noise and Subjective Image Quality on Thin Section CT of the Lung: A Phantom Study. SCBT/MR Annual Meeting, October 22, 2011, Washington, DC.
Cheng	"Affibodies for Cancer Molecular Imaging and Therapy", the 2011 Advanced Research Center for Medical Physics (ARCMP) Joint Symposium: The Catholic University of Korea – MIPS Stanford University, Palo Alto, CA, Sept. 2, 2011.
Cheng	"Biomedical Applications of Cerenkov Luminescence Imaging", Hangzhou International Molecular Imaging Conference (HIMIC), Hangzhou, China, Sept. 24-25, 2011.
Cheng	"Nanotechnology in Medicine", Medical Education Speakers Network, Dominican Santa Cruz Hospital, Santa Cruz, CA, Nov. 18, 2011.
Chetty S, Rubesova E, Rosenberg J, Chueh J, Norton M	Prenatal Bowel Dilation: Correlation Between Ultrasound, Fetal MRI, and Postnatal Outcome Tracking. Meeting of the Maternal Fetal Medicine Dallas, 2012
Chin FT, Pasricha PJ and Biswal S.	(2011) PET-CT Evaluation of NK1 Receptor Using [18F]SPA-RQ in Gastroparesis. Poster presentation at the Bio-X Interdisciplinary Initiatives Symposium, Stanford University, Stanford, CA, Sept 26, 2011.
Choi J-H; Keil A; Maier A; Pal S; McWalter EJ; Besier T; Fahrig R	Motion Compensation for a New Comprehensive Diagnostic Tool for Knee Osteoarthritis Stanford Symposium on Biomedical Imaging, Stanford, April 2012
Chowdhary A, Patel A, Zaidat O, Frei D, Do H, Moran C, Albuquerque F, Lopes D, Heck D, Dumont A, Marks M, Moyle H, Rosenwasser R, Alexander M.	Initial US multicenter experience with Penumbra coil 400TM: a series of 22 cases. 11th Congress of World Federation of Interventional and Therapeutic Neuroradiology (WFITN), Cape Town, South Africa, November8-11 2011.
Cole B, Farr J, Bonner K, Gold GE, Adkisson HD, Reischling P.	A Phase I/II Study of a Tissue Engineered Cartilage Implant Derived from Allogeneic Juvenile Chondrocytes: 3 year results. 2012 10th World Congress of the International Cartilage Repair Society.
Cubedo E, Gentles AJ, Huang CX, Natkunam Y, Bhatt S, Jiang XY, Lu XQ, Romero-Camarero I, Plevritis SK, Martinez-Climent JA, Sanchez-Garcia I, Melnick A, Lossos IS	"Identification of LMO2 Transcriptome and Interactome in Diffuse Large B-Cell Lymphoma by Integrated Experimental and Computational Approach. " Annual Meeting of the American Society of Hematology (ASH), San Diego, CA, December 2, 2011.
Daldrup-Link	Jan 29, 2012 "MR Imaging of Macrophages". Invited lecture, ISMRM Workshop on MRI-based Cell Tracking, International Society of Magnetic Resonance in Medicine (ISMRM), Miami, US
Daldrup-Link	Mar 30, 2012 "Imaging Stem Cell Transplants: Clinically applicable approaches". Invited lecture, California Institute for Regenerative Medicine
Daldrup-Link	Oct 24, 2011 "Imaging Stem Cell Transplants: Assessment of Immune Responses". Invited lecture, FDA / CIRM - Regenerative Medicine Consortium Roundtable, Washington, DC
Daniel	Breast MRI Jeopardy, Korean Congress Radiology, October 27,2011, Seoul, Korea.
Daniel	Future Techniques for Breast MRI. Special Focus Session. Korean Congress Radiology, October 27,2011, Seoul, Korea
Daniel	Magnetic Resonance Imaging of Breast Disease. Yantainshan Hopsital, October 29, 2011, Yantai, China.
Daniel	Optimizing Breast MRI. Scientific Session Keynote, Korean Congress Radiology, October 27,2011, Seoul, Korea.

Other Presentations 2011-2012

Dao CN, Blake T, Liang D, Fischbein MP, Yeung A, Fearon W, Miller CD, Fleischmann D.	Accuracy and Reproducibility of Contrast Enhanced and Non-Enhanced Computed Tomography for Predicting the Angiographic Deployment Angle in Transcatheter Aortic Valve Replacement (TAVR). American College of Cardiology Annual Meeting, March 24, 2012, Chicago, IL (JACC March 27, 2012. Vol 59, No. 13, Supp A, p. A294.
Davidzon GA, Nair VS, Mittra E, Graves E, Loo W, Rubin DR.	Novel pre-operative 18F-FDG PET imaging features augment clinical prediction for post-operative outcome in patients with resected NSCLC (2012). Western Regional Society of Nuclear Medicine. Seattle, WA. Western Regional Society of Nuclear Medicine. Seattle, WA.
Davidzon GA, Quon A, Iagaru M, Goris M, Gambhir SS, Mittra E	(2012). Comparison of Five Imaging Response Criteria in Patients with Diffuse Large-B-Cell Lymphoma Using PET/CT. Western Regional Society of Nuclear Medicine. Seattle, WA.
De Bruin M, Kwong A, Goldstein B, Lipson JA, Ikeda DM, McPherson L, Sharma B, Kardashian A, Schackmann EA, Kingham K, Mills M, West DW, Ford J, Kurian AW	. "Breast Cancer Risk Factors among Asian versus Caucasian women with BRCA 1/2 mutations." Presented at SABCS, December 9, 2011. Presented at SABCS, December 9, 2011.
Deshpande N, Lutz AM, Ren Y, Foygel K, Tian L, Pai R, Schneider M, Pasricha PJ, Willmann JK.	Monitoring of Inflammation in a Mouse Model of Inflammatory Bowel Disease using P-selectin-Targeted Contrast Microbubbles and Ultrasound. Contrast Media Research Conference; October 30 – November 1 2011. Galveston, Texas, USA
Do	2nd Annual Breakthroughs in Neurologic Therapies Conference, San Francisco, CA, October 7-8, 2011
Do	American Society of Spine Radiology 12th Annual Meeting, Miami, FL, February 16-19, 2012
Do	Food and Drug Administration Medical Devices Panel Meeting, Washington DC,
Federle	Abdominal Imaging in Patients w/Suspected Acute Appendicitis: The Differential Diagnosis of RLQ Pathology, Blunt & Penetrating Trauma to the Abdomen: Bowel & Mesenteric Injuries, The Differential Diagnosis of Acute Diverticulitis and Other LLQ Conditions. Setting Imaging Priorities for Acute Abdominal & Pelvic Imaging. 9th Annual Radiology After 5 2011, Las Vegas, NV (September 8-10, 2011)
Federle	"Diffuse Liver Disease Pancreatitis – Less Common Etiologies & Complications Focal Liver Masses: Making the Definitive Diagnosis. 2011 National Diagnostic Imaging Symposium, Lake Buena Vista, FL (December 4 – 8, 2011)"
Federle	Diffuse Liver Disease: Focal Liver Lesions in Cirrhosis, Abdominal Hemorrhage, Uncommon Causes & Manifestations of Pancreatitis. 2011 Abdominal CT Update, San Francisco, CA (September 23-24, 2011)
Federle	"Imaging of Diffuse Liver Disease (It's not all Steatosis) Pitfalls in Pancreatic Imaging Focal Lesions of the Cirrhotic Liver Focal Lesions of the Non-Cirrhotic Liver. 28th Annual Computed Body Tomography 2012 The Cutting Edge, Orlando, FL (February 16-19, 2012)"
Federle	Introduction and Course Goals: Current Status of PET-CT in Gastrointestinal Cancers, Urgent & Emergent CT Findings in the Abdomen & Pelvis, Non-FDG Avid Tumors: A Primer. 2011 IAME PET-CT Imaging Bootcamp, Las Vegas, NV (October 14-15, 2011)
Federle	"New Concepts in CT of Pancreatitis Including Autoimmune Pancreatitis CT of the Liver: Inflammatory Disease CT of the Liver: Tumors CT Evaluation and Management of Cystic Pancreatitis Masses CT Evaluation of Trauma: Current Concepts. 2011 John Hopkins University Essentials in MDCT & CTA, Las Vegas, NV (November 10-13, 2011)"
Federle	Program Director and Moderator: Pancreatic Cystic Masses, Abdominal Hemorrhage, Appendicitis, Right Lower Quadrant, Diverticulitis. 16th Annual Computed Tomography 2011 National Symposium, Las Vegas, NV (October 27-30, 2011)
Federle	"Renal: Dealing with the Incidental or Asymptomatic Lesion Pancreas: Dealing with the Incidental or Asymptomatic Lesion Adrenal: Dealing with the Incidental or Asymptomatic Lesion Hepatic: Dealing with the Incidental or Asymptomatic Lesion Autoimmune Pancreatitis. UCSF Abdominal & Pelvic Imaging: CT/MR/US, Palm Springs, CA (February 1 – 3, 2012)"
Fischbein	9/11/11"Image Guidance in Radiation Therapy: A Collaboration Between Radiation Oncology and Diagnostic Radiology." 45th Annual Meeting of the ASHNR, San Diego, CA
Fleischmann	Innovative Treatments for Aortic Valve Replacement (TAVR) Conference, February 4, 2012, Stanford, CA
Fleischmann	"7th International MDCT Symposium, January 12-14, 2012, Garmisch, GERMANY - Acute chestpain"

Other Presentations 2011-2012

Fleischmann	"Fleischmann D. CME Course: Imaging in Hawaii, September 27-30, 2011, Kauai, HI - CT technology update - Protocol design for cardiovascular CT - Lower extremity CTA - Acute aortic syndrome I: classic dissection - Acute aortic syndrome II: IMH, PAU, and leaking aneurysm - Incidental cardiovascular findings: What would you recommend?"
Gayer	Managing the incidentaloma- Institute for advanced medical education, Las Vegas, Nevada, April 20-21, 2012
Gevaert O, Mitchell LA, Xu J, Yu C, Rubin DL, Zaharchuk G, Napel S, Plevritis S	Radiogenomic analysis indicates MR images are potentially predictive of EGFR mutation status in glioblastoma multi-forme. AACR 103nd annuel meeting, Chicago, 2012.
Gevaert O., Mitchell L. A., Xu J., Yu C., Rubin D. L. , Zaharchuk G., Napel S., Plevritis S. K.	Radiogenomic analysis indicates MR images are potentially predictive of EGFR mutation status in glioblastoma multi-forme. Association of Cancer Research, Chicago, March 2012.
Gevaert O., Mitchell L. A., Xu J., Yu C., Rubin D. L., Zaharchuk G., Napel S., Plevritis S. K.	"Radiogenomic analysis indicates MR images are potentially predictive of EGFR mutation status in glioblastoma multiforme," Association of Cancer Research, Chicago, March 2012.
Girard E, Moore T, Lauritsch G, Rosenberg J, Al-Ahmad A, Chan F, Lee D, Fahrig R.	Contrast-Enhanced Rotational Angiographic C-arm CT Imaging of Myocardial Infarction in the Interventional Suite: Optimized Imaging Protocol For Acute and Chronic Infarcts. J Am Coll Cardiol 2012 59: E169. American College of Cardiology, March 24-27, 2012 Chicago
Glover	Functional Magnetic Resonance Imaging: Thomas Jefferson University, Philadelphia, PA, November 15, 2011
Glover	Historical Perspective: Methods and Progerss: International Society for Magnetic Resonance in Medicine: Fat-Water Separation: Insights, Applications & Progress in MRI. Long Beach, CA February 20, 2012
Glover	International Symposium on State of the Art Imaging, Bordeaux, France, October 3-4, 1011
Glover	National Core for Neouoethics, University of British Columbia, Vancouver, BC. March 14-15, 2012
Glover	Overseas Expert, Tsinghua University, Beijing, China, November 30, 2011
Gold	1/13/12 2012 Horizon lecture for M Vision Consortium, Madrid (1 talk)
Gold	10/24/11 Molecular Imaging Conference, Tel Aviv (1 talk)
Gold	9/15/11 International Skeletal Society, San Diego (1 talk)
Grimmer R, Baek J, Pelc NJ and Kachelriess M	Frequency-combined extended 3D reconstruction for multiple circular cone-beam CT scans. 24th European Congress of Radiology, 2012.
Grimmer R., Fahrig R., Hinshaw W., Gao H. and Kachelriess M.	Empirical Cuping Correction for CT Scanners with Primary Modulation", European Congress of Radiology March 1-5 2012 Vienna, Austria European Congress of Radiology March 1-5 2012 Vienna, Austria
Guan Y, Plevritis SK	Evaluating the Impact of Menopausal Hormone Therapy on US Breast Cancer Incidence: A Stochastic Simulation Approach. INFORMS 2011 Annual Meeting, Charolette, NC, November 13-16, 2011.
Hargreaves	MRI Contrast Mechanisms. SMRT President's Regional Educational Seminar, Oct 15, 2011
Hargreaves	New MR Imaging Methods for Metal Orthopaedic Hardware – Orthopaedic Research Society Annual Meeting, Feb 5, 2012.
Hargreaves	Overview of Pulse Sequences. SMRT President's Regional Educational Seminar, Oct 15, 2011.
Hofmann	American College of Phlebology, 25th Annual Congress: The Big Symposium: Big Veins, Big Issues, Better Solutions. JW Marriott, Los Angeles, CA. November 3, 2011.
Hofmann	"American College of Phlebology, 25th Annual Congress: The Big Symposium: Big Veins, Big Issues, Better Solutions. JW Marriott, Los Angeles, CA. November 3, 2011."
Hofmann	"Current Treatment of DVT and PE: An Interventionist Perspective and Radiology 101: A Primer on Ordering Diagnostic Imaging Examinations. Palo Alto Stanford Medicine Imaging Center, Palo Alto, CA. September 28, 2011."

Other Scientific Meeting Presentations

Other Presentations 2011-2012

Hofmann	"Current Treatment of DVT and PE: An Interventionist Perspective and Radiology 101: A Primer on Ordering Diagnostic Imaging Examinations. Palo Alto Stanford Medicine Imaging Center, Palo Alto, CA. September 28, 2011."
Hofmann	GORE VIABAHN – Endoprosthesis Expert's Forum Meeting: Interventional Management of Deep Vein Thromboses and Lower Limb Venous Aneurysms. Scottsdale, AZ. October 9 – 11, 2011.
Hofmann	"GORE VIABAHN – Endoprosthesis Expert's Forum Meeting: Interventional Management of Deep Vein Thromboses and Lower Limb Venous Aneurysms. Scottsdale, AZ. October 9 – 11, 2011."
Hofmann	"International Congress for Endovascular Specialists: iCON2012 Veins; Role of Venous Stenosis in Venous Thromboembolism. Scottsdale, AZ. February 12-16, 2012."
Hofmann	"International Congress for Endovascular Specialists: iCON2012 Veins; Role of Venous Stenosis in Venous Thromboembolism. Scottsdale, AZ. February 12-16, 2012."
Hofmann	Interventional Molecular Imaging in Radiology. 21 Congress, Utrecht, November 18, 2011.
Hofmann	Interventional Molecular Imaging in Radiology. 21 Congress, Utrecht, November 18, 2011.
Hofmann	Transcatheter Cardiovascular Therapeutics "TCT 2011" Conference: Evidence for Interventional Management of Submassive and Massive Pulmonary Emboli. Moscone Center, San Francisco, CA November 10, 2011.
Hofmann	Transcatheter Cardiovascular Therapeutics "TCT 2011" Conference: Evidence for Interventional Management of Submassive and Massive Pulmonary Emboli. Moscone Center, San Francisco, CA November 10, 2011.
Hom J, Kamaya A, Tye GA, Fleischmann D	Perfusion CT: A Closer Look at the Blood Supply to Neuroendocrine Tumors and Metastases to the Liver. Sept 10, 2011 CFCF-Stanford Neuroendocrine Patient Education Conference
Hovsepian	Faculty, American College of Surgeons 97th Annual Clinical Congress, Panel Session—Acute Gastrointestinal Bleeding: New Techniques and Trends in Management. "Radiological Identification and Control of Upper and Lower GI Bleeding", San Francisco, CA, October 2011
Hovsepian	Faculty, American Osteopathic College of Radiology Midyear Conference, Current Trends in IR: A Primer for Diagnostic Radiologists, "MR Imaging of the Female Pelvis: Planning Gynecological Interventions", MR Imaging of Vascular Anomalies", Chicago, IL, September 2011
Hwang	Speaker, Non-Vascular Oncology session. Irreversible Electroporation: Liver and Beyond. Western Angiographic & Interventional Society 2011, Lake Tahoe, California, September 2011.
Iagaru	Practical Considerations and Clinical Applications of Radioimmunotherapy. Society of Nuclear Medicine, Northern California Chapter Annual Meeting, Pleasanton, CA. Feb 23, 2012.
Ikeda	"Correlating MRI, US, and Mammography." "Hard Needle Localizations." "US 'Second Look' After MRI." "Difficult MRI Cases." "BIRADS Update 2011: Mammo and US." "BIRADS Update 2011: MRI." 2012 Women's Imaging Course. Porto Alegre, Brazil. March 21-30, 2012.
Ikeda	"Correlation of MRI, Mammography, and Ultrasound. " Tricky Locs." "Breast Tomosynthesis." Women's Imaging in Wine Country. University of California Davis. Sonoma, Ca. October 2-3, 2011.
Ikeda	Current Methods of Percutaneous Breast Biopsy: Hardware Requirements for Targeting and Biopsy." IEEE 5th International Workshop on the Molecular Radiology of Breast Cancer 2011. Valencia, Spain. October 30, 2011.
Ikeda	Essentials of MRI Interpretation." "MRI Effectiveness in Women with Dense Breast Tissue." "Tomosynthesis." "Correlating Breast MRI with Mammography and Ultrasound." International Breast Update 2012: Future Directions. Melbourne, Australia. April 28-29, 2012.
Jeffrey	"Complicated Cholecystitis The Abdominal Trauma Checklist 3D Pancreas: Adenocarcinoma The Incidental Pancreatic Lesion ARRS Abdominal CT Update, September 23-24, 2011; San Francisco, CA"
Jeffrey	iiCME Abdominal Imaging Update, Bachelor Gulch, January 3-6, 2012 The Trauma Checklist Ultrasound of Acute GYN Disorders
Jeffrey	Ultrasound 2012: Pearls and Pitfalls, March 11-12, 2012; Naples, FL RLQ Ultrasound, Part I: Appendicitis RLQ Ultrasound, Part II: Mimics Focal Liver Lesions Complicated Cholecystitis GI Ultrasound Case Conference Acute Pelvic Pain Ultrasound of Neck Nodes

Other Presentations 2011-2012

Jeffrey	Ultrasound Pearls in Patients with Acute Abdominal Pain SGR/SUR Abdominal Radiology Course, March 26-27, 2012; Scottsdale AZ
Jones RH, Olcott EW, Shah S, Jeffrey RB, Do B, Shin LK	MR Enterography: Protocol, Pearls and Pitfalls. American Roentgen Ray Society Annual Meeting, Vancouver, Canada. April 29-May 4, 2012.
Kamaya	"Acute Gynecologic Emergency Imaging", Imaging in Hawaii Course: The Center for Promotion and Education in Personalized Medicine. March, 2012
Kamaya	"Acute Gynecologic Emergency Imaging", LA Radiologic Society Pasadena CA May 5, 2012
Kamaya	"Adnexal Masses", Imaging in Hawaii Course: The Center for Promotion and Education in Personalized Medicine. March, 2012
Kamaya	"HCC evaluation", Imaging in Hawaii Course: The Center for Promotion and Education in Personalized Medicine. March, 2012
Kamaya	"Pregnancy and Postpartum Related Complications", Innovations in Ultrasound, Newport Beach CA, November 5, 2011
Kamaya	"Pregnancy and Postpartum Related Complications", LA Radiologic Society Pasadena CA May 5, 2012
Kamaya	"The case for CT when Imaging the Pancreas", Imaging in Hawaii Course: The Center for Promotion and Education in Personalized Medicine. March, 2012
Kamaya	"Thyroid and Parathyroid Evaluation", Imaging in Hawaii Course: The Center for Promotion and Education in Personalized Medicine. March, 2012
Kamaya	"Thyroid Nodule Evaluation and the Post Thyroidectomy Neck", Innovations in Ultrasound, Newport Beach CA November 5, 2011
Kamaya	Abdominal Radiology Course: Society of Gastrointestinal Radiologists and Society of Uroradiology. Retained products of conception: Beyond can't rule it out. Scottsdale AZ March, 2012
Kamaya	Abdominal Radiology Course: Society of Gastrointestinal Radiologists and Society of Uroradiology. Society of Uroradiology Research Award presentation March, 2012
Kamaya	Acute Gynecologic Emergency Imaging", Innovations in Ultrasound, Newport Beach CA, November 5, 2011
Kamaya	BOOST: Gastrointestinal—Case –based Review, Radiologic Society of North America, Chicago IL, November 29, 2011
Knowles JA, Bishop ES, Zinn KR, Miao Z, Cheng Z, Rosenthal EL.	Preclinical Strategies to Optimize Optical Imaging in Head and Neck Cancer, Oral Presentation at the American Academy of Otolaryngology-Head and Neck Surgery Annual Meeting 2011, San Francisco, CA, Sept. 11-14, 2011.
Kothary	IR and the Lung Nodule. Pulmonary and Critical Care Grand Rounds, Stanford University School of Medicine, Stanford, CA
Lai, P.; Fung, M. M.; Vasanawala, S. S.; Brau, A. C	Single breathhold three-dimensional cardiac cine MRI with whole ventricular coverage and retrospective cardiac gating using kat ARC. 15th Annual SCMR Scientific Sessions, Orlando, FL, Feb. 2-5, 2012.
Lau F.W.Y., Reynolds P., Vandenbroucke A., Levin C.S.	Signal conditioning technique for position sensitive photodetectors to manipulate pixellated crystal identification capabilities. Presented at the 2011 BioXIIP Symposium, Stanford University, September 26, 2011. 2011 BioXIIP Symposium, Stanford University, September 26, 2011.
Levin	Innovations in Molecular Imaging Instrumentation and Algorithms. Presented to LIP Research Institute (www.lip.pt), Lisbon, Portugal, October 19, 2011.
Levin	New technologies for positron emission tomography. Presented at Department Ingeniería Electrónica, Universidad Politécnica de Madrid (http://www.die.upm.es/im/), Madrid, Spain, November 3, 2011.
Levin	Research topics in time-of-flight positron emission tomography. Presented at the Medical Physics Seminar Series, University of Wisconsin, April 9, 2012.

Other Scientific Meeting Presentations

Other Presentations 2011-2012

Levin	Simultaneous PET and MRI. Presented at the joint Siemens/Stanford Research meeting. Clark Center, Stanford University. February 15, 2012.
Levin	The Molecular Imaging Instrumentation Laboratory at Stanford. Presented to IFIC (http://ific.uv.es/), Valencia, Spain. October 31, 2011.
Levin	The status of integrating PET and MRI. Presented at the Center for Biomedical Imaging at Stanford Medical Imaging Seminar Series, Li Ka Shing Center, Stanford University, December 7, 2011.
Levin	Time-of-flight positron emission tomography. Presented at Bioe393: BioE Seminar Series, Clark Center, Stanford University, February 17, 2012
Levin	Updates on research projects with clinical translation. Presented to the Nuclear Medicine Division, Department of Radiology, Stanford University School of Medicine, Dec. 2, 2011.
Lipson	"Title: "Breast Cancer Screening" Date: 9/22/2011 Forum: Hewlett-Packard Headquarters (Palo Alto, CA), arranged by Stanford Strategic Partners Audience: 30 HP employees + 300 on-line attendees (broadcast worldwide as webinar)"
Lipson	Title: "Breast Tomosynthesis" Date: 10/6/2011 Forum: Monthly meeting of Stanford radiology technologists and administration Audience: 40 Stanford radiology technologists + administrators
Lipson	"Title: "Imaging work-up of palpable abnormalities; RSNA Refresher course preview" Date: 10/22/2011 Forum: Mid-Atlantic Kaiser/DC ACR Breast Imaging CME (Washington, DC) Audience: 80 conference attendees (physicians)"
Lipson	Title: "Targeted Ultrasound after MRI." Date: 10/23/2011 Forum: Mid-Atlantic Kaiser/DC ACR Breast Imaging CME (Washington, DC) Audience: 80 conference attendees (physicians)
Lipson	"Title: "High Risk MRI Screening for Breast Cancer: Current Guidelines and Challenges" Date: 10/15-16/2011 Forum: SMRT Presidents Regional Meeting (Stanford, CA) Audience: 40 conference attendees (technologists)"
Liu H, Carpenter C, Jiang H, Pratx G, Sun C, Gambhir SS, Xing L, Cheng Z.	Fiber-based system for imaging tumor margins with Cerenkov Luminescence. Oral presentation at the 243rd ACS National Meeting, San Diego, CA, March 25-29, 20012.
Louie	10/26/11 Colorectal Cancer Support Group in the Division of Gastroenterology and Hepatology Stanford University. Lectured about Liver Directed Therapy.
Louie	11/29/11 Stanford Oncology Grand Rounds: "How Can Interventional Radiology Help Your Patients?"
Louie	11/5/11 CSRT (California Society of Radiologic Technologists) 72nd Annual Conference: "C-Arm CT: New Vision for the Cath lab"
Louie	2/9/12 – 2/12/12 Are yoU ready? Y90 Conference. Scottsdale, Az. Advanced Angio for Y-90 Lecture: Cone Beam CT and Y90
Louie	3/19/12 Cath Lab Staff Education Series: Radioembolization
Louie	3/2/12 Radiation Oncology Morning Conference: Interventional Oncology
Louie	3/28/12 Chronic Venous Occlusion Workshop at 37th annual meeting of the Society of Interventional Radiology. San Francisco, Ca
Louie	9/10/11 Stanford Neuroendocrine Patient Education Conference: Lectured on "The Many Faces of Radiation"
Mallick	AACR Molecular Biology in Clinical Oncology
Mallick	Agilent Corporation Seminar Series
Mallick	Amgen Corporation Seminar Series
Mallick	Molecular Imaging Program at Stanford Seminar Series
Mallick	Stanford Center for Cancer Systems Biology
Marks	"Correlation of TICI reperfusion with MR reperfusion, infarct growth and clinical outcome in the DEFUSE 2 trial. DEFUSE Investigators Meeting. Palo Alto, CA. December 2011."

Other Presentations 2011-2012

Marks	Endovascular Treatment of Acute Stroke. Community Hospital of Monterrey Peninsula. December 2011.
Marks	Measuring stroke revascularization: Lessons from the DEFUSE Trial. Consensus Meeting on Revascularization Grading Following Endovascular Ischemic Stroke Therapy. Medical College of Wisconsin. Chicago, IL. January 2012
Mitchell L, Wu A, Ross M, Do HM	Pathologic versus osteoporotic vertebral compression fractures: Is there a difference in response to vertebroplasty? ASSR 12th Annual Meeting, Miami, FL, February 17, 2012.
Mittra	PET Imaging in Lung Cancer (2011). Stanford Department of Radiation Oncology. Stanford, CA.
Mittra	Practical Considerations for Radioactive Iodine Therapy for Thyroid Cancer (2011). ThyCa Workshop. Los Angeles, CA.
Mittra	The Ins and Outs of Nuclear Imaging for Thyroid Cancer (2011). ThyCa Workshop. Los Angeles, CA.
Mittra E, Baek S, Choi CM, Gong G, Oh SJ, Mosci C, Kumar M, Chin FT, Fels LM, Stephens AW, Koglin N, Mueller, A, Dinkelborg LM, Moon DH, and Gambhir SS	Pilot clinical trials of FSPG (BAY 94-9392): An 18F-labeled glutamate derivative for PET imaging of system xC- activity in tumors (2012). American Association of Cancer Research. Chicago, IL.
Moseley	Invited Speaker. Department of Comparative Medicine. "Lab Animal Technician Appreciation Week - Animal Research at Stanford", March 2012.
Moseley	Invited Speaker. Molecular Imaging Joint Symposium. MIPS. September 2011. Modern Neuroimaging for Molecular Imaging and MR.
Moseley	Invited Speaker. NPO Amakakeru. Hiroshima University, November 2011. New Thinking in MRI.
Moseley	Invited Speaker. PAMCVA - WRIISC Neuroimaging Seminar. Role of Advanced Neuroimaging at the VA. September, 2011.
Moseley	Invited Speaker. Shimane University, November, 2011. DWI and PWI at 3T.
Moseley	Plenary Speaker. Japan 1st Annual ICSRT. Kobe, November 2011. Advances in 3D MRI.
Myall N. J., Yeom K., Yeatman J. D., Gaman-Bean S., Feldman H. M.	Tractography demonstrates a variable increase in the fractional anisotropy of multiple white matter tracts in preterm adolescents with ventricular dilatation. Society for Neuroscience. Washington, D.C. Nov 12-16, 2011
Nair V. S., Gevaert O., Davidzon G., Napel S., Graves E., Hoang C. D., Quon A., Rubin D. L., Plevritis S. K.,	Non-small Cell Lung Cancer Tumor 18F-FDG Uptake is Associated with Gene Dysregulation Beyond Glycolysis. American Thoracic Society, San Francisco, May 2012.
Napel	RSNA 2011 Refresher Course on Decision Support in Clinical Practice: Quantitative Image Analysis for Image Retrieval, Decision Support, and Knowledge Discovery. Chicago, November 2011.
Nino-Murica	Lecture: Abdomen and Pelvis Cases. October 4, 2011.
Olcott	Olcott EW, Sommer G. 3D Processing of MDCT: Pancreatic CA and CTU. Society of Uroradiology Scientific Session, March 24-29, 2012. Abdominal Imaging Course 2012, Society of Uroradiology and Society of Gastrointestinal Radiology, Scottsdale, Arizona.
Olcott EW, Shin LK, Sommer G, Fleishmann D	"Renal CT with Model-Based Iterative Reconstruction (MBIR) versus Adaptive Statistical Iterative Reconstruction (ASIR) and Filtered Back Projection (FBP). Society of Uroradiology Scientific Session, March 24-29, 2012. Abdominal Imaging Course 2012, Society of Uroradiology and Society of Gastrointestinal Radiology, Scottsdale, Arizona."
Paulmurugan	Biodegradable Polymer Nanocarriers for Therapeutic Sense and Antisense microRNA Delivery in Living Animals. SPIE, January 21-22, 2012, San Francisco, USA.
Paulmurugan	Epigenetics- New Therapeutic Targets to Treat Cancers by Altering Cellular Homeostasis, King Institute for Preventive Medicine, Chennai, India, January 12, 2012.
Paulmurugan	Nanoparticles mediated delivery of microRNAs- A new therapeutic approach to treat cancers by altering cellular homeostasis, 2nd Molecular Materials Meeting (M3) @ Singapore, 09-12, January 2012, Biolpolis, Singapore.

Other Presentations 2011-2012

Paulmurugan R., Sekar Narayana M., and Sekar Thillai V.	(2012). Nanoparticles Mediated Targeted Delivery of MicroRNAs-The New Therapeutic Approach to Treat Cancer by Altering Cellular Homeostasis 2nd Molecular Materials Meeting (M3) @ Singapore, 09-12, January 2012, Biolpolis, Singapore.
Pauly	Butts Pauly K, Novel Imaging Methods for MR-guided Focused Ultrasound, University of Virginia, BME Seminar Series, Dec. 2011.
Pelc	"Future Prospects in CT". Fourth Annual Hasegawa Lecture, UCSF, March 15, 2012.
Pelc	"New Frontiers in CT: Functional and Spectral Imaging", 24th European Congress of Radiology, March 1-5, 2012.
Pelc	"Physical Basis of Dual Energy CT". 2nd Annual Dual Energy CT Symposium. New York University, Oct. 16, 2011.
Pitteri	"A Multidimensional Protein Fractionation and Enrichment Strategy for Quantitative Glycoproteomic Analysis of Breast Cancer Plasma", US Human Proteome Organization Annual Meeting, March 4-7, 2012, San Francisco, CA
Pitteri	"Analytical Chemistry Challenges in Clinical Proteomics", Federation of Analytical Chemistry and Spectroscopy Societies Annual Meeting, October 2-7, 2011, Reno, NV
Pitteri	"Identification of Circulating Proteins for Breast Cancer Early Detection in Pre-Diagnostic Plasma Samples" and "A Multidimensional Protein Fractionation and Enrichment Strategy for Quantitative Glycoproteomic Analysis of Breast Cancer Plasma", Canary Foundation Early Detection Symposium, May 1, 2012, Stanford, CA
Pitteri	"Identification of Circulating Proteins for Breast Cancer Early Detection in Pre-Diagnostic Plasma Samples", Bio-X Interdisciplinary Initiative Symposium", August 27, 2012, Stanford, CA
Pitteri	"Identification of Circulating Proteins for Breast Cancer Early Detection in Pre-Diagnostic Plasma Samples", Stanford Cancer Institute Retreat, April 16, 2012, Quadrus Conference Center
Pitteri	"Mass Spectrometry-Based Identification and Characterization of microRNA", American Society for Mass Spectrometry and Allied Topics Annual Meeting, May 20-24, 2012, Vancouver, BC
Pitteri	"Proteomic Strategies for Breast Cancer Early Detection", Department of Radiology Early Detection Seminar Series, January 26, 2012, Stanford, CA
Pitteri	"Proteomic Strategies for Breast Cancer Early Detection, Progression, and Recurrence", Merck, July 30, 2012, Palo Alto, CA
Pitteri	"Quantitative Glycoproteomic Analysis of Clinical Samples", Agilent Technologies, August 30, 2012, Santa Clara, CA
Plevritis	(Keynote Talk) "Inferring Biological Progression from High Dimensional Data," Seventh Annual RECOMB Systems Biology Meeting, Barcelona, Spain, October 16, 2011.
Plevritis	"Systems Biology of Cancer" Annual Stanford Comprehensive Cancer Research Training Program (CCRTP), Quadrus Conference Center, Palo Alto, CA, October 1, 2011.
Pritton K., Ren P-G, Ma T., Gibon E., Biswal S., Gambhir S.S., Goodman S.B.	Systematic Migration of Osteogenic Cells Mitigates Particle-Induced Osteolysis. Knee Society Summer Meeting, London, Canada, September, 2011.
Pysz MA, Seeley ES, Foygel K, Gambhir SS, Brentnall T, Willmann JK	Early Detection of Pancreatic Cancer in Transgenic Mice with Ultrasonic Molecular Imaging and VEGFR2-targeted Microbubbles - American Association for Cancer Research Annual Meeting 2012. March 31-April 4th, 2012
Quist B, Hargreaves BA, Daniel BL, Saranathan M	3D balanced SSFP Dixon imaging with Band-Reduction at 3T. ISMRM Workshop: Fat-Water Separation: Insights, Applications & Progress in MRI, Long Beach, 2012.
Quon	Feb. 23, 2012 Annual Northern California Chapter SNM Midwinter Meeting: "Utility of PET/CT in Lymphoid Malignancies"
Quon	Jan. 3-7, 2012 Imaging at Bachelor Gulch
Quon	Oct. 14-15, 2011 PET/CT Imaging Boot Camp
Quon	Sept. 8-9, 2011 Philips PET/MR Advisory Board Meeting: "The Future of PET/MRI"
Rao	China National Center for Nanoscience and Technology, Beijing, May 14, 2012.

Other Presentations 2011-2012

Rao	CMC-Stanford Molecular Imaging Symposium, Stanford, CA, September 2, 2011. Probe development for multimodality molecular imaging.
Rao	International Summer School on Fluorescence Nanoparticles in Biomedicine. Miraflores de la Sierra, Spain, July 16-20, 2012.
Rao	The Southern California Section of the American Chemical Society (SCALACS) 43rd western regional meeting, Pasadena, CA, November 10-12, 2011.
Rubesova	International Society of Pediatric Radiology - London (UK) 2011 - Imaging fetal bowel abnormalities
Rubesova	Santa Clara Medical Center –Fetal imaging and board reviews
Rubin	Rubin DL, "Imaging Informatics: From Pixels to Biomedical Meaning" Bio-X Undergraduate Summer Research Program Lecture Series
Rutt	Rutt B. The Stanford High Field MRI Program. Stanford Medical Imaging seminar series, 18 Jan 2012.
Rutt	Rutt B. Hardware for Vascular MRI. 2011 International MR Angiography Workshop, 25 Sept 2011.
Rutt	Rutt B. The Stanford High Field MRI Program. VA San Francisco invited speaker series, 14 Dec 2011.
Shah	Shah, Rajesh P. "Interventional Radiology in Palliative Care Medicine." Palliative care fellows conference, Stanford University Medical Center, Stanford, CA, April 2012
Shin LK, Jeffrey RB	Pearls and Pitfalls in Patients with Acute Abdominal Pain. Abdominal Radiology Course, Scottsdale, AZ, March 25-30, 2012.
Shin M., Lillaney P., and Fahrig R.	Rotor Resonance in an MR-compatible Rotating Anode X-ray Tube Stanford Symposium on Biomedical Imaging, Stanford, April 2012
Sommer	"iiCME Diagnostic Imaging Update, Bachelor Gulch, CO, January 3-6, 2012 MRI of the Pancreas Doppler Ultrasound of the Liver MRI of the Liver Scrotal Ultrasound Renal and Carotid Doppler Ultrasound"
Sommer	"SGR/SUR Abdominal Radiology Course, Scottsdale, AZ March 26-30, 2012 Workshop: 3D Processing of Pancreatic Cancer and CT Urograms
Olcott E, Shin L, Sommer G, Chan I, Fleischmann.	Renal CT with Model-based Iterative Reconstruction (MBIR) versus Adaptive Statistical Iterative Reconstruction (ASIR) and Filtered Back Projection (FBP)"
Spielman	Dedifferentiated paraosteal osteosarcoma International Skeletal Society, San Diego – September 2011.
Steinberg GK, Darsaut TE, Guzman R, Marcellus ML, Edwards MS, Tian L, Do HM, Chang SD, Levy RP, Adler JR, Marks MP.	Management of pediatric intracranial arteriovenous malformations: experience with multimodality therapy. AANS 73rd Annual Meeting, Scottsdale, AZ, October 2011.
Stevens	Commonly missed fractures of the ankle and foot. Korean Congress of Radiology – Seoul, Korea October 2011.
Stevens	MRI of biceps and triceps tendon pathology at the elbow. International Skeletal Society, San Diego – September 2011.
Stevens	The medial longitudinal arch of the foot. Korean Congress of Radiology – Seoul, Korea October 2011.
Sze	"Assessment, staging, and triage of patients with HCC." Advanced Interventional Management Symposium, New York, NY, November, 2011.
Sze	"C-arm CT applications." The Liver Package, Las Vegas, NV, September, 2011.
Sze	"Complications we can all learn from: IO." Southeast Angiographic Society, Yountville, CA, October, 2011.
Sze	"Emerging image-guided therapies for hepatic malignancies." The Liver Package, Las Vegas, NV, September, 2011.
Sze	"Endovascular management of acute pulmonary emboli – how useful is it really?" VIVA 2011, Las Vegas, NV, October, 2011.

Other Presentations 2011-2012

Sze	“How I do it: Catheter management of massive PE.” VIVA 2011, Las Vegas, NV, October, 2011.
Sze	“Intraprocedural diagnosis, guidance, navigation, and targeting of IO.” Southeast Angiographic Society, Yountville, CA, October, 2011.
Sze	“Local/regional therapy for HCC: TACE vs. Ablation.” Southeast Angiographic Society, Yountville, CA, October, 2011.
Sze	“Radioembolization of hepatocellular carcinoma.” Inaugural Egyptian Radioembolization Symposium, Cairo, Egypt, February, 2012.
Sze	“Radioembolization of neoplasms metastatic to the liver.” Inaugural Egyptian Radioembolization Symposium, Cairo, Egypt, February, 2012.
Sze	“Radioembolization: a new option for treatment of hepatic malignancies.” Inaugural Egyptian Radioembolization Symposium, Cairo, Egypt, February, 2012.
Sze	“Radioembolization: when to use and how to insure safety and effectiveness.” Southeast Angiographic Society, Yountville, CA, October, 2011.
Sze	“Recurrent IVC thrombosis, thrombolysis, reconstruction.” VIVA 2011, Las Vegas, NV, October, 2011.
Sze	“Strategies on the Frontline: Renal artery stenosis, flash pulmonary edema.” VIVA 2011, Las Vegas, NV, October, 2011.
Telli ML, Kurian AW, Jensen KC, Vinayak S, Flaherty P, Lipson JA, Wapnir I, Daniel B, Carlson RW, Mills MA, Chang P-J, Schackmann E, Rocha C, Sherman B, Blackwood-Chirchir A, Bradley C, Ford JM	[P3-14-08] A Phase II Study of Gemcitabine and Carboplatin (GC) Plus Iniparib (BSI-201) as Neoadjuvant Therapy for Triple-Negative and BRCA1/2 Mutation-Associated Breast Cancer. Presented at 2011 CTRC-AACR San Antonio Breast Cancer Symposium. December 8, 2011. CTRC-AACR San Antonio Breast Cancer Symposium
Vasanawala	“New Methods in Body MRI”, Center for Pe
Vasanawala	“Urologic MRI”: Stanford Dept. of Urology Grand Rounds, March 2012.
Vasanawala	CMR Compressed Sensing: Technology and Applications”, 15th Annual Scientific Session of the Society for Cardiovascular Magnetic Resonance, Orlando FL, February 2-5, 2012.
Wang D, Rubin DL, Chambers D, Chambers J, South B, Hwang T, Goldstein MK.	Using Natural Language Processing to Identify Lines and Devices in Portable Chest X-Ray Reports: Evaluation of 500 Reports. Scientific Paper, 2012 AMIA Clinical Research Informatics Summit; San Francisco, CA,
Wang H, Ren Y, Willmann JK	Ultrasound Molecular Imaging Compared with 18FDG-PET-CT in Quantification of Inflammation in Inflammatory Bowel Disease (IBD). Society of Gastrointestinal Radiology. March 25, 2012.
Willmann	Willmann JK. Differenzierte Bildgebung bei Raumforderung des Pankreas. CT 2012. January 13, 2012. Garmisch-Patenkirchen, Germany.
Willmann	Willmann JK. Monitoring Inflammation in Inflammatory Bowel Disease using Ultrasound Molecular Imaging. The 26th Annual Advances of Contrast Ultrasound – ICUS Bubble Conference. September 22-23, 2011, Chicago, USA.
Wu	Mar 2012 Future of Genomic Medicine V Conference. La Jolla, CA
Wu	"Oct 2011 NHLBI Symposium on Cardiovascular Regenerative Medicine [organizers: Manfred Boehm, MD; Denis Buxton, PhD; George Daley, MD, PhD; Robb MacLellan, MD; David Scadden, MD; Susan Shurin, MD; Deepark Srivastava, MD, John Thomas, PhD, Joseph Wu, MD, PhD; Sean Wu, MD, PhD]”
Wu	"Oct 2011 Personalized Medicine in the Genomics Era. Toronto, Canada [organizers: Seema Mital, MD; James Ellis, PhD]”
Wu	"Sept 2011 British Society of Cardiovascular Research. London, United Kingdom [I received the Bernard and Joan Marshall Research Excellence Prize €5,000]. “
Wu	"Sept 2011 Imaging in 2020 VII: Bridging Molecular Imaging & Therapy. Jackson Hole, WY. [organizers: Dean Sherry, PhD; Thomas Meade, PhD; Kathy Ferrara, PhD]”

Other Presentations 2011-2012

Ye D, Pandit P, Roland J, Tikhomirov G, Rutt B, Rao J.	“Smart” MRI probes for molecular imaging. 6th NCI Alliance for Nanotechnology in Cancer Investigators, Boston, September 21-23, 2011.
Yeom K., Lober R.M., Fischbein N. J, Harsh G., Vogel H., Allagio Rita, Calderone Milena, Pearson Matthew, Edwards M.S.B., Mobley B.C.	Diffusion Weighted MRI Distinguishes Skull Base Chordoma and Chondrosarcoma. North American Skull Base Society 22nd annual meeting, Las Vegas, NV Feb. 17-19, 2012.
Zaharchuk	“A Brief History of Stroke Imaging”, Grand Rounds, Visiting Professor, Department of Radiology, Emory University School of Medicine, Atlanta, GA, 1/2012
Zaharchuk	“Imaging Stroke and Transient Ischemic Attack with MRI”, Society of Magnetic Resonance Technologists (SMRT) President's Regional Educational Seminar, Stanford, CA 10/2011
Zaharchuk	“Imaging Stroke and Transient Ischemic Attack” and “Vascular Imaging of the Central Nervous System”, University of British Columbia Radiology Conference - Vancouver Imaging Review, Vancouver, BC, Canada, 9/2011
Zaharchuk	“Patient Selection for Stroke Therapy using MR”, Society for Neurointerventional Surgery (SNIS) Practicum, New York City, NY, 4/2012
Zhao P, Yang X, Qi S, Cao Q, Chua MS, Wang J, So S, Cheng Z.	"Optical imaging of liver carcinoma xenografts using epidermal growth factor receptor targeted fluorescently labeled affibody. Poster presentation at the American Association for the Study of Liver Diseases – The Liver Meeting (AALSD), San Francisco, CA, USA, Nov. 4-8, 2011.”

Published Papers

Published Papers

Abajian AC, Levy M, Rubin DL. Informatics in Radiology: Improving Clinical Work Flow through an AIM Database: A Sample Web-based Lesion Tracking Application. Radiographics. 2012

Abdelmaksoud MH, Louie JD, Hwang GL, Sze DY, Hofmann LV, Kothary N. Transarterial chemoembolization for hepatocellular carcinomas in watershed segments: utility of C-arm computed tomography for treatment planning. J Vasc Interv Radiol. 2012 Feb;23(2):281-3.

Abdelmaksoud MH, Louie JD, Kothary N, Hwang GL, Kuo WT, Hofmann LV, Hovsepian DM, Sze DY. Consolidation of hepatic arterial inflow by embolization of variant hepatic arteries in preparation for yttrium-90.J Vasc Interv Radiol. 2011 Oct;22(10):1364-1371.e1.

Abdelmaksoud MH, Louie JD, Kothary N, Hwang GL, Kuo WT, Hofmann LV, Hovsepian DM, Sze DY. Embolization of parasitized extrahepatic arteries to reestablish intrahepatic arterial supply to tumors before yttrium-90 radioembolization. J Vasc Interv Radiol. 2011 Oct;22(10):1355-62.

Abdelmaksoud MHK, Louie JD, Hwang GL, Kothary N, Minor DR, Sze DY. Yttrium-90 radioembolization of renal cell carcinoma metatstatic to the liver. J Vasc Interv Radiol. 2012 Mar;23(3):323-330.e1

Aksoy M, Forman C, Straka M, Çukur T, Hornegger J, Bammer R. Hybrid prospective and retrospective head motion correction to mitigate cross-calibration errors. Magn Reson Med. 2012; 67 (5): 1237-51

"Albers GW, Goldstein LB, Hess DC, Wechsler LR, Furie KL, Gorlick PB, Hurn P, Liebeskind DS, Noguera RG, Saver JL, STAIR VII Consortium. Stroke treatment academic industry roundtable (STAIR) recommendations for maximizing the use of intravenous thrombolytics and expanding treatment options with intra-arterial and neuroprotective therapies. Stroke. 2011 Sep; 42 (9):2645-50.”

Alieva M, Bagó JR, Aguilar E, Soler-Botija C, Vila OF, Molet J, Gambhir SS, Rubio N, Blanco J. Glioblastoma therapy with cytotoxic mesenchymal stromal cells optimized by bioluminescence imaging of tumor and therapeutic cell response. PLoS One. 2012; 7 (4): e35148

Amon L.M., Pitteri S.J., Li C.I., McIntosh M., Ladd J., Disis M., Porter P., Wong C.H., Zhang Q., Prentice R.L., Hanash S.M. “Concordant up-regulation of glycolysis pathway proteins in plasmas collected prior to a diagnosis of breast cancer.” Cancer Res. 2012, 72, 1935-1942.

Andre JB, Zaharchuk G, Fischbein NJ, Augustin M, Skare S, Straka M, Rosenberg J, Lansberg MG, Kemp S, Wijman CA, Albers GW, Schwartz NE, Bammer R. Clinical Assessment of Standard and Generalized Autocalibrating Partially Parallel Acquisition Diffusion Imaging: Effects of Reduction Factor and Spatial Resolution. AJNR Am J Neuroradiol. 2012 Mar 8. [Epub ahead of print]

Andre JB, Zaharchuk G, Saritas E, Komakula S, Shankaranarayan A, Banerjee S, Rosenberg J, Nishimura DG, Fischbein NJ. Clinical Evaluation of Reduced Field-of-View Diffusion-Weighted Imaging of the Cervical and Thoracic Spine and Spinal Cord. AJNR Am J Neuroradiol. 2012

Published Papers

Ashford JW, Adamson M, Beale T, La D, Hernandez B, Noda A, Rosen A, O'Hara R, Fairchild JK, Spielman D, Yesavage JA. MR spectroscopy for assessment of memantine treatment in mild to moderate Alzheimer dementia. J Alzheimers Dis. 2011;26 Suppl 3:331-6. PubMed PMID: 21971472

Ashford JW, Salehi A, Furst A, Bayley P, Frisoni GB, Jack CR Jr, Sabri O, Adamson MM, Coburn KL, Olichney J, Schuff N, Spielman D, Edland SD, Black S, Rosen A, Kennedy D, Weiner M, Perry G. Imaging the Alzheimer brain. J Alzheimers Dis. 2011;26 Suppl 3:1-27. PubMed PMID: 21971448.

Atlas, Scott W. Another view: Misleading neonatal data distort rankings; USA Today, October 4, 2011

Atlas, Scott W. ObamaCare Is At the Core of the President's War on Excellence; Investor's Business Daily, February 16, 2012

Atlas, Scott W. Striking "Obamacare" a Rejection of Overreach; Politico, March 12, 2012

Atlas, Scott W. Survival of the Smallest; Hoover Digest, Winter 2012, Number 1; January 23, 2012

Atlas, Scott W. The Car Insurance Model; Defining Ideas, February 2, 2012

Atlas, Scott W. The Picture of Health; Hoover Digest; 2012, No. 2, April 6, 2012

Atlas,Scott W. Infant Mortality: A Deceptive Statistic; National Review Online, September 14, 2011

B. Raman, R. Raman, G. D. Rubin, S. Napel, "Automated Tracing of the Adventitial Contour of Aortoiliac and Peripheral Arterial Walls in CT Angiography (CTA) to Allow Calculation of Non- Calcified Plaque Burden," J Digit Imaging. 24(6):1078-86, 2011. PMID: 21547519.

B.J. Hackel, A. Sathirachinda, S.S. Gambhir. Designed Hydrophilic and Charge Mutations of the Fibronectin Domain: Towards Tailored Protein Biodistribution. Protein Engineering Design and Selection, 2012 (Epub ahead of print). PMID: 22691700.

Baek J and Pelc NJ: Effect of detector lag on CT noise power spectra (PMCID: PMC3162307). Med Phys 38, 2995-3005, 2011.

Baek J and Pelc NJ: Local and global 3D noise power spectrum in cone beam CT system with FDK reconstruction (PMCID: PMC3078160). Med Phys 38, 2122-31, 2011.

Baek S, Choi CM, Ahn SH, Lee JW, Gong G, Ryu JS, Oh SJ, Bacher-Stier C, Fels L, Koglin N, Hultsch C, Schatz CA, Dinkelborg LM, Mittra ES, Gambhir SS, Moon DH. Exploratory clinical trial of (4S)-4-(3-[18F]fluoropropyl)-L-glutamate for imaging xC- transporter using positron emission tomography in patients with non-small cell lung or breast cancer. Clin Cancer Res. 2012

Balchandani P; Khalighi MM; Glover GH; Pauly JM, Spielman DM. Self-Refocused Adiabatic Pulse for Spin Echo Imaging at 7T. Magn. Reson. Med. 67(4):1077-1085 (2012)

Bangerter N, Cukur T, Hargreaves BA, Hu B, Quist B, Park D, Gold GE, Nishimura D. 3D Fluid-Suppressed T2- Prep Flow-Independent Peripheral Angiography using Balanced SSFP. Magn Reson Imaging. 2011 Oct;29(8):1119-24. PMID: 21705166

Barth RA. Imaging of Fetal Chest Masses. Pediatr Radiol (2012) 42: (S62-S73)

Bettinger T, Bussat P, Tardy I, Pochon S, Hyvelin JM, Emmel P, Henrioud S, Biolluz N, Willmann JK, Schneider M, Tranquart F. Ultrasound molecular imaging contrast agent binding to both E and P-selectin in different species. Invest Radiol 2012; Jul 18 [Epub ahead of print]

Bhaumik S, Sekar TV, Depuy J, Klimash J, Paulmurugan R. Noninvasive optical imaging of nitroreductase gene-directed enzyme prodrug therapy system in living animals. Gene Ther. 2012; 19 (3): 295-302

Bitton R, Kaye E, Dirbas F, Daniel B, Butts Pauly K. Toward MR-guided High Intensity Focused Ultrasound for Pre-surgical Localization: Focused Ultrasound Lesions in Cadaveric Breast Tissue. J Magn Reson Imaging 2012 May;35(5):1089-97.

Blankenberg FG, Levashova Z, Goris MG, Hamby CV, Backer MV, Backer JM. Targeted systemic radiotherapy with scVEGF/177Lu leads to sustained disruption of the tumor vasculature and intratumoral apoptosis. J Nucl Med. 2011 Oct;52(10):1630-7.

Braun HJ, Gold GE. Diagnosis of Osteoarthritis: Imaging. Bone 2011 Dec. PMID: 22155587.

Braun HJ, Gold GE. Advanced MRI of articular cartilage. Imaging Med. 2011 Oct;3(5):541-555. PMID:22162977

Brown DB, Nikolic B, Covey AM, Nutting CW, Saad WE, Salem R, Sofocleous CT, Sze DY. (2012) Quality improvement guidelines for transhepatic arterial chemoembolization, embolization, and chemotherapeutic infusion for hepatic malignancy. J Vasc Interv Radiol. 23:287-294.

Bu L, Xie J, Chen K, Huang J, Aguilar ZP, Wang A, Sun KW, Chua MS, So S, Cheng Z, Eden HS, Shen B, Chen X. Assessment and comparison of magnetic nanoparticles as MRI contrast agents in a rodent model of human hepatocellular carcinoma. Contrast Media Mol Imaging. 2012 Jul-Aug; 7 (4): 363-72

Published Papers

Burridge PW, Keller G, Gold JD, Wu JC. Production of de novo cardiomyocytes: human pluripotent stem cell differentiation and direct reprogramming. Cell Stem Cell 2012;10(1):16-28. PMID 22226352. PMCID 3255078

Buxton DB, Antman M, Danthi N, Dilsizian V, Fayad ZA, Garcia MJ, Jaff MR, Klimas M, Libby P, Nahrendorf M, Sinusas AJ, Wickline SA, Wu JC, Bonow RO, Weissleder R. Report of the National Heart, Lung, and Blood Institute working group on translation of cardiovascular molecular imaging. Circulation 2011;123(19):2157-63. PMID 21576680

Campbell BC, Costello C, Christensen S, Ebinger M, Parsons MW, Desmond PM, Barber PA, Butcher KS, Levi CR, De Silva DA, Lansberg MG, Mlynash M, Olivot JM, Straka M, Bammer R, Albers GW, Donnan GA, Davis SM; EPITHET-DEFUSE Investigators. Fluid-attenuated inversion recovery hyperintensity in acute ischemic stroke may not predict hemorrhagic transformation. Cerebrovasc Dis. 2011;32(4):401-5. Epub 2011 Oct 8.

Casey BJ; Leah H; Somerville L; Gotlib IH; Ayduk O; Franklin N; Askren MK, Jonides J; Berman MG; Wilson NL; Teslovich T; Glover GH;V Zayas V; Mischel, W; Shoda Y. Behavioral and neural correlates of delay of gratification 40 years later. PNAS 108:14998-5003 (2011)

Castaneda R, Boddington S, Wendland M, Henning TD, Mandrussow L, Daldrup-Link HE: MR Imaging of Human Embryonic Stem Cell Derived Cardiomyocytes: Should iron oxide nanoparticle labeling occur before or after differentiation? Pediatr Radiol. 41(11): 1384-1392, 2011 -> this manuscript received the "Berdon Award" from the Society for Pediatric Radiology for the best basic science paper, published in Pediatric Radiology in 2011

Castaneda R, Khurana A, Khan R, Daldrup-Link HE: Labeling stem cells with ferumoxytol, an FDA-approved iron oxide nanoparticle. J Vis Exp. 2011 Nov 4;(57). pii: 3482. doi: 10.3791/3482, PMCID in progress

Cencioni C, Melchionna R, Straino S, Romani M, Cappuzzello C, Annese V, Wu JC, Pompilio G, Santoni A, Gaetano C, Napolitano M, Capogrossi MC. Ex vivo acidic preconditioning enhances bone marrow ckit+ cell therapeutic potential via increased CXCR4 expression. European Heart Journal 2011; Epub ahead of print. PMID 21784762

Chan C.T., Reeves R.E., Geller R., Yaghoubi S.S., Hoehne A., Solow-Cordero D.E., Chiosis G., Massoud T.F., Paulmurugan R., Gambhir S.S. Discovery and Validation of Small-Molecule Heat-Shock Protein 90 Inhibitors Through Multimodality Molecular Imaging in Living Subjects. Proceedings of the National Academy of Sciences U.S.A., 2012 (Epub ahead of print). PMID: 22895790.

Chan CT, Reeves RE, Geller R, Yaghoubi SS, Hoehne A, Solow-Cordero DE, Chiosis G, Massoud TF, Paulmurugan R, Gambhir SS. Discovery and validation of small-molecule heat-shock protein 90 inhibitors through multimodality molecular imaging in living subjects. Proc Natl Acad Sci U S A. USA. 2012 Aug 15. Epub ahead of print. PMID: 22895790.

Chan KT, Popat RA, Sze DY, Kuo WT, Kothary N, Louie JD, Hovsepian DM, Hwang GL, Hofmann LV. Common iliac vein stenosis and risk of symptomatic pulmonary embolism: an inverse correlation. J Vasc Interv Radiol. 2011; 22 (2): 133-41

Chan KT, Tye GA, Kuo WT, Popat RA, Kothary N, Sze DY, Unver K, Hofmann LV. Common Iliac Vein Stenosis: A Risk Factor for Oral Contraceptive-Induced Deep Venous Thrombosis. Am J Obstet Gynecol. 2011 Dec;205(6):537.e1-6.

Chan L, Shin LK, Pai RK, Jeffrey RB. Pathologic continuum of acute appendicitis: Sonographic findings and clinical management implications. J Clin Ultrasound 2011; 27(2):81-5.

Chang K, Delbello M, Chu WJ, Garrett A, Kelley R, Mills N, Howe M, Bryan H, Adler C, Eliassen J, Spielman D, Strakowski SM. Neurometabolite Effects of Response to Quetiapine and Placebo in Adolescents with Bipolar Depression. J Child Adolesc Psychopharmacol. 2012

Chang YF, Chuang HY, Hsu CH, Liu RS, Gambhir SS, Hwang JJ. Immunomodulation of curcumin on adoptive therapy with T cell functional imaging in mice. Cancer Prev Res (Phila). 2012; 5 (3): 444-52

Charalel RA, Jeffrey RB, Shin LK. Complicated cholecystitis: The complementary roles of sonography and computed tomography. Ultrasound Q 2011; 27(3):161-70.

Chen A; Olsen RK; Preston AR; Glover GH; Wagner AD. Associative Retrieval Processes in the Human Medial Temporal Lobe: Hippocampal Retrieval Success and CA1 Mismatch Detection. Learning & Memory 18:523-8 (2011)

Chen H, Li F, Zhao X, Yuan C, Rutt B, Kerwin WS. Extended graphical model for analysis of dynamic contrast-enhanced MRI. Magn Reson Med. 2011 Sep;66(3):868-78. Epub 2011 Mar 9. PubMed PMID: 21394770.

Chen IY, Wu JC. Cardiovascular molecular imaging: focus on clinical translation. Circulation 2011;123(4):425-43. PMID 21282520. PMCID 3073678

Chen R, Pan S, Ottenhof NA, de Wilde RF, Wolfgang CL, Lane Z, Post J, Bronner MP, Willmann JK, Maitra A, Brentnall TA. Stromal galectin-1 expression is associated with long-term survival in resectable pancreatic ductal adenocarcinoma. Cancer Biol Ther. 2012 Aug 1;13(10).

Chen X., Gambhir S.S., Cheon J. Theranostic Nanomedicine. Accounts of Chemical Research, 44(10): 841, 2011. PMID: 22004477.

Cheng, J. Y.; Alley, M. T.; Cunningham, C. H.; Vasanawala, S. S.; Pauly, J. M.; Lustig, M. Nonrigid motion correction in 3D using autofocusing with localized linear translations. Magn Reson Med 2012 Feb 3, epub ahead of print. PMID: 22307933.

Published Papers

Chennupati SK, Quon A, Kamaya A, Pai RK, La T, Krakow TE, Graves E, Koong AC, Chang DT. Positron emission tomography for predicting pathologic response after neoadjuvant chemoradiotherapy for locally advanced rectal cancer. Am J Clin Oncol. 2012; 35 (4): 334-9

Chin AS, Fleischmann D. State-of-the-art computed tomography angiography of acute aortic syndrome. Semin Ultrasound CT MR. 2012; 33 (3): 222-34

Chin FT, Shen B, Liu S, Berganos RA, Chang E, Mittra E, Chen X, Gambhir SS. First experience with clinical-grade ([18F]FPP(RGD□): an automated multi-step radiosynthesis for clinical PET studies. Mol Imaging Biol. 2012; 14 (1): 88-95

Choi PS, van Riggelen J, Gentles A, BAchireddy P, Rakhra K, Adam SJ, Plevritis SK, Felsher DW. Lymphomas that recur after MYC suppression continue to exhibit oncogene addiction, Proceedings of the National Academy of Sciences, 2011 Oct 18;108(42):17432-7.

Christe A, Lin MC, Yen AC, Hallett RL, Roychoudhury K, Schmitzberger F, Fleischmann D, Leung AN, Rubin GD, Vock P, Roos JE. CT patterns of fungal pulmonary infections of the lung: Comparison of standard-dose and simulated low-dose CT. Eur J Radiol 2011 (Epub ahead of print)

Christen T, Lemasson B, Pannetier N, Farion R, Remy C, Zaharchuk G, Barbier EL, Is T2* enough to assess oxygenation? A quantitative blood-oxygen level dependent analysis in brain tumor, Radiology 2012; 262:495-502.

Christen T, Schmiedeskamp H, Straka M, Bammer R, Zaharchuk G. Measuring brain oxygenation in humans using a multiparametric quantitative blood oxygenation level dependent MRI approach. Magn Reson Med. 2011 Dec 12. doi: 10.1002/mrm.23283.

Christen T, Zaharchuk G, Pannetier N, Serduc R, Joudiou N, Vial JC, Remy C, Barbier EL, Quantitative MR estimates of blood oxygenation based on T2*: a numerical study of the impact of model assumptions, Magn Reson Med 2012; 67:1458-68.

Chu KP, Murphy JD, La TH, Krakow TE, Iagaru A, Graves EE, Hsu A, Maxim PG, Loo B, Chang DT, Le QT. Prognostic Value of Metabolic Tumor Volume and Velocity in Predicting Head-and-Neck Cancer Outcomes. Int J Radiat Oncol Biol Phys. 2012; 83 (5): 1521-7

Cloyd JM, Chandra V, Louie JD, Rao S, Visser BC. Preoperative embolization of replaced right hepatic artery prior to pancreaticoduodenectomy. J Surg Oncol. 2012 Feb 28. doi: 10.1002/jso.23082. [Epub ahead of print]

Colombani M, Rubesova E, Potier A, Quarello E, Barth RA, Devred P, Petit P, Gorincour G. Management of fetal mediastinal shift: A practical approach. Journal de Radiologie 2011: 91(2); 118-124

Conley NR, Dragulescu-Andrasi A, Rao J, Moerner WE. A selenium analogue of firefly D-luciferin with red-shifted bioluminescence emission. Angewandte Chemie International Edition 2012, 51, 3350-3353.

Coogan JS, Chan FP, Ladisa JF Jr, Taylor CA, Hanley FL, Feinstein JA. Computational fluid dynamic simulations for determination of ventricular workload in aortic arch obstructions. J Thorac Cardiovasc Surg. 2012 Apr 17 [Epub ahead of print].

Dake MD, Ansel GM, Jaff MR, Ohki T, Saxon RR, Smouse HB, Zeller T, Roubin GS, Burket MW, Khatib Y, Snyder SA, Ragheb AO, White JK, Machan LS; Zilver PTX Investigators…Sze D. (2011) Paclitaxel-eluting stents show superiority to balloon angioplasty and bare metal stents in femoropopliteal disease: twelve-month Zilver PTX randomized study results. Circ Cardiovasc Interv 2011;4:495-504.

Daldrup-Link HE, Golovko D, Ruffell B, Denardo DG, Castaneda R, Ansari C, Rao J, Tikhomirov GA, Wendland MF, Corot C, Coussens L: MR imaging of tumor associated macrophages with clinically applicable iron oxide nanoparticles. Clinical Cancer Research 17(17):5695-704, 2011

Darsaut T, Darsaut NM, Chang SD, Silverberg GD, Shuer LM, Tian L, Dodd RL, Do HM, Marks MP, Steinberg GK. Predictors of clinical and angiographic outcome following surgical or endovascular therapy of very large and giant intracranial aneurysms. Neurosurgery, 68(4):903-915; discussion 915, 2011

Darsaut TE, Guzman R, Marcellus ML, Edwards MS, Tian L, Do HM, Chang SD, Levy RP, Adler JR, Marks MP, Steinberg GK. Management of pediatric intracranial arteriovenous malformations: experience with multimodality therapy. Neurosurgery, 69(3):540-546, 2011

"de Almeida PE, van Rappard JR, Wu JC. In vivo bioluminescence for tracking cell fate and function. Am J Physiol Heart Circ Physiol 2011;301(3):H663-71. PMID 21666118"

de Bruin MA, Kwong A, Goldstein BA, Lipson JA, Ikeda DM, McPherson L, Sharma B, Kardashian A, Schackmann E, Kingham KE, Mills MA, West DW, Ford JM, Kurian AW. Breast cancer risk factors differ between Asian and white women with BRCA1/2 mutations. Fam Cancer. 2012

de la Zerda A, Bodapati S, Teed R, May SY, Tabakman SM, Liu Z, Khuri-Yakub BT, Chen X, Dai H, Gambhir SS. Family of enhanced photoacoustic imaging agents for high-sensitivity and multiplexing studies in living mice. ACS Nano. 2012; 6 (6): 4694-701

de la Zerda A, Kim JW, Galanzha EI, Gambhir SS, Zharov VP. Advanced contrast nanoagents for photoacoustic molecular imaging, cytometry, blood test and photothermal theranostics. Contrast Media Mol Imaging. 2011 Sep-Oct; 6 (5): 346-69

De Silva DA, Churilov L, Olivot JM, Christensen S, Lansberg MG, Mlynash M, Campbell BC, Desmond P, Straka M, Bammer R, Albers GW, Davis SM, Donnan GA; EPITHET-DEFUSE Investigators. Greater effect of stroke thrombolysis in the presence of arterial obstruction. Ann Neurol. 2011 Oct;70(4):601-5. doi: 10.1002/ana.22444. PMID: 22028220 [PubMed - indexed for MEDLINE]

Published Papers

De Silva DA, Churilov L, Olivot JM, Christensen S, Lansberg MG, Mlynash M, Campbell BC, Desmond P, Straka M, Bammer R, Albers GW, Davis SM, Donnan GA; on behalf of the EPITHET-DEFUSE Investigators. Reply. Ann Neurol. 2012 Mar;71(3):433-434. doi: 10.1002/ana.23525.

Delbeke D, Segall GM. Status of and trends in nuclear medicine in the United States. J Nucl Med. 2011;52 Suppl 2:24S-8S.

Deshmukh SD, Shin DS, Willmann JK, Rosenberg J, Jeffrey RB. Non-emergent small bowel obstruction: Assessment of CT findings that predict need for surgery. Eur Radiol. 2011;21(5):982-6. PMID: 20963444

Deshpande N, Lutz AM, Ren Y, Foygel K, Tran L, Schneider M, Pasricha PJ, Willmann JK. Quantification and monitoring inflammation in colitis by targeted contrast-enhanced ultrasound imaging. Radiology 2012; 262: 172 – 180. PMID: 22056689 Selected for Editorial Article in Radiology 2012

Deshpande N, Ren Y, Foygel K, Rosenberg J, Willmann JK. Tumor Angiogenic Marker Expression Levels during Tumor Growth: Longitudinal Assessment with Molecularly Targeted Microbubbles and US Imaging. Radiology 2011; 258:804-811.

"Dey D, Inayathullah M, Lee AS, Lemieux MC, Zhang X, Wu Y, Nag D, De Almeida PE, Han L, Rajadas J, Wu JC. Efficient gene delivery of primary human cells using peptide linked polyethylenimine polymer hybrid. Biomaterials 2011;32(20):4647-58. PMID 21477858. PMCID 3090516."

Do BH, Tseng JR, Rosenberg J, Mari CA, Quon A, and Biswal S. (2011) Pattern of 18F-FDG uptake in the spinal canal in patients with non-central nervous system malignancy. Spine (Phila Pa 1976). Oct 1;36(21):E1395-401. PMID: 21311407

Draper CE, Fredericson M, Gold GE, Besier TF, Delp SL, Beaupre GS, Quon A. Patients with patellofemoral pain exhibit elevated bone metabolic activity at the patellofemoral joint. J Orthop Res. 2012 Feb;30(2):209-13. PMID:21812024.

"Draper CE, Quon A, Fredericson M, Besier TF, Delp SL, Beaupre GS, Gold GE. Comparison of MRI and (18) F-NaF PET/CT in patients with patellofemoral pain. J Magn Reson Imaging. 2012 May 1. doi: 10.1002/jmri.23682. [Epub ahead of print] PubMed PMID: 22549985."

Drescher C.W., Hawley S.H., Thorpe J.D., Particke S., Mcintosh M.W., Gambhir S.S., Urban N. Impact of Screening Test Performance and Cost on Mortality Reduction and Cost-Effectiveness of Multimodal Ovarian Cancer Screening. Cancer Prevention Research (Philadephia, Pa.), 2012 (Epub ahead of print). PMID: 22750949.

Drescher CW, Hawley S, Thorpe JD, Particke S, McIntosh M, Gambhir SS, Urban N. Impact of Screening Test Performance and Cost on Mortality Reduction and Cost-effectiveness of Multimodal Ovarian Cancer Screening. Cancer Prev Res (Phila). 2012; 5 (8): 1015-24

Duffis EJ, Gandhi CD, Prestigiacomo CJ, Abruzzo T, Albuquerque F, Bulsara KR, Derdeyn CP, Fraser JF, Hirsch JA, Hussain MS, Do HM, Jayaraman MV, Meyers PM, Narayanan S. Head, neck, and brain tumor embolization guidelines. J Neurointerv Surg. 2012; 4 (4): 251-5

Eckels, J., Hussey, P., Nelson, E.K., Myers, T., Rauch, A., Bellew, M., Connolly, B., Law, W., Eng, J.K., Katz, J., McIntosh, M., Mallick, P. & Igra, M. Installation and use of labkey server for proteomics. Current protocols in bioinformatics / editoral board, Andreas D. Baxevanis ... [et al.] Chapter 13, Unit13.15 (2011).

Economopoulos V, Noad JC, Krishnamoorthy S, Rutt BK, Foster PJ. Comparing the MRI appearance of the lymph nodes and spleen in wild-type and immunodeficient mouse strains. PLoS One. 2011;6(11):e27508. Epub 2011 Nov 9. PubMed PMID: 22096586; PubMed Central PMCID: PMC3212579.

Endress R, Woon CY, Farnebo SJ, Behn A, Bronstein J, Pham H, Yan X, Gambhir SS, Chang J. Tissue-engineered Collateral Ligament Composite Allografts for Scapholunate Ligament Reconstruction: An Experimental Study. J Hand Surg Am. 2012; 37 (8): 1529-37

Enns GM, Kinsman SL, Perlman SL, Spicer KM, Abdenur JE, Cohen BH, Amagata A, Barnes A, Kheifets V, Shrader WD, Thoolen M, Blankenberg F, Miller G. "Initial experience in the treatment of inherited mitochondrial disease with EPI-743." Mol Genet Metab. 2012 Jan;105(1):91-102.

Fang Q*, Kani K*, Faca V, Zhang W, Zhang Q, Jain A, Hanash S, Agus DB, McIntosh MW, Mallick P. Impact of Protein Stability, Cellular Localization, and Abundance on Proteomic Detection of Tumor-derived Proteins in Plasma. PLoS One. 2011; 6(7): e23090.

Farrah, T., Deutsch, E.W., Omenn, G.S., Campbell, D.S., Sun, Z., Bletz, J.A., Mallick, P., Katz, J.E., Malmstrom, J., Ossola, R., Watts, J.D., Lin, B., Zhang, H., Moritz, R.L. & Aebersold, R. A high-confidence human plasma proteome reference set with estimated concentrations in peptideatlas. Molecular & cellular proteomics : MCP 10, M110 006353 (2011).

Faruque JS, Rubin DL, Beaulieu CF, Rosenberg, J., Kamaya, A, Tye, G, Napel, S, and Summers, RM. A Scalable Reference Standard of Visual Similarity for a Content-Based Image Retrieval System. In: Healthcare Informatics, Imaging and Systems Biology (HISB), 2011 First IEEE International Conference on: IEEE, 2011; 158-165. (Peer reviewed conference proceedings)

Feldman HM, Lee ES, Loe IM, Yeom KW, Grill-Spector K, Luna B. White matter microstructure on diffusion tensor imaging is associated with conventional magnetic resonance imaging findings and cognitive function in adolescents born preterm. Dev Med Child Neurol. 2012; 54 (9): 809-14

Fieselmann A, Ganguly A, Deuerling-Zheng Y, Zellerhoff M, Rohkohl C, Boese J, Hornegger J, Fahrig R. Interventional 4-D C-Arm CT Perfusion Imaging Using Interleaved Scanning and Partial Reconstruction Interpolation. IEEE Trans Med Imaging. 2012 Apr;31(4):892-906. Epub 2011 Dec 23.

Published Papers

Frey KA, Royal HD, Di Carli MF, Dillehay GL, Gordon L, Mankoff DA, O'Malley J, Ramanna L, Rohren E, Segall GM, Shulkin BL, Wallis JW, Ziessman HA. ABNM position statement: Nuclear medicine professional competency and scope of practice. J Nucl Med. 2011;52(6):994-7.

Fritton K, Ren PG, Gibon E, Rao AJ, Ma T, Biswal S, Gambhir SS, Goodman SB. Exogenous MC3T3 Preosteoblasts Migrate Systemically and Mitigate the Adverse Effects of Wear Particles. Tissue Eng Part A. 2012

Fritton K., Pei-Gen R., Gibon E., Rao A., Ma T., Gambhir S.S., Goodman S.B. Exogenous MC3T3 Pre-osteoblasts Migrate Systemically and Mitigate the Adverse Effects of Wear Particles. Tissue Engineering Part A, 2012 (Epub ahead of print). PMID: 22741555.

Ganguly A, Fieselmann A, Marks MP, Rosenberg J, Boese J, Deuerling-Zheng M, Straka M, Zaharchuk G, Bammer R, Fahrig R. Cerebral perfusion CT (PCT) using an interventional c-arm imaging system: cerebral blood flow (CBF) measurements. AJNR 2011 Sep;32(8):1525-31.

Gao J, Chen K, Luong R, Bouley DM, Mao H, Qiao T, Gambhir SS, Cheng Z*. A Novel Clinically Translatable Fluorescent Nhanoparticle for Targeted Molecular Imaging of Tumors in Living Subjects. Nano Letters. 2012; 12(1):281-6. PMID: 22172022.

Gawande R, Khurana A, Messing S, Zhang D, Castaneda R, Goldsby R, Hawkins R, Daldrup-Link HE. Differentiation of normal thymus from anterior mediastinal lymphoma and lymphoma recurrence at Pediatric PET-CT. Radiology 262(2):613-622, 2012 -> This study was featured in the "Healthimaging" journal: http://www.healthimaging.com/index.php?option=com_articles&view=article&id=30867

Gayer G, Ben Ely A, Maymon R, Hertz M. Enlargement of the spleen as an incidental finding on CT in post-partum females with fever. Br J Radiol. 2011 Oct 5. [Epub ahead of print]

Gayer G, Desser TS, Hertz M, Osadchy A, Daniel BL, Zissin R. Spontaneous suburothelial hemorrhage in coagulopathic patients: CT diagnosis. Am J Roentgenol, 2011;197(5):W887-90.

Gevaert O, Xu J, Hoang CD, Leung AN, Xu Y, Quon A, Rubin DL, Napel S, Plevritis SK. Non-small cell lung cancer: identifying prognostic imaging biomarkers by leveraging public gene expression microarray data--methods and preliminary results. Radiology. 2012; 264 (2): 387-96

Ghanouni P, Gill H, Kaye E, Pauly KB, Daniel B. MR Imaging-Guided Cryoablation for the Treatment of Benign Prostatic Hyperplasia. J Vasc Interv Radiol 2011;22(10):1427-30.

Ghanouni P, Walters SG, Vasanawala SS. Rapid MR venography in children using a blood pool contrast agent and multi-station fat-water-separated volumetric imaging. Pediatr Radiol. 2012; 42 (2): 242-8

Gheysens O, Chen IY, Rodriguez-Porcel M, Chan C, Rasooly J, Vaerenberg C, Paulmurugan R, Willmann JK, Deroose C, Wu J, Gambhir SS. Non-invasive bioluminescence imaging of myoblast-mediated hypoxia-inducible factor-1 alpha gene transfer. Mol Imaging Biol. 2011 Dec; 13(6):1124-32. PMID 21267661. NIHMS282760.

"Ghosh Z, Huang M, Hu S, Wilson KD, Dey D, Wu JC. Dissecting the oncogenic and tumorigenic potential of differentiated human induced pluripotent stem cells and humane embryonic stem cells. Cancer Research 2011;71(14):5030-9. PMID 21646469. PMCID 3138859."

Gibon E, Batke B, Jawad U, Fritton K, Rao A, Yao Z, Biswal S, Gambhir SS, Goodman SB. (2012) MC3T3-E1 Osteoprogenitor Cells Systemically Migrate to a Bone Defect and Enhance Bone Healing. Tissue Eng Part A Epub ahead of print]. PMID: 22129134.

Gibon E, Yao Z, Rao AJ, Zwingenberger S, Batke B, Valladres R, Smith RL, Biswal S Gambhir SS and Goodman SB. (2012) Effect of a CCR1 receptor antagonist on systemic trafficking of MSCs and polyethylene particle-associated bone loss. Biomaterials 33(14):3632-8. Epub 2012 Feb 23. PMID: 22447731.

Gimenez F, Xu J, Liu TT, Beaulieu CF, Rubin DL, Napel S. On the Feasibility of Predicting Radiological Observations from Computational Imaging Features of Liver Lesions in CT Scans. In: Healthcare Informatics, Imaging and Systems Biology (HISB), First International Conference on: IEEE, 2011; 346-350. (Peer reviewed conference proceedings)

Glover GH. Overview of functional magnetic resonance Imaging. Neurosurg Clin N Am. 22:133-9 (2011).

Glover GH. Spiral imaging in fMRI. NeuroImage. PMID 22036996 (2011)

Glover GH; Chang CE. Hadamard-encoded sub-slice fMRI for reduced signal dropout. Magn. Reson. Imaging 30:1-8 (2011)

Glover GH; Mueller BA; Turner JA; van Erp TG; Liu TT; Greve DN; Voyvodic JT; Rasmussen J; Brown GG; Keator DB; Calhoun VD; Lee HJ; Ford JM; Mathalon DH; Diaz M; O'Leary DS; Gadde S; Preda A; Lim KO; Wible CG; Stern HS; Belger A; McCarthy G; Ozyurt B; Potkin SG. Function biomedical informatics research network recommendations for prospective multicenter functional MRI studies. JMRI. PMID: 22314879 (2012)

Goodman M, Willmann JK, Jeffrey RB. Incidentally discovered solid pancreatic masses: imaging and clinical observations. Abdom Imaging. 2012; 37 (1): 91-7

Gowrishankar G., Zitmann-Kolbe S., Junutula A., Reeves R., Levi J., Srinivasan A., Bruus-Jensen K., Cyr J., Dinkelborg L., Gambhir S.S. GLUT 5 Is Not Over-Expressed in Breast Cancer Cells and Patient Breast Cancer Tissues. PLoS One, 6(11): e26902, 2011. PMCID: PMC3206880.

Published Papers

Graziotti AL, Hammond J, Messinger DS, Bann CM, Miller-Loncar C, Twomey JE, Bursi C, Woldt E, Ann Nelson J, Fleischmann D, Alexander B. Maintaining participation and momentum in longitudinal research involving high-risk families. J Nurs Scholarsh. 2012 Jun;44(2):120-126

Greenberg SB, Bhutta S, Braswell L, Chan F. Computed tomography angiography in children with cardiovascular disease: low dose techniques and image quality. Int J Cardiovasc Imaging. 2012 Jan;28(1):163-70.

Grimmer R, Fahrig R, Hinshaw W, Gao H, Kachelriess M. Empirical cupping correction for CT scanners with primary modulation (ECCP). Med Phys. 2012 Feb;39(2):825-31.

Grissom WA, Khalighi MM, Sacolick LI, Rutt BK, Vogel MW. Small-tip-angle spokes pulse design using interleaved greedy and local optimization methods. Magn Reson Med. 2012 Mar 5. [Epub ahead of print] PubMed PMID: 22392822.

Gu M, Nguyen PK, Lee AS, Xu D, Hu S, Plews J, Han L, Huber BC, Lee WH, Gong Y, de Almeida PE, Lyons J, Ikeno F, Pacharinsak C, Connolly AJ, Gambhir SS, Robbins RC, Longaker MT, Wu JC. Microfluidic Single Cell Analysis Show Porcine Induced Pluripotent Stem Cell-Derived Endothelial Cells Improve Myocardial Function by Paracrine Activation. Circ Res. 2012

Gu M., Nguyen P.K., Lee A.S., Xu D., Hu S., Plews J., Han L., Huber B.C., Lee W.H., Gong Y., de Almelda P.E., Lyons J., Ikeno F., Pacharinsak C., Connolly A.J., Gambhir S.S., Robbins R.C., Longaker M.T., Wu J.C. Microfluidic Single Cell Analysis Show Porcine Induced Pluripotent Stem-Cell Derived Endothelial Cells Improve Myocardial Function by Paracrine Activation. Circulation Research, 2012 (Epub ahead of print). PMID: 22821929.

Guo H, Mosci C, Iagaru A. Demonstration of peripheral nerve root involvement by non-Hodgkin's lymphoma on 18F-FDG PET/CT. Eur J Nucl Med Mol Imaging. 2012; 39 (4): 729-30

Gutierrez LB, Bansal AK, Hovsepian DM. Utero-enteric fistula resulting from fibroid expulsion after uterine fibroid embolization: case report, review of the literature, and management algorithm. Cardiovasc Interv Radiol. 2011 Dec 19 [Epub ahead of print]

Hackel BJ, Kimura RH, Gambhir SS. Use of (64)Cu-labeled fibronectin domain with EGFR-overexpressing tumor xenograft: molecular imaging. Radiology. 2012; 263 (1): 179-88

Hackel BJ, Sathirachinda A, Gambhir SS. Designed hydrophilic and charge mutations of the fibronectin domain: towards tailored protein biodistribution. Protein Eng Des Sel. 2012

Hargreaves BA, Worters PW, Butts Pauly K, Pauly JM, Koch KM, Gold GE. Metal-Induced Artifacts in MRI. AJR Am J Roentgen. 2011 Sep;197(3):547-55. PMID: 21862795.

Hathout L, Do HM. Vascular tortuosity: a mathematical modeling perspective. J Physiol Sci. 2012

Henning TD, Gawande R, Khurana A, Tavri S, Mandrussow L, Golovko D, Horvai A, Sennino B, McDonald D, Meier R, Wendland M, Derugin N, Link TM, Daldrup-Link HE: MR Imaging of Ferumoxides labeled Mesenchymal Stem Cells in Cartilage Defects: in vitro and in vivo investigations. Molecular Imaging 2011, Sep 28 [Epub ahead of print]

Higgins LJ, Hwang GL, Rosenberg J, Katzenberg RH, Kothary N, Sze DY, Hofmann LV. In vitro design and characterization of the nonviral gene delivery vector iopamidol, protamine, ethiodized oil reagent. J Vasc Interv Radiol. 2011 Oct;22(10):1457-1463.e2.

Hillman BJ, Frank RA, Rodriguez GM; Medical Imaging & Technology Alliance (MITA) Workshop Participants (including Segall GM). J Am Coll Radiol. 2012;9(2):108-14. New pathways to Medicare coverage for innovative PET radiopharmaceuticals: report of a Medical Imaging & Technology Alliance (MITA) workshop.

"Hippocampal CA1 apical neuropil atrophy and memory performance in Alzheimer's disease. Kerchner GA, Deutsch GK, Zeineh M, Dougherty RF, Saranathan M, Rutt BK. Neuroimage. 2012; 63 (1): 194-202 "

Hiti C, Stevens K, Jamati M, Garza D, Matheson G. Athletic osteitis pubis. Sports Med 2011; 41 (5) 361 – 376.

Ho MY, Fleischmann D, Forrester MD, Lee DP. Coil embolization of a left circumflex feeder branch in a patient with a mediastinal paraganglioma. JACC Cardiovasc Interv. 2011 Dec;4(12):1345-6.

Hoeft F; Black AM; Tanaka H; Stanley L; Nagamine M; Zakerani N; Thurston A; Kesler S; Hulme C; Lyytinen H; Glover GH; Serrone C; Raman MM; Reiss AL. Maternal History of Reading Difficulty is Associated with Reduced Language-Related Grey Matter in Beginning Readers. NeuroImage 59:3021-32 (2012)

"Hofmann LV, Kuo WT. Cather-directed thrombolysis for acute DVT. Lancet. 2012 Jan 7;379(9810):3-4. Epub 2011 Dec 13."

Holbrook AB, Ghanouni P, Santos JM, Medan Y, Butts Pauly K. In vivo MR acoustic radiation force imaging in the porcine liver. Med Phys. 2011; 38 (9): 5081-9

Holdsworth SJ, Aksoy M, Newbould RD, Yeom K, Van AT, Ooi MB, Barnes PD, Bammer R, Skare S. Diffusion tensor imaging (DTI) with retrospective motion correction for large-scale pediatric imaging. J Magn Reson Imaging. 2012

Published Papers

Hong R, Dhanani RS, Louie JD, Sze DY. Intravascular ultrasound-guided mesocaval shunt creation in patients with portal or mesenteric venous occlusion. J Vasc Interv Radiol. 2012 Jan;23(1):136-41

Hoppmann S, Qi S, Miao Z, Liu H, Jiang H, Culter CS, Bao A, Cheng Z.* 177Lu-DOTA-HSA-ZEGFR:1904: In vitro and in vivo characterization as a potential radiopharmaceutical for radionuclide therapy of EGFR-expressing head and neck carcinomas. Journal of Biological Inorganic Chemistry. March. 2012 Mar 16. [Epub ahead of print] PMID: 22418921

Hori S.S., Gambhir S.S. Mathematical Model Identifies Blood Biomarker-Based Early Cancer Detection Strategies and Limitations. Science Translational Medicine, 3(109): 109ra116, 2011. (Cover Article) PMID: 22089452.

Hsiao A, Lustig M, Alley MT, Murphy M, Chan FP, Herfkens RJ, Vasanawala SS. Rapid Pediatric Cardiac Assessment of Flow and Ventricular Volume with Compressed Sensing Parallel Imaging Volumetric Cine Phase-contrast MRI. AJR. 2012 Mar;198(3):W250-9.

Hsu JL, Kuschner WG, Paik J, Bower N, Kothary N. The Diagnostic Yield of CT-Guided Percutaneous Lung Biopsy in Solid Organ Transplant Recipients. Clin Transplant. 2012 Early View (Online version before inclusion in an issue).

"Hu S, Huang M, Nguyen PK, Gong Y, Li Z, Jia F, Lan F, Liu J, Nag D, Robbins RC, Wu JC. Novel microRNA prosurvival cocktail for improving engraftment and function of cardiac progenitor cell transplantation. Circulation 2011;124:S27-S34. PMID 21911815. PMCID 3181082. (*Selected as top 3 major scientific advances in 2011 by AHA BCVS council)"

Huang M, Nguyen PK, Jia F, Hu S, Gong Y, de Almeida PE, Wang L, Nag D, Kay MA, Giaccia AJ, Robbins RC, Wu JC. Double knockdown of prolyl hydroxylase and factor-inhibiting hypoxia-inducible factor with nonviral minicircle gene therapy enhances stem cell mobilization and angiogenesis after myocardial infarction. Circulation 2011;124:S46-S54. PMID 21911818. PMCID 3181087.

Huo JL, Choi JC, Deluna A, Lee D, Fleischmann D, Berry GJ, Deuse T, Haddad F. Cardiac paraganglioma: Diagnostic and Surgical challenges. J Card Surg. 2012 Mar;27(2):178-182.

Iagaru A, Mittra E, Dick DW, Gambhir SS. Prospective evaluation of (99m)Tc MDP scintigraphy, (18)F NaF PET/CT, and (18)F FDG PET/CT for detection of skeletal metastases. Mol Imaging Biol. 2012; 14 (2): 252-9

Jacobs KE, Behera D, Rosenberg R, Gold GE, Moseley M, Yeomans D and Biswal S. (2012) Oral Manganese as an MRI Contrast Agent for the Detection of Nociceptive Activity. NMR in Biomed 25(4):563-9. Epub 2011 Aug 25. PMID: 22447731.

Jacobs KE, Visser BC, Gayer G. Changes in spleen volume after resection of hepatic colorectal metastases. Clin Radiol. 2012 May 16. [Epub ahead of print]

James ML, Gambhir SS. A molecular imaging primer: modalities, imaging agents, and applications. Physiol Rev. 2012; 92 (2): 897-965

"Jayachandran P, Pai RK, Quon A, Graves E, Krakow TE, La T, Loo BW Jr, Koong AC, Chang DT. Postchemoradiotherapy Positron Emission Tomography Predicts Pathologic Response and Survival in Patients with Esophageal Cancer. Int J Radiat Oncol Biol Phys. 2012 Feb 28. [Epub ahead of print] PubMed PMID: 22381904."

Jeffrey RB. Pancreatic Cancer: Radiologic imaging. Gastroenterol Clin N Am 2012; 41(1):159-77.

Jiang L, Miao Z, Kimura RH, Ren G, Liu HG, Silverman AP, Li PY, Gambhir SS, Cochran JR, Cheng Z. 111In-Labeled Agouti Related Proteins for SPECT/CT Imaging of Tumor αvβ3 Integrin. Journal of Biomedicine and Biotechnology. 2012: 2012 doi:10.1155/2012/ 36

Johnson PT, Horton KM, Megibow AJ, Jeffrey RB, Fishman EK. Common incidental findings on MDCT: Survey of radiologist recommendations for patient management. J Am Coll Radiol 2011; 8(11):762-7.

Jokerst J.V., Gambhir S.S. Molecular Imaging with Theranostic Nanoparticles. Accounts of Chemical Research, 44(10): 1050-60, 2011. PMCID: PMC3196845.

Jokerst JV, Thangaraj M, Kempen PJ, Sinclair R, Gambhir SS. Photoacoustic Imaging of Mesenchymal Stem Cells in Living Mice via Silica-Coated Gold Nanorods. ACS Nano. 2012; 6 (7): 5920-30

Jones R; Somerville L; Li J; Ruberry E; Libby V; Glover G; Voss H; Ballon D; Casey BJ. Behavioral and neural properties of social reinforcement learning. J. Neurosci. 31:13039-45 (2011)

Jordan C, Gold GE. Musculoskeletal MRI at 3.0T and 7.0T: A Comparison of Relaxation Times and Image Contrast. European Journal of Radiology. 2011 Dec. PMID: 22172536

Josan S, Spielman D, Yen YF, Hurd R, Pfefferbaum A, Mayer D. Fast volumetric imaging of ethanol metabolism in rat liver with hyperpolarized [1-(13)C]pyruvate. NMR Biomed. 2012 Feb 14. doi: 10.1002/nbm.2762. [Epub ahead of print] PubMed PMID: 22331837.

"Joseph T, Unver K, Hwang GL, Rosenberg J, Sze DY, Hashimi S, Kothary N, Louie JD, Kuo WT, Hofmann LV, Hovsepian DM. Percutaneous cholecystostomy for acute cholecystitis: ten-year experience. J Vasc Interv Radiol. 2012 Jan;23(1):83-8.e1"

Published Papers

Jr Ladisa JF, Dholakia RJ, Figueroa CA, Vignon-Clementel IE, Chan FP, Samyn MM, Cava JR, Taylor CA, Feinstein JA. Computational Simulations Demonstrate Altered Wall Shear Stress in Aortic Coarctation Patients Treated by Resection with End-to-end Anastomosis. Congenit Heart Dis. 2011 Sep;6(5):432-43.

Jr Ladisa JF, Figueroa CA, Vignon-Clemental IE, Kim HJ, Xiao N, Ellwein LM, Chan FP, Feinstein JA, Taylor CA. Computational Simulations for Aortic Coarctation: Representative Results from a Sampling of Patients. J Biomech Eng. 2011 Sep;133(9):091008

"Kamaya A, Federle MP, Desser TS. Imaging manifestations of abdominal fat necrosis and its mimics. Radiographics. 2011 Nov-Dec;31(7):2021-34. PubMed PMID: 22084185.

Kaneko OF, Willmann JK. Ultrasound for molecular imaging and therapy in cancer. Quant Imaging Med Surg 2012;2(2):87-97

Kani K, Faca VM, Hughes LD, Zhang W, Fang Q, Shahbaba B, Luethy R, Erde J, Schmidt J, Pitteri SJ, Zhang Q, Katz JE, Gross ME, Plevritis SK, McIntosh MW, Jain A, Hanash S, Agus DB, Mallick P. Quantitative proteomic profiling identifies protein correlates to EGFR kinase inhibition. Mol Cancer Ther. 2012; 11 (5): 1071-81

Karamchandani J, Vogel H, Fischbein N, Gibbs I, Edwards MS, Griffith H. Extravascular papillary endothelial hyperplasia mimicking neoplasm after radiosurgery: case report. Neurosurgery. 2012; 70 (4): E1043-8; discussion E1048

Karow M, Chavez CL, Farruggio AP, Geisinger JM, Keravala A, Jung WE, Lan F, Wu JC, Chen-Tsai Y, Calos MP. Site-specific recombinase strategy to create iPS cells efficiently with plasmid DNA. Stem Cells 2011;29(11):1696-704. PMID 21898697

"Kedziorek DA,* Hofmann LV,* Fu Y, Gilson WD, Cosby KM, Kohl B 3rd, Barnett BP, Simons BW, Walczak P, Bulte JW, Gabrielson K, Kraitchman DL. X-ray-visible Microcapsules Containing Mesenchymal Stem Cells Improve Hindlimb Perfusion in a Rabbit Model of Peripheral Arterial Disease. Stem Cells. 2012 Mar 21. doi: 10.1002/stem.1096. [Epub ahead of print] (* denotes co-first authorship)"

Kehagia AA: Tairyan K; ; Federico C; ; Glover GH; J. More Education, Less Administration: Reflections of Neuroimagers' Attitudes to Ethics Through the Qualitative Looking Glass. Sci Eng Ethics 17 (2011).

Khalighi MM, Rutt BK, Kerr AB. RF pulse optimization for Bloch-Siegert B+1 mapping. Magn Reson Med. 2011 Dec 5. [Epub ahead of print] PubMed PMID: 22144397; PubMed Central PMCID: PMC3297726.

Khurana A, Nejadnik H, Gawande R, Lin G, Lee S, Messing S, Castaneda R, Derugin N, Pisani L, Lue TF, Daldrup-Link HE. Intravenous Ferumoxytol Allows Noninvasive MR Imaging Monitoring of Macrophage Migration into Stem Cell Transplants. Radiology. 2012

Kim DH, Kim SH, Im SA, Han SW, Goo JM, Willmann JK, Lee ES, Eo JS, Paeng JC, Han JK, Choi BI. Intermodality comparison between 3D perfusion CT and 18F-FDG PET/CT imaging for predicting early tumor response in patients with liver metastasis after chemotherapy: Preliminary results of a prospective study. Eur J Radiol. 2012 Mar 27. [Epub ahead of print] PMID: 22459347

Kim JW, Do HM, Egbert P. Enucleated eyes after failed Intra-arterial infusion of chemotherapy for unilateral retinoblastoma: Histopathologic evaluation of vitreous seeding. Clin Ophthalmol. 5:1655-1658,

Kim MJ, Wapnir IL, Ikeda DM, Chisholm KM, Do Y, Daniel BL. MRI enhancement correlates with high grade desmoid tumor of breast. Breast J. 2012; 18 (4): 374-6 PubMedID: 22716922

Kim YI, Ahn BC, Ronald JA, Katzenberg R, Singh A, Paulmurugan R, Ray S, Gambhir SS, Hofmann LV. Intratumoral versus intravenous gene therapy using a transcriptionally targeted viral vector in an orthotopic hepatocellular carcinoma rat model. J Vasc Interv Radiol. 2012; 23 (5): 704-11 Epub 2012 Mar 2. PMID 22387029. NIHMS364991. PMCID - in process.

Kimura RH, Teed R, Hackel BJ, Pysz MA, Chuang CZ, Sathirachinda A, Willmann JK, Gambhir SS. Pharmacokinetically stabilized cystine knot peptides that bind alpha-v-beta-6 integrin with single-digit nanomolar affinities for detection of pancreatic cancer. Clin Cancer Res. 2012; 1;18(3):839-49. PMID:22173551

Kircher M.F., Gambhir S.S., Grimm J. Noninvasive Cell-Tracking Methods. Nature Reviews Clinical Oncology, 8(11): 677-88, 2011. PMID: 21946842.

Kircher MF, de la Zerda A, Jokerst JV, Zavaleta CL, Kempen PJ, Mittra E, Pitter K, Huang R, Campos C, Habte F, Sinclair R, Brennan CW, Mellinghoff IK, Holland EC, Gambhir SS. A brain tumor molecular imaging strategy using a new triple-modality MRI-photoacoustic-Raman nanoparticle. Nat Med. 2012; 18 (5): 829-34

Kircher MF, Willmann JK. Molecular Body Imaging: MRI, CT and US – Part 1: Techniques. Radiology 2012. 263(3):633-43

Kitzler HH, Su J, Zeineh M, Harper-Little C, Leung A, Kremenchutzky M, Deoni SC, Rutt BK. Deficient MWF mapping in multiple sclerosis using 3D whole-brain multi-component relaxation MRI. Neuroimage. 2012 Feb 1;59(3):2670-7. Epub 2011 Sep 2. PubMed PMID: 21920444.

Kleinman JT, Zaharchuk G, Mlynash M, Ogdie AA, Straka M, Lansberg MG, Schwartz NE, Kemp S, Bammer R, Albers GW, Olivot JM. Automated Perfusion Imaging for the Evaluation of Transient Ischemic Attack. Stroke. 2012 Apr 3. [Epub ahead of print]

Published Papers

Knoblock, C.A., Szekely, P., Ambite, J.L., Gupta, S., Goel, A., Muslea, M., Lerman, K. & Mallick, P. Interactively mapping data sources into the semantic web. Proceedings of the Workshop on Linked Science (2011).

Kopeinigg D, Aksoy M, Forman C, Straka M, Seaman D, Rosenberg J, Fleischmann D, Hornegger J, Bammer R. Prospective optical motion correction for 3D time-of-flight angiography. Magn Reson Med. 2012 Aug 10 [Epub ahead of print]

Kothapalli SR, Liu H, Liao JC, Cheng Z, Gambhir SS. Endoscopic imaging of Cerenkov luminescence. Biomed Opt Express. 2012; 3 (6): 1215-25

Kothapalli SR, Ma TJ, Vaithilingam S, Oralkan O, Khuri-Yakub BT, Gambhir SS. Deep tissue photoacoustic imaging using a miniaturized 2-D capacitive micro-machined ultrasonic transducer array. IEEE Trans Biomed Eng. 2012; 59 (5): 1199-204

Kothary N, Abdelmaksoud MH, Tognolini A, Fahrig R, Rosenberg J, Hovsepian DM, Ganguly A, Louie JD, Kuo WT, Hwang GL, Holzer A, Sze DY, Hofmann LV. Imaging Guidance with C-arm CT: Prospective Evaluation of Its Impact on Patient Radiation Exposure during Transhepatic Arterial Chemoembolization. J Vasc Interv Radiol. 2011 Nov; 22(11): 1535-43. Epub 2011 Aug 27.

Kumar MA, Vangala H, Tong DC, Campbell DM, Balgude A, Eyngorn I, Beraud AS, Olivot JM, Hsia AW, Bernstein RA, Wijman CA, Lansberg MG, Mlynash M, Hamilton S, Moseley ME, Albers GW. MRI guides diagnostic approach for ischaemic stroke. J Neurol Neurosurg Psychiatry. 2011 Nov;82(11):1201-5. Epub 2011 May 7.

Kunga Mohan Ramkumar, Cinnasamy Manjula, Gnana kumar, Muzafar A. Kanjwal, Thillai. V. Sekar, Ramasamy Paulmurugan, Palanisamy Rajaguru (2012). Oxidative stress-mediated cytotoxicity and apoptosis induction by TiO2 nanofibers in HeLa cells. European Journal of Pharmaceutics and Biopharmaceutics, 2012 Mar 7. [Epub ahead of print].

Kuo WT, Cupp JS, Louie JD, Kothary N, Hofmann LV, Sze DY, Hovsepian DM. Complex retrieval of embedded IVC filters: alternative techniques and histologic tissue analysis. Cardiovasc Intervent Radiol. 2012; 35 (3): 588-97

Kuo WT, Odegaard JI, Louie JD, Sze DY, Unver K, Kothary N, Rosenberg JK, Hovsepian DM, Hwang GL, Hofmann LV. Photothermal Ablation With the Excimer Laser Sheath Technique for Embedded IVC Filter Removal: Initial Results From a Prospective Study. J Vasc Interv Radiol. J Vasc Interv Radiol. 2011; 22 (6): 813-23.

Kuo WT. Endovascular therapy for acute pulmonary embolism. J Vasc Interv Radiol 2012; 23:167–179.

Kurian A, Munoz D, Rust P, Schackmann EA, Smith M, Clarke L, Mills M, Plevritis SK. An online tool to guide decisions for BRCA/2 mutation carriers. Journal of Clinical Oncology, 2012 Feb 10;30(5):497-506.2012. [Epub Jan 9].

Kwon OK, Kim SH, Jacobsen EA, Marks MP. Clinical Implications of Internal Carotid Artery Flow Impairment Caused by Filter Occlusion During Carotid Artery Stenting. AJNR Am J Neuroradiol. 2012 Mar; 33 (3) 494-9.

Ladd J., Busald T., Johnson M.M., Zhang Q., Pitteri S.J., Wang H., Brenner D., Lampe P.D., Kucherlapati R., Feng Z., Prentice R.L., Hanash S. "Increased plasma levels of the APC-interacting protein MAPRE1, LRG1 and IGFBP2 preceding a diagnosis of colorectal cancer." Cancer Prev. Res. 2012, 5, 655-664.

Laeseke PF, Gayer G. An uncommon cause of abdominal pain following blunt abdominal trauma. Br J Radiol. 2012 ;85:1025-6

Le TT, Fischbein NJ, Andre JB, Wijman C, Rosenberg J, Zaharchuk G. Identification of venous signal on arterial spin labeling Improves diagnosis of dural arterio-venous fistulae and small arteriovenous malformations. AJNR Am J Neuroradiol 2012 Jan; 33:61-68.

Lee AS, Xu D, Plews JR, Nguyen PK, Nag D, Lyons JK, Han L, Hu S, Lan F, Huang M, Liu J, Narsinh KN, Long CT, de Almeida P, Levi B, Kooreman N, Bangs C, Pacharinsak C, Ikeno F, Yeung AC, Gambhir SS, Robbins RC, Longaker MT, Wu JC. Preclinical derivation and imaging of autologously transplanted canine induced pluripotent stem cells. Journal Biological Chemistry 2011;286(37):32697-704. PMID 21719696

Lee P, Bazan JG, Lavori PW, Weerasuriya DK, Quon A, Le QT, Wakelee HA, Graves EE, Loo BW. Metabolic tumor volume is an independent prognostic factor in patients treated definitively for non-small-cell lung cancer. Clin Lung Cancer. 2012; 13 (1): 52-8

Lehwald N, GZ Tao, Jang KY, Papandreou I, Liu B, Liu B, Pysz MA, Willmann JK, Knoefel WT, Denko NC, Sylvester KG. β-catenin regulates mitochondrial function and energy balance in livers of mice. Gastroenterology 2012; Gastroenterology. 2012 Jun 7. [Epub ahead of print]

Leung AN, Bull TM, Jaeschke R, Lockwood CJ, Boiselle PM, Hurwitz LM, James AH, McCullough LB, Menda Y, Paidas MJ, Royal HD, Tapson VF, Winer-Muram HT, Chervenak FA, Cody DD, McNitt-Gray MF, Stave CD, Tuttle BD. American Thoracic Society Documents: An Official ATS/STR Clinical Practice Guideline: Evaluation of Suspected Pulmonary Embolism in Pregnancy. Radiology 262: 635-646, 2012.

Levi B, Hyun JS, Nelson ER, Li S, Montoro DT, Wan DC, Jia F, Glotzbach JC, James AW, Lee M, Huang M, Quarto N, Gurtner GC, Wu JC, Longaker MT. Non-integrating knockdown and customized scaffold design enhances human adipose derived stem cells in skeletal repair. Stem Cells 2011;29(12):2018-29. PMID 21997852.

Published Papers

Levi B, Nelson ER, Brown K, James AW, Xu D, Dunlevie R, Wu JC, Lee M, Wu B, Commons GW, Vistnes D, Longaker MT. Differences in osteogenic differentiation of adipose-derived stromal cells from murine, canine, and human sources in vitro and in vivo. Plastic Reconstructive Surgery 2011;128;2:373-86. PMID 21788829

Levi B, Nelson ER, Hyun JS, Glotzbach JP, Li S, Nauta A, Montoro DT, Lee M, Commons GC, Hu S, Wu JC, Gurtner GC, Longaker MT. Enhancement of human adipose-derived stromal cell angiogenesis through knockdown of a BMP-2 inhibitor. Plastic Reconstructive Surgery 2012;129(1):53-66. PMID 21915082. PMCID 3246067

Levin. Promising new photon detection concepts for high resolution clinical and preclinical positron emission tomography. Journal of Nuclear Medicine, 53(2) (2012) 167-170

Levy MA and Rubin DL, Computational approaches to assist in the evaluation of cancer treatment response. Imaging in Medicine 3(2): 233-246, 2011.

"Levy MA and Rubin DL, Current and future trends in imaging informatics for oncology. Cancer J 17(4): 203-10, 2011."

Li P, Fischbein NJ, Do HM, Blevins NH. Dural arteriovenous fistula following translabyrinthine resection of cerebellopontine angle tumors: report of two cases. Skull Base Rep 1:51-57, 2011

Liang G, Ronald J, Chen Y, Ye D, Pandit P, Ma ML, Rutt B, Rao J. Controlled self-assembly of nanoparticles as molecular magnetic resonance imaging contrast agents. Angewandte Chemie International Edition 2011, 50, 6283-6286.

Lin FI, Rao J, Mittra ES, Nallapareddy K, Chengapa A, Dick DW, Gambhir SS, Iagaru A. Prospective Comparison of Combined 18F FDG and 18F NaF PET/CT vs. 18F FDG PET/CT Imaging for Detection of Malignancy. Eur J Nucl Med Mol Imaging. 2012 Feb;39(2):262-70.

Lin R, Plevritis SK. Comparing the benefits of screening for breast cancer and lung cancer using a novel natural history model, Cancer Causes and Control, Jan;23 (1):175-85, 2012. Epub Nov 25, 2011.

Linderman MD, Bjornson Z, Simonds EF, Qiu P, Bruggner R, Sheode K, Meng TH, Plevritis SK, Nolan GP. CytoSPADE: High-Performance Analysis and Visualization of High-Dimensional Cytometry Data. Bioinformatics. 2012

Liu H., Carpenter C.M., Jiang H., Pratx G., Sun C., Buchin M.P., Gambhir S.S., Xing L., Cheng Z. Intraoperative Imaging of Tumors Using Cerenkov Luminescence Endoscopy: A Feasibility Experimental Study. Journal of Nuclear Medicine, 2012 (Epub ahead of print). PMID: 22904353.

Liu I, Kamaya A, Jeffrey RB, Shin LK%. MDCT Triphasic Evaluation of the Liver Pre-Transplantation: Importance of Equilibrium Phase Washout and Morphology for Characterizing Hypervascular Lesions. J Comput Assist Tomogr. 2012; 36(2):213-9.

Liu S, Liu H, Jiang H, Zhang H, Cheng Z.* One-Step Radiosynthesis of 18F-AlF-NOTA-RGD2 for Tumor Angiogenesis PET imaging. European Journal of Nuclear and Medicine Molecular Imaging. 2011; 38(9):1732-41. PMID: 21617974.

Liu S, Liu H, Ren G, Kimura RH, Zhang X, Jiang L, Cochran JR, Cheng Z*. PET imaging of integrin expression using fluorine-18 labeled knottin peptides. Theranostics. 2011;1:403-412. PMID: 22211146.

Liu S, Shen B, Chin F, Cheng Z.* Recent Progress in Radiofluorination of Peptides for PET Molecular Imaging. Invited review (peer reviewed), Current Organic Synthesis. 2011; 8(4): 584-592.

Liu YI, Kamaya A, Jeffrey RB, Shin LK. Multidetector computed tomography triphasic evaluation of the liver before transplantation: importance of equilibrium phase washout and morphology for characterizing hypervascular lesions. J Comput Assist Tomogr 2012; 36(2):213-9.

Loe IM, Luna B, Bledsoe IO, Yeom KW, Fritz BL, Feldman HM. Oculomotor Assessments of Executive Function in Preterm Children. J Pediatr. 2012

Lu A, Daniel BL, Kaye E, Butts Pauly K. MRI of frozen tissue demonstrates a phase shift. Magn Reson Med. 2011 Dec;66(6):1582-9.

Lu H, Ladd J, Feng Z, Wu M, Goodell V, Pitteri SJ, Li CI, Prentice R, Hanash SM, Disis ML. Evaluation of Known Oncoantibodies, HER2, p53, and Cyclin B1, in Prediagnostic Breast Cancer Sera. Cancer Prev Res (Phila). 2012; 5 (8): 1036-43

Luo Q; Glover GH. Influence of Dense Array EEG Cap on fMRI Signal. Magn. Reson. Med. PMID: 22161695 (2011)

Lutz AM, Willmann JK, Drescher C, Ray P, Cochran F, Urban N, Gambhir SS. Early diagnosis of ovarian cancer: is a solution in sight? Radiology 2011; 259: 329 - 345

Maier A, Wigstrom L, Hofmann HG, Hornegger J, Zhu L, Strobel N, Fahrig R. Three-dimensional anisotropic adaptive filtering of projection data for noise reduction in cone beam CT. Med Phys. 2011 Nov;38(11):5896-909.

Mandelblatt JS, Cronin KA, Berry DA, Chang Y, de Koning HJ, Lee SJ, Plevritis SK, Schechter CB, Stout NK, can Ravesteyn NT, Zelen M, Feuer EJ. Modeling the impact of population screening on breast cancer mortality in the United States. Breast, Oct; 20 Suppl 3:S75-81, 2011.

Published Papers

Marks MP, Steinberg GK. Cerebral proliferative angiopathy. J Neurointerv Surg. 2011 Sep 20. (Epub ahead of print) PMID:21990497

Marks MP. Is there a future for endovascular treatment of intracranial atherosclerotic disease after stenting and aggressive medical management for preventing recurrent stroke and intracranial stenosis (SAMMPRIS)? Stroke 2012 Feb; 43 (2) 580-4

Maturen K, Wasnik A, Kamaya A, Dillman J, Kaza R, Pandya A, Maheshwary R. Ultrasound Imaging of Bowel Pathology: Technique and Keys to Diagnoses in the Acute Abdomen. AJR Am J Roentgenol 197:W1-9, 2011.

Mayer D, Yen YF, Josan S, Park JM, Pfefferbaum A, Hurd RE, Spielman DM. Application of hyperpolarized [1-13C]lactate for the in vivo investigation of cardiac metabolism. NMR Biomed. 2012 Jan 25. doi: 10.1002/nbm.2778. [Epub ahead of print] PubMed PMID: 22278751.

McTaggart RA, Fischbein NJ, Elkins CJ, Hsiao A, Cutalo MJ, Rosenberg J, Dake MD, Zaharchuk G. Extracranial Venous Drainage Patterns in Patients with Multiple Sclerosis and Healthy Controls. AJNR Am J Neuroradiol. 2012

McWalter EJ, Gold GE. UTE T2* mapping detects sub-clinical meniscus degeneration. Osteoarthritis Cartilage. 2012 Mar 8 [Epub ahead of print]. PMID: 22406647.

Meer AB, Basu PA, Baker LC, Atlas SW. Exposure to Ionizing Radiation and Estimate of Secondary Cancers in the Era of High Speed CT Scanning: Projections from the Medicare Population. Journal Amer Coll Radiol 2012;9:245□250

Mendoza JM, Melcher ML, Daniel B, Tan JC. Multiple Renal Arteries and Non-Contrast Magnetic Resonance Angiography in Transplant Renal Artery Stenosis. Clin Kid J 2012 (In Press; epub ahead of print March 29, 2012).

Meng K, Lipson JA. "Utilizing a PACS-Integrated Breast Biopsy Simulator to Reinforce American College of Radiology (ACR) Practice Guidelines for Ultrasound-Guided Percutaneous Breast Intervention in Residency. Acad Radiol. 2011 Oct;18(10):1324-8.

Miao Z, Ren G, Jiang L, Liu H, Webster JM, Zhang R, Namavari M, Gambhir SS, Syud F, Cheng Z.* A Novel 18F-Labeled 2-Helix Small Protein for PET Imaging of HER2 Positive Tumor. European Journal of Nuclear Medicine and Molecular Imaging. 2011; 38(11):1977-84. PMID: 21761266.

Miao Z., Ren G., Lei J., Liu H., Webster J.M., Zhang R., Namavari M., Gambhir S.S., Syud F., Cheng Z. A Novel 18F-labeled Two-Helix Scaffold Protein for PET Imaging of HER2-Positive Tumor. European Journal of Nuclear Medicine and Molecular Imaging, 38(11): 1977-84, 2011. PMID: 21761266

Mitra R, Nguyen A, Stevens KJ. Fluoroscopically guided supraglenoid tubercle steroid injections for the management of biceps tendonitis. Pain Pract. 2011 Jul-Aug; 11 (4): 392-6

"Mogensen MA, Karzmark P, Zeifert PD, Rosenberg J, Marks MP, Steinberg GK, Dorfman LJ.

Neuroradiologic correlates of cognitive impairment in adult moyamoya disease. AJNR Am J Neuroradiol. 2012 Apr; 33(4):721-5."

Mosci C, Iagaru A. PET/CT Imaging of Thyroid Cancer. Clin Nucl Med. 2011 Dec;36(12):e180-5.

Mosci C, McDougall IR, Jeffrey RB, Iagaru A. 18F-FDG PET/CT Demonstration of a Liver Metastasis in a Patient With Papillary Thyroid Cancer. Clin Nucl Med. 2012; 37 (9): e234-6

Mumenthaler, S.M*., Foo, J*., Leder, K., Choi, N.C., Agus, D.B., Pao, W., Mallick, P. & Michor, F. Evolutionary modeling of combination treatment strategies to overcome resistance to tyrosine kinase inhibitors in non-small cell lung cancer. Molecular pharmaceutics 8, 2069-2079 (2011).

Murillo H, Lane MJ, Punn R, Fleischmann D, Restrepo CS. Imaging of the aorta: embryology and anatomy. Semin Ultrasound CT MR. 2012; 33 (3): 169-90

Murphy JD, Chisholm KM, Daly ME, Wiegner EA, Truong D, Iagaru A, Maxim PG, Loo BW Jr, Graves EE, Kaplan MJ, Kong C, Le QT. Correlation between metabolic tumor volume and pathologic tumor volume in squamous cell carcinoma of the oral cavity. Radiother Oncol. 2011 Dec;101(3):356-61.

Murphy M, Alley M, Demmel J, Keutzer K, Vasanawala SS, Lustig M. Fast L1-SPIRiT Compressed Sensing Parallel Imaging MRI: Scalable Parallel Implementation and Clinically Feasibly Runtime. IEEE Trans Med Imaging 2012. Epub ahead of print. PMID 2234559.

Nair VS, Gevaert O, Davidzon G, Napel S, Graves EE, Hoang CD, Shrager JB, Quon A, Rubin DL, Plevritis SK. Prognostic PET 18F-FDG Uptake Imaging Features Are Associated with Major Oncogenomic Alterations in Patients with Resected Non-Small Cell Lung Cancer. Cancer Res. 2012; 72 (15): 3725-34

Nakatamari H, Ueda T, Ishioka F, Raman B, Kurihara K, Rubin GD, Ito H, Sze DY. (2011) Discriminant analysis of native thoraci aortic curvature: risk prediction for endoleak formation after thoracic endovascular aortic repair. J Vasc Interv Radiol. 22:974-9.

Namavari M., Chang Y.F., Kusler B., Yaghoubi S., Mitchell B.S., Gambhir S.S. A Novel Synthesis of 2'-Deoxy-2'-[18F]Fluoro-9-?-D: -Arabinofuranosylguanine: a Novel Agent for Imaging T-Cell Activation with PET. Molecular Imaging and Biology, 13(5): 812-818, 2011. PMID: 20838911

Narsinh K, Narsinh KH, Wu JC. Derivation of human induced pluripotent stem cells for cardiovascular disease modeling. Circulation Research 2011;108(9):1146-56. PMID 21527744. PMCID 3098466

Published Papers

Natarajan A, Gowrishankar G, Nielsen CH, Wang S, Iagaru A, Goris ML, Gambhir SS. Positron Emission Tomography of (64)Cu-DOTA-Rituximab in a Transgenic Mouse Model Expressing Human CD20 for Clinical Translation to Image NHL. Mol Imaging Biol. 2012

Natarajan A, Habte F, Gambhir SS. Development of a Novel Long-Lived ImmunoPET Tracer for Monitoring Lymphoma Therapy in a Humanized Transgenic Mouse Model. Bioconjug Chem. 2012

Natarajan A., Habte F., Gambhir S.S. Development of a Novel Long-Lived ImmunoPET Tracer for Monitoring Lymphoma Therapy in a Humanized Transgenic Mouse Model. Bioconjugate Chemistry, 2012 (Epub ahead of print). PMID: 22621257.

Nejadnik H, Daldrup-Link HE. Engineering stem cells for treatment of osteochondral defects. Skeletal Radiol. 2012; 41 (1): 1-4 PubMedID: 22072236

Neofytou E, Chang E, Patlola B, Kimura N, Lijkwan M, Joubert L-M, Rajadas J, Wu J, Chen X, Robbins RC, Gambhir SS, Cheng Z, Beygui RE. Enhanced Vascularization of Tissue-Engineered Adipose Tissue-Derived Stem Cell on Three Dimensional Scaffolds. Journal of Biomedical Materials Research Part A. 2011;98(3):383-93. PMID: 21630430.

Neofytou E.A., Chang E., Patlola B., Joubert L.M., Rajadas J., Gambhir S.S., Cheng Z., Robbins R.C., Beygui R.E. Adipose Tissue-derived Stem Cells Display a Proangiogenic Phenotype on 3D Scaffolds. Journal of Biomedical Materials Research Part A, 98(3): 383-93, 2011. PMID: 21630430

Newbould RD, Miller SR, Tielbeek JA, Toms LD, Rao AW, Gold GE, Strachan RK, Taylor PC, Matthews PM, Brown AP. Reproducibility of sodium MRI measures of articular cartilage of the knee in osteoarthritis. Osteoarthritis Cartilage. 2012 Jan;20(1):29-35. PMID: 22040861.

"Newbould RD, Miller SR, Toms LD, Swann P, Tielbeek JA, Gold GE, Strachan RK, Taylor PC, Matthews PM, Brown AP. T2* Measurement of the Knee Articular Cartilage in Osteoarthritis at 3T. J Magn Reson Imaging. 2012 Feb 7 [Epub ahead of print] Doi: 10.1002/jmri.23598. PMID: 22314961"

Newman B, Goske M, Hernanz- Schulman M. Pause and Pulse: Radiation dose in Pediatric Fluoroscopy. Pediatr Rev.2011Sep; 32:9:e83-90.

Newman B, Vasanawala SS. Point counterpoint – Dose related issues in cardiac CT imaging. Pediatr Radiol, 2011 Sep: 41 Suppl 2:528-33

Newman B. Ultrasound body applications in children, Pediatr Radiol. 2011 Sep: 41 Suppl 2:555-61

"Nguyen PK, Lan F, Wang Y, Wu JC. Imaging: guiding the clinical translation of cardiac stem cell therapy. Circulation Research 2011;109(8):962-979. PMID 21960727. PMCID 3206967"

Nnewihe A, Grafendorfer T, Daniel B, Calderon P, Alley M, Robb F, Hargreaves BA. Custom –fitted 16-Channel Bilateral Breast Coil for Bidirectional Parallel Imaging Acceleration. Magn Reson Med 2011;66(1):281-9.

O'Halloran RL, Holdsworth S, Aksoy M, Bammer R. Model for the correction of motion-induced phase errors in multishot diffusion-weighted-MRI of the head: Are cardiac-motion-induced phase errors reproducible from beat-tobeat? Magn Reson Med. 2011 Dec 28. doi: 10.1002/mrm.23245. [Epub ahead of print]

Ooi MB, Muraskin J, Zou X, Thomas WJ, Krueger S, Aksoy M, Bammer R, Brown TR. Combined prospective and retrospective correction to reduce motion-induced image misalignment and geometric distortions in EPI. Magn Reson Med. 2012 Apr 12. doi: 10.1002/mrm.24285. [Epub ahead of print]

Padilla-Thornton AE, Willmann JK, Jeffrey RB. Adenocarcinoma of the uncinate process of the pancreas: MDCT patterns of local invasion and clinical features at presentation. Eur Radiol. 2012; 22(5):1067-74.

Pal S, Besier TF, Draper Ce, Fredericson M, Gold GE, Beaupre GS, Delp SL. Patellar Tilt Correlates with Vastus Lateralis: Vastus Medialis Activation Ration in Maltracking Patellofemoral Pain Patients. J Orthop Res. 2012 Jun;30(6):927-33. PMID: 22086708.

Pandey P, Marks MP, Harraher CD, Westbroek EM, Chang SD, Do HM, Levy RP, Dodd RL, Steinberg GK. Multimodality management of Spetzler-martin grade III arteriovenous malformations: Clinical article. JNS 2012.

Pandey P, Steinberg GK, Dodd RL, Do HM, Marks MP. A simplified method for administration of intra-arterial nicardipine for vasospasm using guide catheter infusion. Neurosurgery 2011

Pandey P, Steinberg GK, Westbroek EM, Dodd RL, Do HM, , Marks MP. Intraoperative angiography during surgery for cranial dural AV fistulas. AJNR, 32(6):1091-1095, 2011

Parashurama N., Lobo N.A., Ito K., Mosley A.R., Habte F.G., Zabala M., Smith B.R., Lam J., Weissman I.L., Clarke M.F., Gambhir S.S. Remodeling of Endogenous Mammary Epithelium by Breast Cancer Stem Cells. Stem Cells, 2012 (Epub ahead of print). PMID: 22899386.

Park JM, Josan S, Jang T, Merchant M, Yen YF, Hurd RE, Recht L, Spielman DM, Mayer D. Metabolite kinetics in C6 rat glioma model using magnetic resonance spectroscopic imaging of hyperpolarized [1-(13)C]pyruvate. Magn Reson Med. 2012 Feb 14. doi: 10.1002/mrm.24181. [Epub ahead of print] PubMed PMID: 22334279.

Published Papers

Paulmurugan R, Tamrazi A, Massoud TF, Katzenellenbogen JA, Gambhir SS. In vitro and in vivo molecular imaging of estrogen receptor a and β homo and heterodimerization: exploration of new modes of receptor regulation. Mol Endocrinol. 2011 Dec; 25 (12): 2029-40. Epub 2011 Nov 3. PMID 22052998, PMCID PMC3231840.

Pei Z, Lan X, Cheng Z, Qin C, Wang P, He Y, Mghanga FP, Tian Y, Zhang Y. A multimodality reporter gene for monitoring transplanted stem cells. Nuclear Medicine & Biology. 2012 Feb 14. [Epub ahead of print] PMID: 22336371

"Peng H., Levin C.S. Study of PET intrinsic spatial resolution and contrast recovery improvement for PET/MRI systems. Physics in Medicine and Biology, 57 (9) (2012) N101-115."

Percha B, Nassif H, Lipson J, Burnside E, Rubin D. Automatic classification of mammography reports by BI-RADS breast tissue composition class. J Am Med Inform Assoc. 2012; 19 (5): 913-6

Percha B, Nassif J, Lipson JA, Burnside ES, Rubin DL. "Automatic Extraction of Breast Density Information from Mammography Reports." Journal of the American Medical Informatics Association. 2012 Jan (Epub ahead of print).

Postma E, van Hillergersberg R, Daniel BL, Merckel LG, Verkooijen HM, van den Bosch MAA. Magnetic Resonance Image-guided ablation of breast cancer; Where do we stand today? J Magn Reson Imaging, 2011;34(2):254-61.

Press JZ, Reyes M, Pitteri SJ, Pennil C, Garcia R, Goff BA, Hanash SM, Swisher EM. "Microparticles from ovarian carcinomas are shed into ascites and promote cell migration" Int J Glynecol Cancer 2012 May;22(4):546-552.

Pysz MA, Foygel K, Panje CM, Needles A, Tian L, Willmann JK. Assessment and Monitoring Tumor Vascularity with Contrast-enhanced Ultrasound Maximum Intensity Persistence Imaging. Investigative Radiology 2011; 46: 187-195

Pysz MA, Guracar I, Foygel K, Tian L, Willmann JK. Effect of Real-Time Motion Compensation on Quantitative Assessment of Tumor Vascularity using Contrast-Enhanced Ultrasound Imaging. Angiogenesis 2012; Apr 26. [Epub ahead of print]

Pysz MA, Guracar I, Tian L, Willmann JK. Fast microbubble dwell-time based ultrasonic molecular imaging approach for quantification and monitoring of angiogenesis in cancer. Quant Imaging Med Surg 2012;2(2):68-80

Pysz MA, Willmann JK. Targeted contrast-enhanced ultrasound: An emerging technology in abdominal and pelvic imaging. Gastroenterology 2011; 140: 785-790.

Qiu D, Straka M, Zun Z, Bammer R, Moseley ME, Zaharchuk G. CBF measurements using multidelay pseudocontinuous and velocity-selective arterial spin labeling in patients with long arterial transit delays: Comparison with xenon CT CBF. J Magn Reson Imaging. 2012 Feb 22. doi: 10.1002/jmri.23613.

Qiu P, Simonds EF, Bendall SC, Gibbs KD, Bruggner RV, Linderman MD, Sachs K, Nolan GP, Plevritis SK. Extracting a cellular hierarchy from high-dimensional cytometry data with SPADE. Nature Biotechnology, Oct 2;29(10):886-91, 2011.

Quist B, Hargreaves BA, Cukur T, Morell GR, Gold GE, Bangerter NK. Simultaneous fat suppression and band reduction with large-angle multiple-acquisition balanced steady-state free precession. Magn Reson Med. 2012 Apr;67(4):1004-12. PMID: 22038883.

Quon A, Dodd R, Iagaru A, de Abreu MR, Hennemann S, Neto JM, Sprinz C. Initial investigation of (18)F-NaF PET/CT for identification of vertebral sites amenable to surgical revision after spinal fusion surgery. Eur J Nucl Med Mol Imaging. 2012

Raman SP, Kamaya A, Federle M, Fishman EK. Aortoenteric fistulas: spectrum of CT findings. Abdominal Imaging Feb 2012.

Ramkumar KM, Manjula C, Gnanakumar G, Kanjwal MA, Sekar TV, Paulmurugan R, Rajaguru P. Oxidative stress-mediated cytotoxicity and apoptosis induction by TiO2 nanofibers in HeLa cells. Eur J Pharm Biopharm. 2012 June;81(2):324-33. Epub 2012 Mar 7. PMID 22446064. PMCID - in process.

Reiner M; Stylianou-Korsnes M, Glover GH; Hugdahl K; Feldman MW. Seeing Shapes and Hearing Textures: Two Neural Categories of Touch. The Open Neuroscience Journal 5: 8-15 (2011).

Ren G, Blum G, Verdoes M, Liu H, Syed S, Edgington LE, Gheysens O, Miao Z, Jiang H, Gambhir SS*, Bogyo M*, Cheng Z.* Non-Invasive Imaging of Cysteine Cathepsin Activity in Solid Tumors Using a 64Cu-Labeled Activity-Based Probe. Plos One. 2011, 6(11): e28029. doi:10.1371/journal.pone.0028029. PMID:22132198.

Ren G, Webster JM, Liu Z, Zhang R, Miao Z, Gambhir SS, Syud FA, Cheng Z.* In Vivo Targeting of HER2 Positive Tumor Using 2-helix Affibody Molecules. Amino Acids. 2011 Oct 8. [Epub ahead of print]. PMID: 21984380.

Ren Y, Fleischmann D, Foygel K, Molvin L, Lutz AM, Koong AC, Jeffrey RB, Tian L, Willmann JK. Antiangiogenic and radiation therapy: early effects on in vivo computed tomography perfusion parameters in human colon cancer xenografts in mice. Investigative Radiology. 2012 Jan; 47(1):25-32

Rubesova E. Fetal bowel anomalies – US and MR assessment. - Pediatric Radiology 2012 Jan;42 Suppl 1: S101-6

Published Papers

Rubin DL, Informatics in radiology: Measuring and improving quality in radiology: meeting the challenge with informatics. Radiographics 31(6): 1511-27, 2011.

Rubin DL. Finding the Meaning in Images: Annotation and Image Markup. Philosophy, Psychiatry, and Psychology. 2012;18(4).

Rufaihah A.J., Huang N.F., Jame S., Lee J., Nguyen H.N., Byers B., De A., Okogbaa J., Rollins M., Reijo-Pera R., Gambhir S.S., Cooke J.P. Endothelial Cells Derived From Human iPSCS Increase Capillary Density and Improve Perfusion in A Mouse Model of Peripheral Arterial Disease. Arteriosclerosis, Thrombosis, and Vascular Biology, 31(11):e72-9, 2011. PMCID: PMC3210551

Ryu SC, Renaud P, Black RJ, Daniel BL, Cutkosky MR. Feasibility study of an optically actuated MR-compatible active needle. 2011 Intelligent Robots and Systems (IROS), IEEE/RSJ, p2564-2569.

Saad WEA, Sze DY. (2011) Variations of balloon-occluded retrograde transvenous obliteration (BRTO): Balloon-occluded antegrade transvenous obliteration (BATO) and alternative/adjunctive routes for BRTO. Semin Interv Radiol. 28:314-324.

Safran MR, Lopomo N, Zaffagnini S, Signorelli C, Vaughn ZD, Lindsey DP, Gold G, Giordano G, Marcacci M. In vitro analysis of peri-articular soft tissues passive constraining effect on hip kinematics and joint stability. Knee Surg Sports Traumatol Arthrosc. 2012

Saranathan, M.; Rettmann, D. W.; Hargreaves, B. A.; Clarke, S. E.; Vasanawala, S. S. DIfferential Subsampling with Cartesian Ordering (DISCO): A High Spatio-Temporal Resolution Dixon Imaging Sequence for Multiphasic Contrast Enhanced Abdominal Imaging. J Magn Reson Imaging 2012. Epub ahead of print. PMID: 22334505.

"Saxon P, Badler RL, Desser TS, Tublin ME, Katz DS. Segmental testicular infarction: report of seven new cases and literature review. Emerg Radiol. 2012 Jan 18. [Epub ahead of print] PubMed PMID: 22252203.

Schellenberg D, Kim J, Christman-Skieller C, Chun CL, Columbo LA, Ford JM, Fisher GA, Kunz PL, Van Dam J, Quon A, Desser TS, Norton J, Hsu A, Maxim PG, Xing L, Goodman KA, Chang DT, Koong AC. Single-fraction stereotactic body radiation therapy and sequential gemcitabine for the treatment of locally advanced pancreatic cancer. Int J Radiat Oncol Biol Phys. 2011 Sep 1;81(1):181-8. Epub 2011 May 5. PubMed PMID: 21549517.

Schmiedeskamp H, Straka M, Newbould RD, Zaharchuk G, Andre JB, Olivot JM, Moseley ME, Albers GW, Bammer R. Combined spin- and gradient-echo perfusion-weighted imaging. Magn Reson Med. 2011 Nov 23. doi: 10.1002/mrm.23195. [Epub ahead of print]

Sekar TV, Foygel K, Willmann, JK, Paulmurugan R. Dual-therapeutic reporter genes fusion for enhanced cancer gene therapy and imaging. Gene Therapy. 2012 Aug 23. doi: 10.1038/gt.2012.66. Epub ahead of print. PMID: 22914496.

Shah RP, Brown KT, Sofocleous CT. Arterially directed therapies for hepatocellular carcinoma. AJR Am J Roentgenol. 2011 Oct;197(4):W590-602.

Shapiro L, Gold GE. MRI of weight-bearing and movement. Osteoarthritis and Cartilage. 2012 Feb;20(2):69-78. PMID: 22138286.

"Sheikh AY, Huber BC, Narsinh KH, Spin JM, van der Bogt K, de Almeida PE, Ransohoff KJ, Kraft DL, Fajardo G, Ardigo D, Ransohoff J, Bernstein D, Fishbein MP, Robbins RC, Wu JC. In vivo functional and transcriptional profiling of bone marrow stem cells after transplantation into ischemic myocardium. Arteriosclerosis Thrombosis Vascular Biology 2012;32:92-102. PMID 22034515. PMCID 3241895 (*Journal cover & editorial)"

"Shore MW, Rubin DL and Kahn CE, Jr., Integration of Imaging Signs into RadLex. J Digit Imaging, 2011."

Sigal BM, Munoz DF, Kurian AW, Plevritis SK. A Simulation Model to Predict the Impact of Prophylactic Surgery and Screening on the Life Expectancy of BRCA1 and BRCA2 Mutation Carriers. Cancer Epidemiol Biomarkers Prev. 2012; 21 (7): 1066-77

Sims ME, Shin LK, Rosenberg J, Jeffrey RB. Multidetector computed tomography of acute vascular injury in blunt abdominal/pelvic trauma: imaging predictors of treatment. Eur J Trauma Emerg Surg 2011; 37(5):525-32.

Sin J, Beck A, Pai R, Stevens K. Multifocal epithelioid hemangioma with reactive bone formation. ISRN Pathology, 2011, article 378940.

Singh S, Ladabaum U, Hovsepian DM, Triadafilopoulos G. Cancer-associated aorto-enteric fistula presenting as hemorrhagic shock. Digestive Diseases and Science. 2011 Oct 22. [Epub ahead of print]

Sista AK, Hwang GL, Hovsepian DM, Sze DY, Kuo WT, Kothary N, Louie JD, Yamada K, Hong R, Dhanani R, Brinton TJ, Krummel TM, Makower J, Yock PG, Hofmann LV. Applying a structured innovation process to interventional radiology: a single-center experience. J Vasc Interv Radiol. 2012 Apr;23(4):488-94.

Smith BR, Kempen P, Bouley D, Xu A, Liu Z, Melosh N, Dai H, Sinclair R, Gambhir SS. Shape matters: intravital microscopy reveals surprising geometrical dependence for nanoparticles in tumor models of extravasation. Nano Lett. 2012; 12 (7): 3369-77

Starman J, Tognina C, Partain L, Fahrig R. A forward bias method for lag correction of an a-Si flat panel detector. Med Phys. 2012 Jan;39(1):18-27.

Staroswiecki E, Granlund KL, Alley MT, Gold GE, Hargreaves BA. Simultaneous estimation of T(2) and apparent diffusion coefficient in human articular cartilage in vivo with a modified three-dimensional double echo steady state (DESS) sequence at 3 T. Magn Reson Med. 2012; 67 (4): 1086-96

Published Papers

Stewart JK, Kuo WT, Hovsepian DM, Hofmann LV, Bonham CA, Sze DY. Portal venous remodeling after endovascular reduction of pediatric autogenous porto-systemic shunts. J Vasc Interv Radiol. 2011; 22 (8): 1199-205.

Sun C, Pratx G, Carpenter CM, Liu H, Cheng Z, Gambhir SS, Xing L*. Synthesis and Radioluminescence of PEGylated Eu3+-doped Nanophosphors as Bioimaging Probes. Advanced Materials. 2011,23(24):H195-9. PMID: 21557339.

Swetman, G. L.; Berk, D. R.; Vasanawala, S. S.; Feinstein, J. A.; Lane, A. T.; Bruckner, A. L.; Sildenafil for severe lymphatic malformations. N Engl J Med 2012 Jan 26, 366 (4),384-386. PMID: 22276841.

Sze DY, Iagaru AH, Gambhir SS, De Haan HA, Reid TR. Response to intra-arterial oncolytic virotherapy with the herpes virus NV1020 evaluated by [18F]fluoro-deoxyglucose positron emission tomography and computed tomography. Hum Gene Ther. 2012; 23 (1): 91-7

Taguchi A., Politi K., Pitteri S.J., Lockwood W.W., Faca V.M., Kelly-Spratt K., Wong C.H., Zhang Q., Chin A., Park K.S., Goodman G., Gazdar A.F., Sage J., Dinulescu D.M., Kucherlapati R., DePinho R.A., Kemp C.J., Varmus H.E., Hanash S.M. "Lung Cancer Signatures in Plasma Based on Proteome Profiling of Mouse Tumor Models." Cancer Cell. 2011, 20, 289-299.

Tall M, Choudhury K. Roy, Napel S. , Roos J.E. , Rubin G.D, "Accuracy of a Remote Eye Tracker for Radiologic Observer Studies: Effects of Calibration and Recording Environment," Acad Radiol. 19(2):196-202, 2012. PMID: 22212422

Tang C, Lee AS, Peter-Volkmer J, Sahoo D, Mosley A, van de Rijn M, Inlay MA, Ardehali R, Wu JC, Weissman IL, Drukker M. Removal of residual teratoma-forming cells via a surface antibody panel ensures transplantation safety of human pluripotent stem cell derivatives. Nature Biotechnology 2011;29(9):829-834. PMID 21841799 (*Journal cover)

Tang C, Murphy JD, Khong B, La TH, Kong C, Fischbein NJ, Colevas AD, Iagaru AH, Graves EE, Le QT. Validation that Metabolic Tumor Volume Predicts Outcome in Head and Neck Cancer. Int J Radiat Onc Biol Phys 2012 Jan 21 [Epub ahead of print]

Thakor A.S., Jokerst J., Zavaleta C., Massoud T.F., Gambhir S.S. Gold Nanoparticles: A Revival in Precious Metal Administration to Patients. Nano Letters, 11(10): 4029-36, 2011. PMCID: PMC3195547

Thomas DG, Klaessig F, Harper SL, Fritts M, Hoover MD, Gaheen S, Stokes TH, Reznik-Zellen R, Freund ET, Klemm JD, Paik DS, Baker NA, "Informatics and standards for nanomedicine technology," WIRES Nanomedicine and Nanobiotechnology, 2011; 3(5):511-32.

Thomason ME; Dennis EL; Joshi AA; Joshi SH; Dinov ID; Chang C; Henry ML; Johnson RF; Thompson PM; Toga AM; Glover GH; Van Horn JD; Gotlib IH. Resting-state fMRI can reliably map neural networks in children. NeuroImage 55:165-75(2011)

"Tran PT, Bendapudi PK, Lin HJ}, Choi P, Koh S, Chen J, Horng G, Hughes NP, Schwartz LH, Miller VA, Kawashima T, Kitamura T, {Paik D, Felsher DW}, ""Survival and death signals can predict tumor response to therapy after oncogene inactivation,"" Science Translational Medicine 2011; 3(103):103ra99. { } = co-equal authorship"

Tran PT, Shroff EH, Burns TF, Thiyagarajan S, Das ST, Zabuawala T, Chen J, Cho YJ, Luong R, Tamayo P, Salih T, Aziz K, Adam SJ, Vicent S, Nielsen CH, Withofs N, Sweet-Cordero A, Gambhir SS, Rudin CM, Felsher DW. Twist1 suppresses senescence programs and thereby accelerates and maintains mutant Kras-induced lung tumorigenesis. PLoS Genet. 2012; 8 (5): e1002650

"Tseng D, Rachakonda LP, Su Z, Advani R, Horning S, Hoppe RT, Quon A, Graves EE, Loo BW Jr, Tran PT. Interim-treatment quantitative PET parameters predict progression and death among patients with Hodgkin's disease. Radiat Oncol. 2012 Jan 19;7:5. PubMed PMID: 22260710."

Van de Sompel D, Garai E, Zavaleta C, Gambhir SS. A hybrid least squares and principal component analysis algorithm for Raman spectroscopy. PLoS One. 2012; 7 (6): e38850 Conf Proc IEEE Engineering in Medicine and Biology Society, 6971-4, 2011. PMID: 22255942

van de Ven SM, Elias SG, Chan CT, Miao Z, Cheng Z, De A, Gambhir SS. Optical Imaging with HER2-targeted Affibody Molecules can monitor Hsp90 treatment response in a xenograft mouse model. Clinical Cancer Research. 2012; 18(4): 1073-1081. PMID: 22235098.

van der Bogt KE, Hellingman AA, Lijkwan MA, Bos EJ, de Vries MR, van Rappard JR, Fischbein MP, Quax PH, Robbins RC, Hamming JF, Wu JC. Molecular imaging of bone marrow mononuclear cell survival and homing in murine peripheral artery disease. JACC Cardiovasc Imaging 2012;5(1):46-55. PMID 22239892 (*Editorial)

van der Zwaag W; Marques JP; Kober T; Glover G; Gruetter R; Krueger G. Temporal SNR characteristics in segmented 3D-EPI at 7T. Magn Reson Med. Feb;67(2):344-52 (2012)

Vasanawala SS, Chan FP, Newman B, Alley MT. Combined respiratory and cardiac triggering improves blood pool contrast-enhanced pediatric cardiovascular MRI. Pediatr Radiol. 2011 Dec; 41(12):1536-44.

Vasanawala, S. S.; Murphy, M. J.; Alley, M. T.; Lai, P.; Keutzer, K.; Pauly, J. M.; Lustig, M. Practical parallel imaging compressed sensing MRI: Summary of two years of experience in accelerating body MRI of pediatric patients. In Proceedings of IEEE International Symposium on Biological Imaging 2011. pp.1039~1043

Published Papers

Vasanawala, S. S.; Yu, H.; Shimakawa, A.; Jeng, M.; Brittain, J. H., Estimation of liver T*(2) in transfusion-related iron overload in patients with weighted least squares T*(2) IDEAL. Magn Reson Med 2011.

Voyvodic JT; Glover GH; Greve D; Gyadde S. FBIRN. Automated real-time behavioral and physiological data acquisition and display integrated with stimulus presentation for fMRI. Frontiers in Neuorinformatics. 27:1-9 (2011)

Wang AS and Pelc NJ: Sufficient statistics as a generalization of binning in spectral x-ray imaging (PMID: 20682470). IEEE Trans Med Imaging 30, 84-93, 2011.

Wang AS and Pelc NJ: Synthetic CT: Simulating Low Dose Single and Dual Energy Protocols from a Dual Energy Scan (PMID: 21992373). Med Phys 38, 5551-62, 2011.

Wang C, Stebbins GT, Medina DA, Shah RC, Bammer R, Moseley ME, deToledo-Morrell L. Atrophy and dysfunction of parahippocampal white matter in mild Alzheimer's disease. Neurobiol Aging. 2012; 33 (1): 43-52

Wang DS, Panje C, Pysz MA, Paulmurugan R, Rosenberg J, Gambhir SS, Schneider M, Willmann JK. Cationic versus Neutral Microbubbles for Ultrasound-mediated Gene Delivery in Cancer. Radiology. 2012 Sep;264(3):721-32, Epub 2012 June 21. PMID: 22723497. PMCID: PMC3426857.

Wang X, Shah RP, Maybody M, Brown KT, Stevenson C, Petre EN, Solomon SB. Cystic Artery Localization with a Three-Dimensional Angiography Vessel Tracking System Compared with Conventional Two-Dimensional Angiography. J Vasc Interv Radiol. 2011 Oct; 22(10):1414-9.

Wiegner EA, Daly ME, Murphy JD, Abelson J, Chapman CH, Yu Y, Colevas DA, Kaplan MJ, Fischbein NJ, Le QT, Chang DT. Intensity-Modulated Radiotherapy for Tumors of the Nasal Cavity and Paranasal Sinuses: Clinical Outcomes and Patterns of Failure. Int J Radiat Oncol Biol Phys 2011 Oct 20. [Epub ahead of print]

Williams, J.; Vasanawala, S. S., Active gastrointestinal hemorrhage identification by blood pool contrast-enhanced magnetic resonance angiography. Pediatr Radiol 2011, 41 (9), 1198-2000.

Won J. H., Rosenberg J., Rubin G. D., Napel S., "Uncluttered Single-Image Visualization of Vascular Structures Using GPU and Integer Programming," Epub ahead of print, IEEE Transactions on Visualization and Computer Graphics, January 2012. PMID: 22291148

Wood DE, Eapen GA, Ettinger DS, Hou L, Jackman D, Kazerooni EA, Klippenstein D, Lackner RP, Leard LE, Leung AN, Massion PP, Munden RF, Myers BF, Otterson GA, Peairs K, Pipavath S, Pratt-Pozo C, Reddy C, Reid ME, Rotter AJ, Schabath MB, Sequist LC, Tong BC, Travis WD, Unger M, Yang SC. NCCN Clinical Practice Guidelines in Oncology: Lung Cancer Screening. J Natl Compr Canc Netw 10; 240-265, 2012.

Woon C.Y., Farnebo S.J., Schmitt T., Megerle K., Pham H., Kraus A., Yan X., Gambhir S.S. Human Flexor Tendon Tissue Engineering: Revitalization of Biostatic Allograft Scaffolds. Tissue Engineering Part A, 2012 (Epub ahead of print). PMID: 22712522.

Woon CY, Farnebo S, Schmitt T, Kraus A, Megerle K, Pham H, Yan X, Gambhir SS, Chang J. Human Flexor Tendon Tissue Engineering: Revitalization of Biostatic Allograft Scaffolds. Tissue Eng Part A. 2012

Worters PW, Sung K, Stevens KJ, Koch KM, Hargreaves BA. Compressed-Sensing multispectral imaging of the postoperative spine. J Magn Reson Imaging. 2012

Worters, P. W.; Saranathan, M.; Xu, A.; Vasanawala, S. S.; Inversion-recovery-prepared dixon bSSFP: Initial clinical experience with a novel pulse sequence for renal MRA within a breathhold. J Magn Reson Imaging 2011 Nov 16, epub ahead of print. PMID: 22095672.

Wu S, Chang E, Cheng Z.* Molecular Probes for Bioluminescence Imaging. Invited review (peer reviewed), Current Organic Synthesis. 2011; 8(4): 488-497.

Xia Z., Xing Y., Kim Y.P., Gall J., Dragulescu-Andrasi A., Gambhir S.S., Rao J. Immobilizing Reporters for Molecular Imaging of the Extracellular Microenvironment in Living Animals. ACS Chemical Biology, 6(10): 1117-26, 2011. PMCID: PMC3199358

Xu J., Agrawal N., Greenspan H., Beaulieu C. F., Napel S., Rubin D. L., "Quantifying the Margin Sharpness of Lesions on Radiological Images for Content-Based Image Retrieval," in press, Medical Physics, July 2012.

Xu J., Greenspan H., Napel S., Rubin D. L. "Automated Temporal Tracking and Segmentation of Lymphoma on serial CT Examinations," Med Phys. 38(11):5879, 2011. PMID: 22047352.

Xu T, Mayer D, Gu M, Yen YF, Josan S, Tropp J, Pfefferbaum A, Hurd R, Spielman D. Quantification of in vivo metabolic kinetics of hyperpolarized pyruvate in rat kidneys using dynamic 13C MRSI. NMR Biomed. 2011 Oct;24(8):997-1005. doi: 10.1002/nbm.1719. Epub 2011 Apr 28. PubMed PMID: 21538639; PubMed Central PMCID: PMC3169748.

Xu Y, Liu H, Cheng Z.* Harnessing the Power of Radionuclides for Optical Imaging: Cerenkov Luminescence Imaging. Journal of Nuclear Medicine. 2011; 52(12):2009-18. PMID: 22080446.

Xu Y, Chang E, Liu H, Jiang H, Gambhir SS, Cheng Z.* Proof-of-Concept Study of Monitoring Cancer Drug Therapy with Cerenkov Luminescence Imaging. Journal of Nuclear Medicine. 2012; 53(2):312-317. PMID: 22241909.

Published Papers

Xu, J, Faruque, JS, Beaulieu, CF, Rubin, DL, Napel, S. A Comprehensive Descriptor of Shape: Method and Application to Content-Based Retrieval of Similar Appearing Lesions in Medical Images, J Digit Imaging 25:121-8, 2012 PMID: 21547518

Yang Y, Aw J, Chen K, Padmanabhan P, Hou Y, Cheng Z*, Xing B*. Enzyme-Responsive Multifunctional Magnetic Nanoparticles for Tumor Intracellular Drug Delivery and Imaging. Chemistry An Asian Journal. 2011, 6(6):1381-1389. PMID: 21548100. Cover page article.

Yang M, Hoppmann S, Chen L, Cheng Z.* Human Serum Albumin Conjugated Biomolecules for Cancer Molecular Imaging. Current Pharmaceutical Design. 2012;18:1023-1031. PMID: 22272822.

Yang Y, Shao Q, Deng R, Wang C, Teng X, Cheng K, Cheng Z, Huang L, Liu Z, Liu X, Xing B. In Vitro and In Vivo Uncaging and Bioluminescence Imaging by Using Photocaged Upconversion Nanoparticles. Angewandte Chemie International Edition. 2012 Jan 12. doi: 10.1002/anie.201107919. [Epub ahead of print] PMID: 22241651. [Selected as "Hot Paper" and Featured as "inside cover"].

Yao Y, Jiang Y, Sheng Z, Zhang Y, An Y, Ma G, Liu N, Teng G, Cheng Z. Analysis of In Situ and Ex Vivo αvβ3 Integrin Expression during Experimental Carotid Atherogenesis. International Journal of Nanomedicine. 2012;7:641-9. PMID:22334786

Young P, Daniel B, Sommer G, Kim B, Herfkens R. Intravaginal gel for staging of female pelvic cancers-preliminary report of safety, distention, and gel-mucosal contrast during magnetic resonance examination. J Comput Assist Tomogr. 2012 Mar;36(2):253-6.

Young PM, Gerber TC, Williamson EE, Julsrud PR, Herfkens RJ. AJR Am J Roentgenol. Cardiac imaging: Part 2, normal, variant, and anomalous configurations of the coronary vasculature. 2011 Oct;197(4):816-26. PMID: 21940568 [PubMed - in process]

Zaharchuck G, Do HM, Marks MP, Rosenberg J, Moseley ME, Steinberg GK. Arterial spin labeling MRI can identify the presence and intensity of collateral perfusion in patients with moyamoya disease. Stroke 42(9):2485-2491, 2011

Zaharchuk G, Arterial spin label imaging of acute ischemic stroke and transient ischemic attack, Neuroimag Clin N Amer 2011; 21:285-301.

Zaharchuk G, Better late than never: the long journey for noncontrast arterial spin label perfusion imaging in acute stroke, Stroke 2012; 43: 931-2.

Zaharchuk G, El Mogy IS, Fischbein NJ, Albers GW. Comparison of arterial spin labeling and bolus perfusion-weighted imaging for detecting mismatch in acute stroke. Stroke. 2012; 43 (7): 1843-8

Zaharchuk G, Fischbein NJ, Rosenberg J, Herfkens RJ, Dake MD. Comparison of magnetic resonance and contrast venography of the cervical venous system in multiple sclerosis. AJNR Am J Neuroradiol 2011 Sep; 32(8):1482-9.

Zavaleta C.L., Kircher M.F., Gambhir S.S. Raman's "Effect" on Molecular Imaging. Journal of Nuclear Medicine, 52(12): 1839-44, 2011. PMID: 21868625

Zavaleta CL, Hartman KB, Miao Z, James ML, Kempen P, Thakor A, Nielsen CH, Sinclair R, Cheng Z, Gambhir SS. Preclinical Evaluation of Raman Nanoparticle Biodistribution for Their Potential Use in Clinical Endoscopy Imaging. Small. 2011;7(15)2232-40. PMID: 21608124.

Zeineh MM, Holdsworth S, Skare S, Atlas SW, Bammer R. Ultra-high resolution diffusion tensor imaging of the microscopic pathways of the medial temporal lobe. Neuroimage. 2012; 62 (3): 2065-82

Zhang X, Liu H, Miao Z, Kimura R, Fan F, Cheng Z.* Macrocyclic Chelator Assembled RGD Multimers for Tumor Targeting. Bioorganic Medicinal Chemistry Letters. 2011, 21(11): 3423-3426. PMID: 21524578.

Zhang J, Liu C, Moseley ME. Parallel reconstruction using null operations. Magn Reson Med. 2011 Nov;66(5):1241-53. doi: 10.1002/mrm.22899. Epub 2011 May 20. PMID: 21604290 [PubMed - indexed for MEDLINE]

Zhang T, Pauly JM, Vasanawala SS, Lustig M. Coil Compression for Accelerated Imaging with Cartesian Sampling. Magn Reson Med 2012, Epub ahead of print. PMID: 22588589.

Books and Book Chapters

Essentials of the US Health Care System; Scott W. Atlas; in Inside America's Health Care: Access to Excellence, Scott W. Atlas, editor, Hoover Press, Stanford, November 2011.

WHO Rankings: A Critical Appraisal; Scott W. Atlas; in Inside America's Health Care: Access to Excellence, Scott W. Atlas, editor, Hoover Press, Stanford, November 2011.

Health System Quality: Why Life Expectancy and Infant Mortality Don't Measure Up; Scott W. Atlas; in Inside America's Health Care: Access to Excellence, Scott W. Atlas, editor, Hoover Press, Stanford, November 2011.

The Facts: Medical Care for Serious Disease in the United States; Scott W. Atlas; in Inside America's Health Care: Access to Excellence, Scott W. Atlas, editor, Hoover Press, Stanford, November 2011.

Access in America: Advanced Medical Technology, Innovative Treatments, Preventive Care and Screening; Scott W. Atlas; in Inside America's Health Care: Access to Excellence, Scott W. Atlas, editor, Hoover Press, Stanford, November 2011.

Innovation from America's Doctors and Medical Scientists; Scott W. Atlas; in Inside America's Health Care: Access to Excellence, Scott W. Atlas, editor, Hoover Press, Stanford, November 2011

Maintaining Excellence with Reform; Scott W. Atlas; in Inside America's Health Care: Access to Excellence, Scott W. Atlas, editor, Hoover Press, Stanford, November 2011.

Inside America's Health Care: Access to Excellence, Scott W. Atlas, Hoover Press, Stanford, November 2011

TUGAN'S CHAPTER

Hintz SR, Chueh J, Barth RA, Cunniff C, Hudgins L. Prenatal Diagnosis and Consultation. In Neonatology: Clinical Practice and Procedural Atlas. Ed. Stevenson DK et al. submitted for 2012 Publication by McGraw-Hill Company

Poullos P, Beaulieu CF. Practical Performance of CTC. In: Colorectal Cancer Screening and Computerized Tomographic Colonography: A Comprehensive Overview. Cash, B., Editor., Springer, New York, In Press, 2012.

Poullos P, Beaulieu CF. Training and Interpretation of CTC Images. In: Colorectal Cancer Screening and Computerized Tomographic Colonography: A Comprehensive Overview. Cash, B., Editor., Springer, New York, In Press, 2012.

Feinstein JA, Chan FP. Chapter 10: Magnetic Resonance Imaging in Pediatric Pulmonary Hypertension. In book: Pediatric Pulmonary Hypertension. By editors: Beghetti M, Barst RJ, Berger RMF, Humpl T, Ivy D, Schulze-Neick I. Elsevier 2011, pp.155-177.

Chan FP. Chapter 94: Congenital Anomalies of the Thoracic Great Arteries. In book: Caffey's Pediatric Diagnostic Imaging. 12th Ed. By editors: Kuhn JP, Slovis TL, Haller JO. Elsevier 2012, in print.

Towbin A, Newman B, Chan FP. Chapter 95: Syndromes and Chromosomal Anomalies. In book: Caffey's Pediatric Diagnostic Imaging. 12th Ed. By editors: Kuhn JP, Slovis TL, Haller JO. Elsevier 2012, in print.

Chan FP. Chapter 98: Coronary Artery Disease in Children. In book: Caffey's Pediatric Diagnostic Imaging. 12th Ed. By editors: Kuhn JP, Slovis TL, Haller JO. Elsevier 2012, in print.

Chan FP. Chapter 99: Acquired Great Vessel Diseases. In book: Caffey's Pediatric Diagnostic Imaging. 12th Ed. By editors: Kuhn JP, Slovis TL, Haller JO. Elsevier 2012, in print.

Towbin A, Newman B, Chan FP. Chapter 100: Cardiac Involvement by Systemic Diseases. In book: Caffey's Pediatric Diagnostic Imaging. 12th Ed. By editors: Kuhn JP, Slovis TL, Haller JO. Elsevier 2012, in print.

Cheng K, Cheng Z.* Multimodality Molecular Imaging and Multifunctional Molecular Probes, Chapter XX in the book of Molecular Nuclear Medicine and Molecular Imaging, Yongxue Zhang, Eds, People's Medical Publishing House, 2012. In press.

Liu H, Cheng Z.* Cerenkov Luminescence Imaging, Chapter XX in the book of Molecular Nuclear Medicine and Molecular Imaging, Yongxue Zhang, Eds, People's Medical Publishing House, 2012. In press.

Cheng K, Cheng Z.* Diagnostic Applications of Engineered Nanomaterials in Cancer, Chapter 11 in the book of Adverse Effects of Engineered Nanomaterials, Bengt Fadeel, Antonio Pietroiusti, Anna Shvedova, Eds, Elsevier, 2012. ISBN: 978-0-12-386940-1.

Liu, S., Chin, F. T., Cheng, Z. and Chen, X. (2012) Synthesis of [18F]FPPRGD2, in Radiochemical Syntheses: Radiopharmaceuticals for Positron Emission Tomography, Volume 1 (eds P. J. H. Scott and B. G. Hockley), John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/9781118140345. ch6

Books and Book Chapters

Golovko D, Sutton E, Daldrup-Link HE: MR Contrast Media. In: A. Baur (Editor): MRI of the bone marrow. Series: Medical Radiology – Diagnostic Imaging (Series Editors: A.L. Baert, M. Reiser, H. Hricak, M. Knauth), Springer, Heidelberg, 2012

Desser TS and Hann LE. Ultrasound of the Liver, Biliary Tract, and Pancreas. In Blumgart's Surgery of the liver, biliary tract, and pancreas Philadelphie, Elsevier Inc, 2012.

Saul KR, Delp SL, Gold GE, Murray WM. "Upper Limb Muscle Volumes in Adults". In Holzbaur K, Handbook of Anthropometry, Springer 2011.

Hargreaves BA, Worters PW, Butts-Pauly K, Pauly JM, Gold GE, Koch KM. "Imaging in the Presence of Prostheses. In Fullerton, et al., Encyclopedia of Magnetic Resonance. Wiley, 2012.

McWalter, EJ, Braun HJ, Keenan, KE, Gold GE. "Knee Imaging with uTE. In Fullerton, et al., Encyclopedia of Magnetic Resonance. Wiley, 2012.

• Steele JR, Terrell JA, Hovsepian DM, Jordan VS. "Control Charts and Dashboards" in Quality and Safety in Radiology, Abujudeh H and Bruno M, Eds. 2012 pp. 196-209. Oxford University Press, New York, NY.

Iagaru A, McDougall IR. PET/CT in Thyroid Cancer. In: Wartofsky L, Van Nostrand D, eds. Thyroid Cancer: a Comprehensive Guide to Clinical Management, 2nd Edition. Humana Press.

V. Spanoudaki and C.S. Levin. Design considerations of small-animal PET scanners. In Multimodality Molecular Imaging of Small-Animals: Instrumentation and Applications. Ed. H. Zaidi, Springer (2012).

C.S. Levin. Molecular Imaging Instrumentation. Chapter 2 in Molecular Imaging Probes for Cancer Research. Ed. Shawn Chen. World Scientific (2012).

Kani, K., Sordella, R. & Mallick, P. Investigation of acquired resistance to EGFR-targeted therapies in lung cancer using cDNA microarrays. Methods in molecular biology (Clifton, N.J.) 795, 233-253 (2012).

Vogelsang MS, Kani K, Katz JE, Mallick P "Model-based discovery of circulating biomarkers." Methods Mol Biol 2011; 728: 87-107

Newman B. Conotruncal Anomalies- A Case Based Review NASCI 39th annual meeting, Baltimore September 2011.(IL)

Newman B. Optimizing CT Imaging in Children. El Camino Hospital, Mountain View CA, Pediatric Grand Rounds. October 17, 2011(IL)

Newman B. Congenital Lung Anomalies: Postnatal Imaging. US, CT and MRI. Congenital Pulmonary Malformations. 2nd annual international best care for neonates symposium. Barcelona Spain. November 11, 2011.(IL)

Paulmurugan, R. 2011. Introduction to Cancer Biology. Fundamentals of Molecular Imaging. Molecular Imaging Probes for Cancer Imaging. Editor: Xiaoyuan Chen. World Scientific Publishing, Singapore 596224

Paulmurugan, R. 2012. Bioluminescence. Recent Advances in Oceanic Measurements and Laboratory Applications. Editor: David Lapota. InTech Publishing, Rijeka, Croatia 51000, Ch. 3, pp 49-80, ISBN-978-953-307-940-0.

"Colorectal Cancer Screening and Computerized Tomographic Colonography: A Comprehensive Overview Editor: Brooks D. Cash, MD Practical Performance of CTC-Peter D. Poullos MD and Chris Beaulieu MD Training and Interpretation of CTC Images- Peter D. Poullos MD and Chris Beaulieu MD"

Chan JC, Gambhir SS, Willmann JK. Imaging techniques in drug development and clinical practice. In: Drug Delivery in Oncology. F. Kratz, P. Senter, H. Steinhagen (ed.), Wiley-VCH, Weinheim, Germany (2012)

Hu S, Lavinghousez P, Li Z, Wu JC. Differentiation of endothelial cells from human embryonic stem cells and induced pluripotent stem cells. In: Ye K, Jin S, eds. Human Embryonic and Induced Pluripotent Stem Cells. New York, NY: Springer Protocols, 2011.

Nguyen PK, Nag D, Wu JC. Molecular imaging of cardiovascular disease. In: Patterson C, Willis MS, eds. Molecular & Translational Cardiology. New York, NY: Springer Science, 2012

Lijkwan MA, Jan Bos E, Wu JC. Principles of bioluminescence imaging and its application in vivo. In: Kraitchman D, Wu JC, eds. Boca Raton, FL: CRC Press, 2012

"The following pediatric neuroradiology and head and neck chapters in Pearls and Pitfalls in Pediatric Radiology: Langerhans cell histiocytosis involvement of the calvarium; Branchio-oto-renal syndrome; Labrynthitis ossificans; Medulloblastoma; PHACES syndrome; Ectopic Thymus; Adrenal leukodystrophy; Craniopharyngioma; Retinoblastoma"

The Department of Radiology is deeply grateful for its many collaborators here at Stanford, across the country, and internationally. Your support is critical as we work together providing advanced diagnostic imaging for our patients, earlier detection of disease, earlier therapeutic interventions, and continuous disease monitoring for patients managing chronic illness.

Academy of Molecular Imaging
Alza Corporation
American Association for Cancer Research
American College of Radiology (ACR)
American Heart Association
American Society for Therapeutic Radiology
American Society of Clinical
Oncology and Oncology
AMGEN
Apple Computer, Inc.
Bayer
Beth Israel Deaconess Medical Center
BRACCO
Brigham & Women's Hospital
Caliper Life Sciences
Canary Foundation
Canon
CCNE-TR
Cedars-Sinai
Centocor Ortho Biotech Inc.
Chiron
CRI
Crump Institute for Molecular Imaging
Doris Duke Charitable Foundation
Edward Mallinckrodt, Jr. Foundation
Eli & Edythe L. Broad Foundation
Emory University
ENDRA
ev3 Neurovascular
Fred Hutchinson Cancer Research Center
Fujifilm
Gamma Medica
GE Healthcare
Genentech
Georgetown University
GlaxoSmithKline
Hamamatsu
ImaginAb
InSightec-TxSonics, Inc.
Intel
International Society for Heart
and Lung Transplantation
Johns Hopkins University Hospital
Life Sciences Research Foundation
MagArray
Massachusetts General Hospital
Micrus Endovascular Corporation
Nanyang Technological University
National Cancer Institute
National Institute of Biomedical
Imaging & Bioengineering
National Institutes of Health
NCI Alliance for Nanotechnology in Cancer
NN-LABS, LLC
Novartis
Ocean Nanotech
Oregon Health Sciences University
Peter Michael Foundation
Pfizer
Philips
Prostate Cancer Foundation
RMD
Roche
RSNA
Sanofi-Aventis, US, Inc.
Schering
SibTech Inc
Siemens
Society for Imaging Informatics in Medicine
Society of NeuroInterventional Surgery (SNIS)
Society of Nuclear Medicine
Society of Uroradiology
Texas A & M University
The Ben & Catherine IVY Foundation
The Burroughs Wellcome Fund
The National Pancreas Foundation
The Society of Gastrointestinal Radiologists
The University of Alabama at Birmingham
The University of California
The University of Texas
Thrasher Research Fund
UCLA
University of Miami
University Of Minnesota
University of Southern California (USC)
UT Health Science Center
Vanderbilt University
Varian Medical Systems
VisualSonics
Washington State University
Zymera

Collaborating Stanford Departments

The Department of Radiology is deeply grateful for its many collaborators here at Stanford, across the country, and internationally. Your support is critical as we work together providing advanced diagnostic imaging for our patients, earlier detection of disease, earlier therapeutic interventions, and continuous disease monitoring for patients managing chronic illness.

Aeronautics and Astronautics
Anesthesia
Applied Physics
Biochemistry
Bioengineering
Bio-X
Cancer Biology
Stanford Cancer Institute - NCI Designated Cancer Center
Cardiothoracic Surgery
Chemistry
Comparative Medicine
Computer Sciences
Developmental Biology
Electrical Engineering
ENT
Freeman Spogli Institute
Genetics
Health Research and Policy
Hematology
Infectious Diseases
Lucile Packard Children's Hospital
Materials Science and Engineering
Mechanical Engineering
Medical Informatics
Medicine
Microbiology and Immunology
Molecular and Cellular Physiology
Neurobiology
Neurology and Neurological Sciences
Neurosurgery
Obstetrics & Gynecology
Oncology
Orthopedics/Orthopedic Surgery
Otolaryngology
Palo Alto VA
Pathology
Pediatrics
Pediatrics/Neonatology
Psychiatry and Behavioral Sciences
Psychology
Radiation Oncology
Stanford Center for Biomedical Ethics
Stroke Center
Surgery

Summary Statistics

116

Total number of all faculty;

3rd largest in the School of Medicine

$20M

New major gift funding (2012-13)

 # 2

NIH rank according to Academy of Radiology Research, acadrad.org, 2012

Top 10

Residency Training in the U.S.

auntminnie.com, 2012

227

Radiology trainees, 2012-13

12

Number of Distinguished Investigators

Academy of Radiology Research, 2012

Presentations & Publications

44

Books and Chapters

350+

Publications

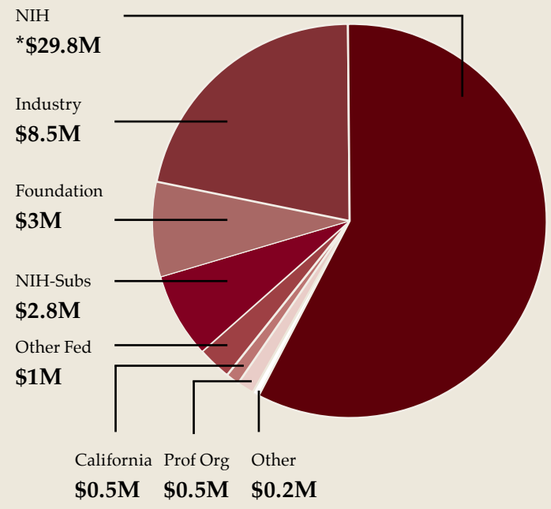
500+

Abstracts/Presentations
(faculty, postdocs, scientific staff)

For details see http://radiology.stanford.edu/about/annual_report/

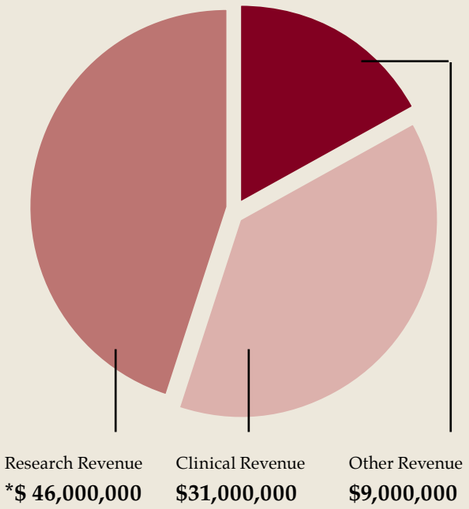
Research Funding FY12

$46,000,000 (directs and indirects)



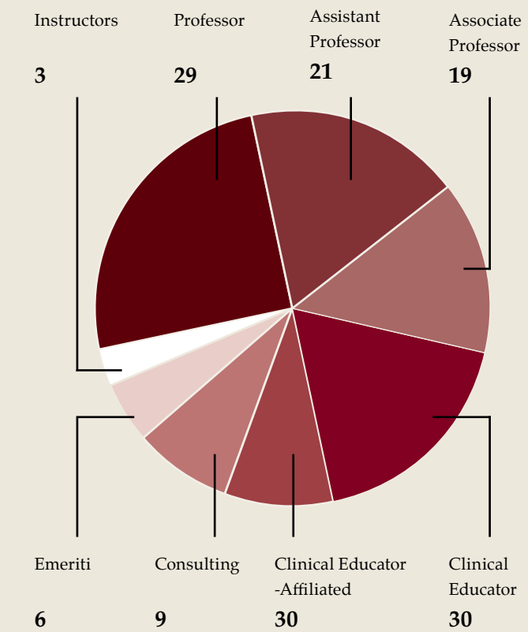
Revenue Sources FY12

$86,000,000

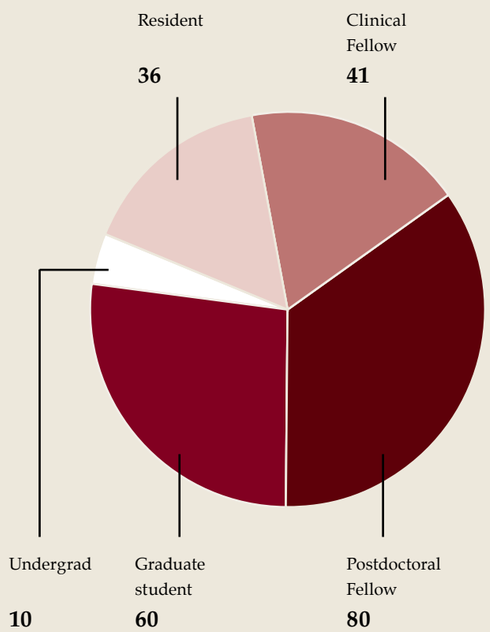


* Totals based on Stanford Fiscal Year

Faculty: 116



Trainees: 227



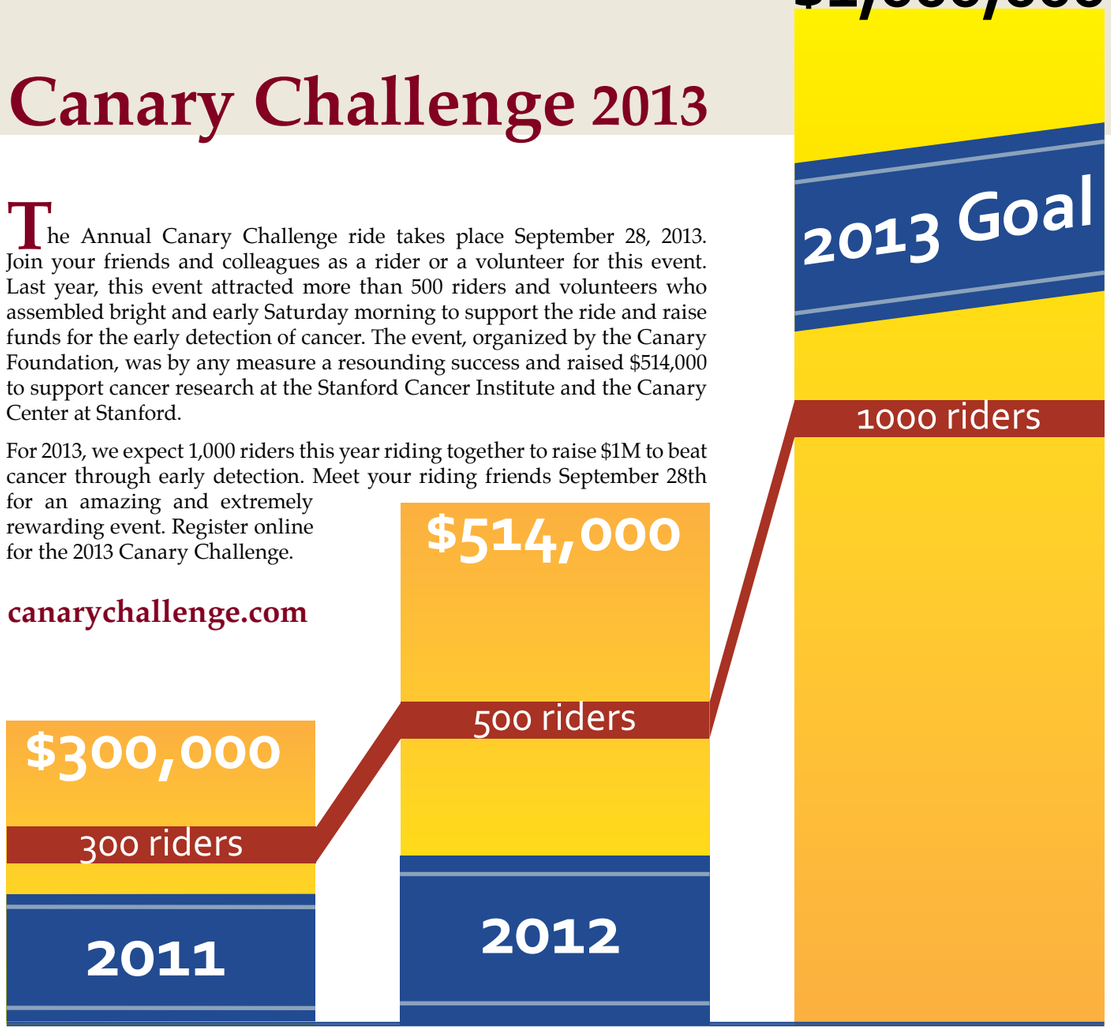

Canary Challenge riders, 2012

Canary Challenge 2013

The Annual Canary Challenge ride takes place September 28, 2013. Join your friends and colleagues as a rider or a volunteer for this event. Last year, this event attracted more than 500 riders and volunteers who assembled bright and early Saturday morning to support the ride and raise funds for the early detection of cancer. The event, organized by the Canary Foundation, was by any measure a resounding success and raised $514,000 to support cancer research at the Stanford Cancer Institute and the Canary Center at Stanford.

For 2013, we expect 1,000 riders this year riding together to raise $1M to beat cancer through early detection. Meet your riding friends September 28th for an amazing and extremely rewarding event. Register online for the 2013 Canary Challenge.

canarychallenge.com



The Stanford Department of Radiology thanks the following foundations for their generous support for our research in the imaging sciences including technology development and solutions for the early detection, monitoring, and treatment of disease.

The Canary Foundation

The Ben and Catherine Ivy Foundation

The Lucas Foundation

The Sir Peter Michael Foundation

2012 -13 Annual Report Team:

Executive Editor: Sanjiv Sam Gambhir, MD, PhD
Editor: Susan Kopiwoda
Copy Editors: Karen Aguilar, Bonita Crabbe, Elizabeth Gill
Design & Production: Amy (Morris) Thomas
Photography: Mark Riesenberger & Amy Thomas
Archiving: Samantha Scott
Printing: A. Maciel Printing