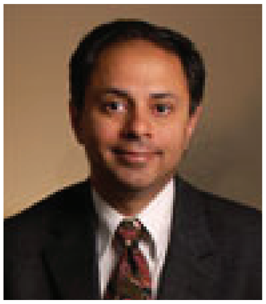
Division of Nuclear Medicine
Department of Radiology

STANFORD
SCHOOL OF MEDICINE

Stanford Hospital & Clinics

Nuclear Medicine Faculty & Staff

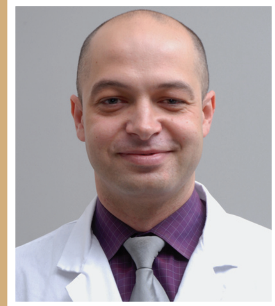
FACULTY



Sanjiv Sam Gambhir, MD, PhD
Professor of Radiology and Bioengineering
Director, Molecular Imaging Program at Stanford (MIPS)
Chief, Division of Nuclear Medicine

Sherief H. Gamie, MD, PhD
Clinical Assistant Professor
Assistant Chief, Nuclear Medicine Clinic
VA Palo Alto

Michael L. Goris, MD, PhD
Professor of Radiology

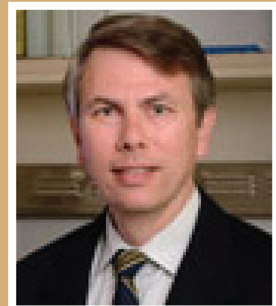


Andrei Iagaru, MD
Instructor of Radiology

Craig S. Levin, PhD
Associate Professor of Radiology

I. Ross McDougall, MD, PhD
Professor of Radiology and Medicine
Residency Program Director

Andrew Quon, MD
Assistant Professor of Radiology
Fellowship Director

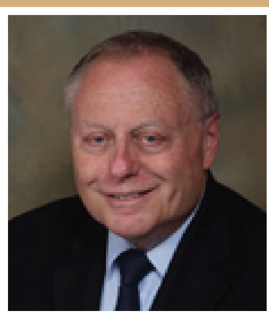


George Segall, MD
Professor of Radiology
Chief, Nuclear Medicine Clinic VA Palo Alto

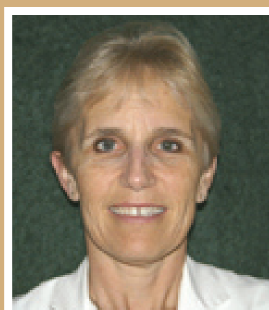
Minal Vasanawala, MD
Instructor of Radiology

Joseph Wu, MD, PhD
Assistant Professor of Radiology and Medicine (Cardiovascular)

ADJUNCT CLINICAL FACULTY



Lawrence Basso, MD
Adjunct Clinical Professor



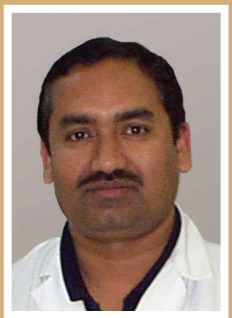
Christine Keeling, MD
Adjunct Clinical Assistant Professor

RESEARCH SCIENTISTS – RADIOCHEMISTRY CYCLOTRON FACILITY

Frederick Chin, PhD
Head, Cyclotron Radiochemistry

David Dick, PhD
Head, Cyclotron Physics

RADIOCHEMISTRY CYCLOTRON STAFF



Naseem Ahmed, PhD
Radiochemistry Research Assistant

Rhona Berganos
Radiochemistry Research Assistant

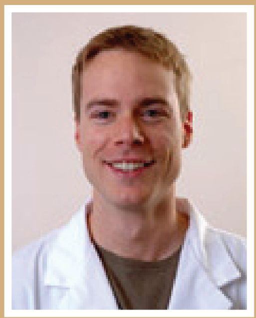
Andrew Lamb
Cyclotron Production Technician

Murugesan Subbarayan, PhD
Radiochemistry Research Associate

NUCLEAR MEDICINE TECHNOLOGISTS

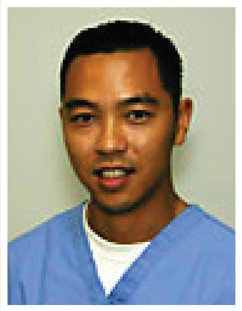
Elizabeth Farmer
NMT

Christine Fujii
NMT



Matthew Gabriele
NMT

Nora Gurevich
NMT



Luan Nguyen
NMT

Jayesh Patel
Technical Manager

Lincoln Sanders
NMT

Patient Care

The Division of Nuclear Medicine in the Department of Radiology is a diversified, active service performing numerous diagnostic and therapeutic procedures. The campus location in the Medical Center allows full usage of the Stanford University resources, including Physics, Electrical Engineering, Radiation Biology and the Linear Accelerator.

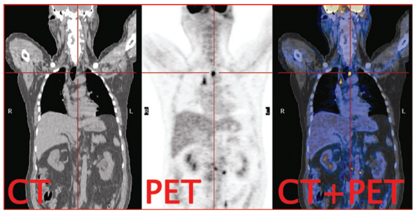
WHAT IS NUCLEAR MEDICINE?

Nuclear medicine involves the use of small amounts of radioactive materials (or tracers) to help diagnose and treat a variety of diseases. Nuclear medicine determines the cause of the medical problem based on the function of the organ, tissue or bone. This is how nuclear medicine differs from an x-ray, ultrasound or any other diagnostic test that determines the presence of disease based on structural appearance.

Millions of nuclear medicine tests are performed each year in the United States alone. Nuclear medicine tests (also known as scans, examinations, or procedures) are safe and painless. In a nuclear medicine test, the radioactive material is introduced into the body by injection, ingestion, or inhalation. Different tracers are used to study different parts of the body. The amount of tracer used is carefully selected to provide the least amount of radiation exposure to the patient but ensures an accurate test. A special camera (scintillation or gamma camera) is used to take pictures of your body. The camera does this by detecting the tracer in the organ, bone or tissue being imaged and then records this information on a computer screen or on film. Generally, nuclear medicine tests are not recommended for pregnant women because unborn babies have a greater sensitivity to radiation than children or adults. If you are pregnant or think that you are pregnant, your doctor may order a different type of diagnostic test.

WHAT IS POSITRON EMISSION TOMOGRAPHY (PET)?

PET is a powerful diagnostic test that is having a major impact on the diagnosis and treatment of disease. Because disease is a biological process and PET is a biological imaging examination, PET can detect and stage most cancers, often before they are evident through other tests. PET can also give physicians important early information about heart disease and many neurological disorders, like Alzheimer's. A PET scan examines the body's chemistry. Most common medical tests, like CT and MR scans, only show details about the structure of your body. PET is different. It also provides information about function. With a single PET procedure, physicians can collect images of function throughout the entire body, uncovering abnormalities that might otherwise go undetected.



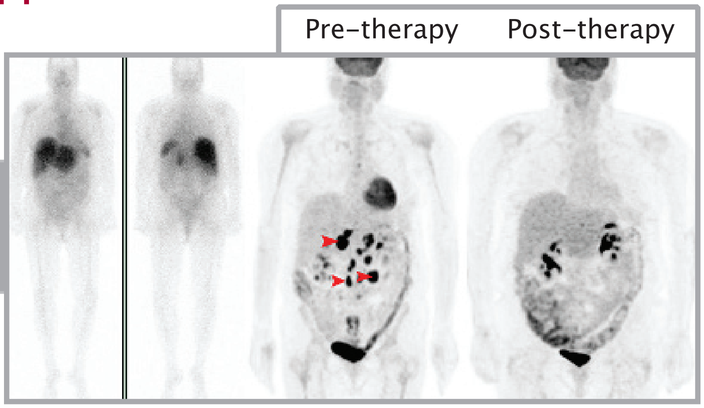
For example, a PET scan is the most accurate, non-invasive way to tell whether a tumor is benign or malignant, sparing patients expensive, often painful diagnostic surgeries and suggesting treatment options earlier in the course of the disease. And although cancer spreads silently in the body, PET can inspect all organs of the body for cancer in a single examination!

PET is able to detect extremely small cancerous tumors and very subtle changes of function in the brain and heart. This allows physicians to treat these diseases earlier and more accurately. The earlier the diagnosis, the better the chance for treatment.
For more information, visit http://www.stanfordhospital.com/clinicsmedServices/medicalServices/petct/

RADIOIMMUNOTHERAPY AND TARGETED THERAPY

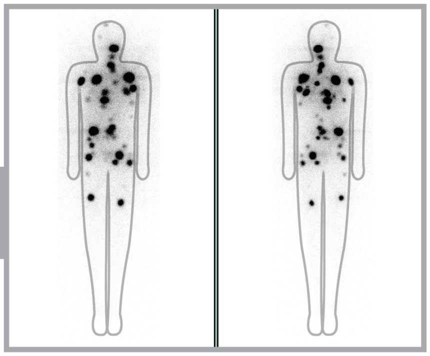
Antibodies are used to seek out and attach to tumors. The antibodies are labeled with radioactive substances that irradiate locally and destroy the tumor.

60-year-old woman with Non-Hodgkin's Lymphoma and complete response after Zevalin treatment. FDG PET shows resolution of the lesions noted prior to therapy.



THYROID CLINIC

Patients with thyroid problems are diagnosed and treated. In many but not all cases the diagnosis and the treatment involve the use of different forms of radio-iodine.

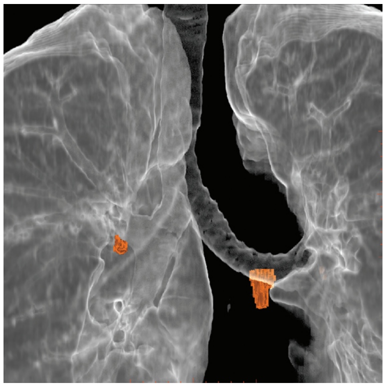


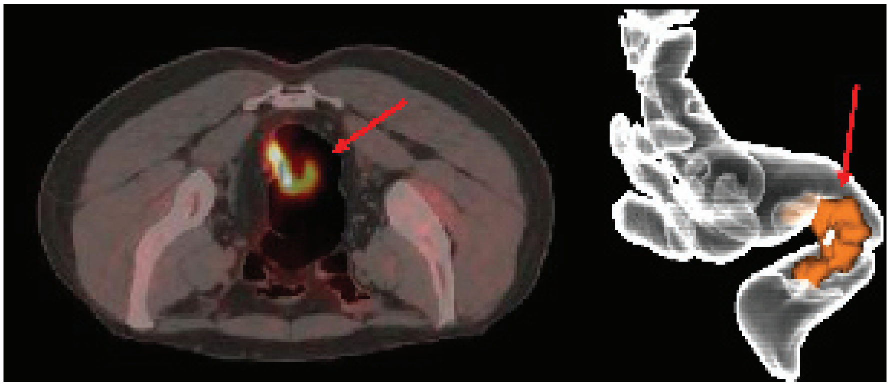
> The patient has thyroid cancer spread (metastatic) to many sites in the body and is being treated with radioiodine-131, which accumulates in the lesions.

IS NUCLEAR MEDICINE SAFE?

Nuclear medicine procedures are among the safest diagnostic imaging exams available. A patient only receives a small amount of a radiopharmaceutical, just enough to provide sufficient diagnostic information.

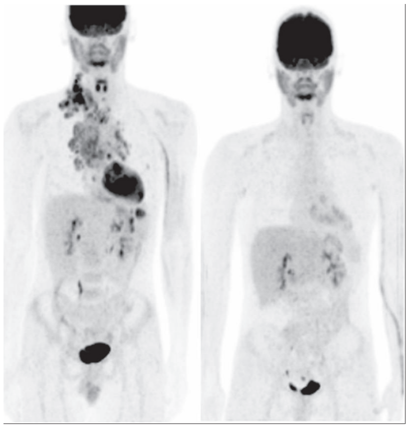
Although we do not think much about it, everyone is continually exposed to radiation from natural and manmade sources. For most people, natural background radiation from space, rocks, soil, and even carbon and potassium atoms in his or her own body, accounts for 85 percent of their annual exposure. Additional exposure is received from consumer products such as household smoke detectors, color television sets, and luminous dial clocks. The remainder is from x-rays and radioactive materials used for medical diagnosis and therapy. With most nuclear medicine procedures, the patient receives about the same amount of radiation as that acquired in a few months of normal living.

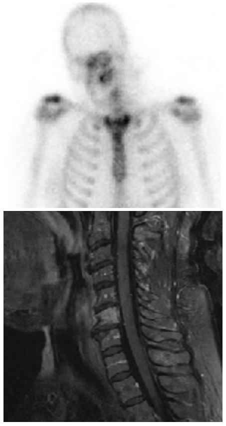


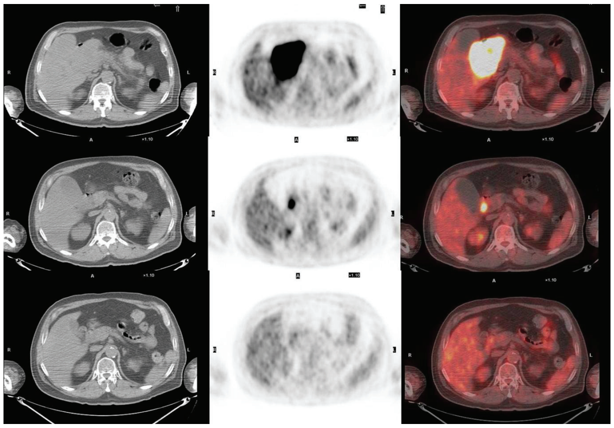


WHAT ARE THE BENEFITS OF NUCLEAR MEDICINE?

Nuclear medicine is a safe, painless, and cost-effective way of gathering information that may otherwise be unavailable or require a more expensive and risky diagnostic test. One unique aspect of a nuclear medicine test is its extreme sensitivity to abnormalities in an organ's function. As an integral part of patient care, nuclear medicine is used in the diagnosis, management, treatment and prevention of serious disease. Nuclear medicine imaging procedures often identify abnormalities very early in the progression of a disease before some medical problems are apparent with other diagnostic tests. This early detection allows a disease to be treated early in its course when there may be a better prognosis. Although nuclear medicine is commonly used for diagnostic purposes, it also has valuable therapeutic applications such as treatment of hyperthyroidism, thyroid cancer, blood imbalances, and bony pain from certain types of cancer.







EDUCATIONAL PROGRAMS

http://nuclearmedicine.stanford.edu/education/

The Division of Nuclear Medicine offers several programs for medical students and residents and fellows all of which feature a mixture of traditional didactics with strong clinical exposure. Our residents and students service three main hospital facilities: The VA Palo Alto, Lucile Packard Children's Hospital, and Stanford University Hospital. There are ample clinical research opportunities at the Medical Center and more basic science oriented projects can be found in the Molecular Imaging Program based at the Clark Center.

NUCLEAR MEDICINE RESIDENCY PROGRAM

Program Director: I. Ross McDougall, MD, PhD

The Division of Nuclear Medicine is training the next generation of world-wide leaders in academic and clinical Nuclear Medicine. We offer a three year residency approved by the American Board of Nuclear Medicine and the Accreditation Council for Graduate Medical Education. The Nuclear Medicine Residency program combines training in basic nuclear instrumentation technology, molecular imaging, and clinical nuclear medicine. We offer a clinical program centered at Stanford University with a Nuclear Medicine satellite that includes the VA Hospital. Training in conventional Nuclear Medicine and PET/CT are provided. A strong basic science program in molecular imaging is also a unique feature of the program.

PET/CT FELLOWSHIP PROGRAM

Program Director: Andrew Quon, MD

The clinical fellowship focuses on all aspects of clinical PET/CT imaging and includes clinical research projects that evaluate emerging molecular imaging technologies related to PET. Clinical duties include helping with the PET/CT service and joint Nuclear Medicine/Radiology read-outs. Features include intensive training in the interpretation of FDG PET/CT, the formulations of imaging protocols, and the daily management of the PET/CT scanner. Training from both Radiology and Nuclear Medicine faculty allow for a unique learning experience not available in most programs. The fellowship lasts one year and is renewable at the end of each academic year.

CLERKSHIPS

Diagnostic Radiology and Nuclear Medicine Clerkship
This clerkship is designed to familiarize medical students with the interpretation of medical images and nuclear medicine studies. The clerkship consists of four weeks of combination seminar and lecture sessions of approximately 3-5 hours per day, with special emphasis on methods used in interpreting chest radiographs, cardiac series, abdominal films, bone films and routine nuclear medicine investigations. Introductory sessions concerning ultrasound, CT and MRI examinations, and mammography are also included. Emphasis of the clerkship is on correlating radiographic or nuclear medicine findings and clinical data in order to arrive at differential diagnoses. Indications for various examinations and radiographic and clinical methods of further exploration of suspected abnormalities are stressed.

Nuclear Medicine Clerkship
This clerkship acquaints students with the basic principles of nuclear medicine, the instrumentation used, the gamut of procedures available, and the judgments used to select specific diagnostic or therapeutic procedures and interpret results. The experience should be especially helpful for students planning a career in diagnostic radiology, nuclear medicine, cardiology, or oncology. The student experience includes instruction in radiologic physics, instrumentation, responsibility for selected isotopic procedures, daily teaching rounds for review of all cases studies, and special conferences.

Clinical Elective in Diagnostic Radiology & Nuclear Medicine
Provides an opportunity for a student in the clinical years to have a clinical experience in Diagnostic Radiology or Nuclear Medicine, quality and duration to be decided upon by the student and a faculty preceptor in the Department.

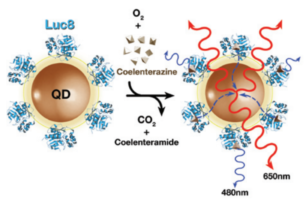
Thyroid Clinic Clerkship
Students work with consultants in examining and managing patients with thyroid disorders.

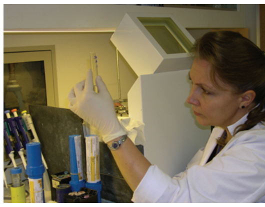
MOLECULAR IMAGING PROGRAM AT STANFORD (MIPS)

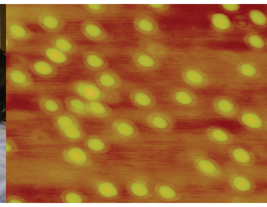
http://mips.stanford.edu/

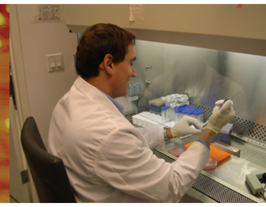
The Molecular Imaging Program at Stanford (MIPS) was established as an inter-disciplinary program to bring together scientists and physicians who share a common interest in developing and using state-of-the-art imaging technology and developing molecular imaging assays for studying intact biological systems. A multimodality approach using imaging technologies such as positron emission tomography (PET), single photon emission computed tomography (SPECT), digital autoradiography, magnetic resonance imaging (MRI), magnetic resonance spectroscopy (MRS), optical bioluminescence, optical fluorescence, and ultrasound are all technologies under active development and investigation. The goals of the program are to fundamentally change how biological research is performed with cells in their intact environment in living subjects and to develop new ways to diagnose diseases and monitor therapies in patients. Areas of active investigation are cancer research, microbiology/immunology, developmental biology and pharmacology.

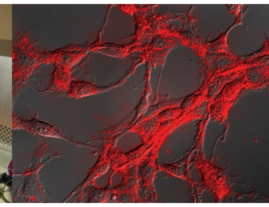
The program consists of over 100 scientists and is directed by Sanjiv Sam Gambhir, MD, PhD.











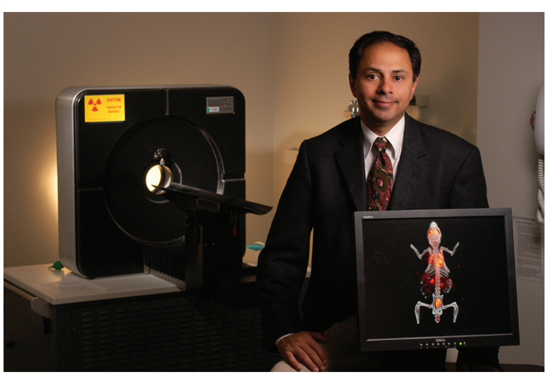
MULTIMODALITY MOLECULAR IMAGING LAB

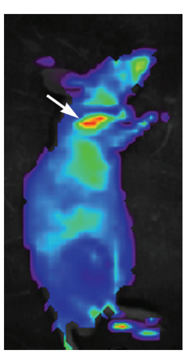
Sanjiv Sam Gambhir, MD, PhD

http://mips.stanford.edu/research/lab?lab%5fid=3

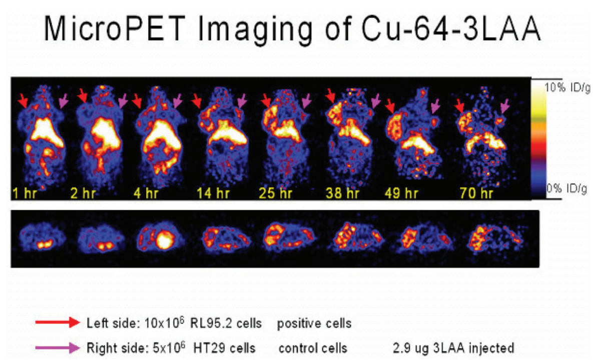
This laboratory is developing imaging assays to monitor fundamental cellular/molecular events in living subjects including patients. Technologies such as micro positron emission tomography (microPET), bioluminescence optical imaging, fluorescence optical imaging, micro computerized axial tomography (microCAT), ultrasound, and photoacoustics are all being actively investigated in small animal models. Our goals are to marry fundamental advances in molecular/cell biology with those in biomedical imaging to advance the field of molecular imaging. We have a particular interest in cancer biology and gene therapy. Research in early cancer detection and pharmacological therapy assessment is also being performed.

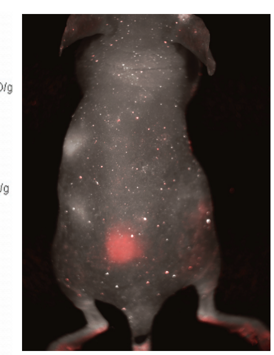
Assays to interrogate cells for mRNA levels, cell surface antigens, intracellular proteins and protein-protein interactions are under active development. We are also extending many of these approaches for human clinical applications using optical and PET-CT technologies.





microPET



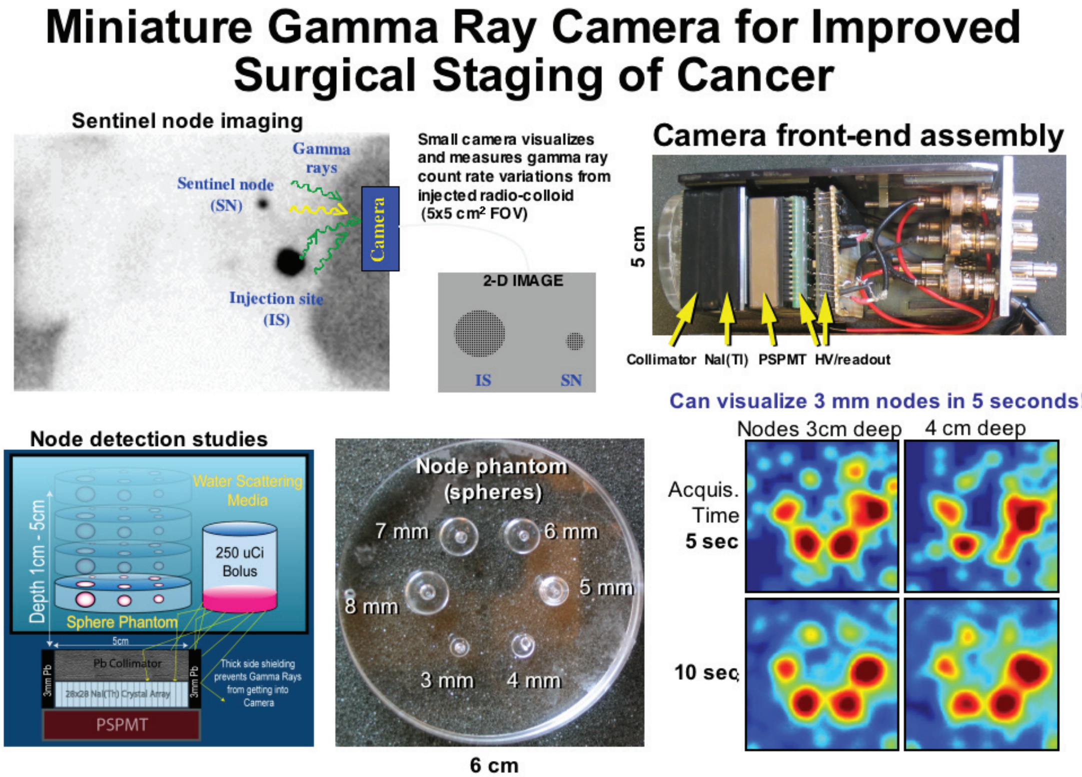


Optical Imaging

MOLECULAR IMAGING INSTRUMENTATION LAB

Craig Levin, PhD
http://mips.stanford.edu/public/faculty-info?personnel%5fid=1937

This laboratory is interested in the development of novel instrumentation and software algorithms for in vivo imaging of molecular signals in humans and small laboratory animals. The goals of the instrumentation projects are to push the sensitivity and spatial, spectral, and/or temporal resolutions as far as physically possible. The algorithm goals are to understand the physical system comprising the subject tissues, radiation transport, and imaging system, and to provide the best available image quality and quantitative accuracy. The work involves computer modeling, position sensitive sensors, readout electronics, data acquisition, image formation, 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.



Equipment

Cyclotron

http://mips.stanford.edu/public/lucas.adp

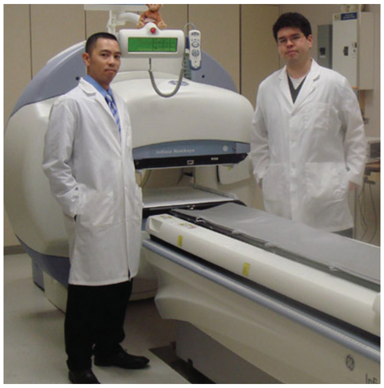
The cyclotron suite is located on the first floor of the Lucas Expansion building. The heart of the cyclotron suite is a GE PETrace cyclotron, which is used for the production of radioisotopes for clinical and research use. Surrounding the cyclotron are an FDG production lab and research hot labs. The hot labs, fully equipped with hot cells and shielded fume hoods, are used for the production of research radiopharmaceuticals as well as to provide space for radiochemistry research to develop new radiopharmaceuticals. These radiopharmaceuticals are used to support both clinical and research PET studies at the Stanford University Medical Center and the Stanford Center for Innovation in In-Vivo Imaging (SCI3).

Philips Skylight

The Skylight dual head spect camera is a gantry free camera which creates an open floor design. This design allows for easier transfer of patients and in some cases, allows for imaging studies to be done in patient beds. At Stanford, we use the skylight as our primary cardiac camera and it is used for in-patient imaging.

Equipment (continued)

GE Infinia Hawkeye SPECT/CT

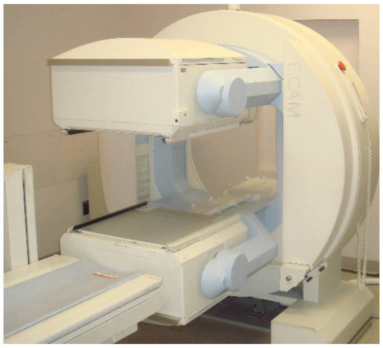


The Infinia dual head spect camera is a combination whole body and spect gamma camera combined with a registered CT scanner. This feature allows for more precise organ and lesion localization. At Stanford, we use the Infinia as our primary oncology imaging camera.

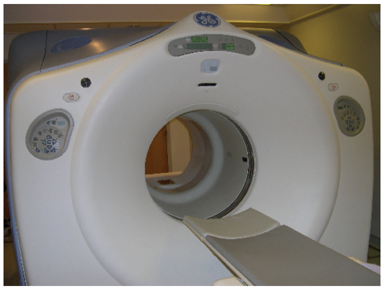
Digirad (Mobile SPECT)

The Digirad mobile camera uses solid state technology to acquire images. It has a smaller field of view which allows more flexibility in imaging smaller organs in the body or imaging of pediatric patients. The portable feature of the camera allows imaging of critically ill patients at bedside. At Stanford, we use the flexibility of the Digirad camera to increase our productivity and offer greater patient comfort to our in-patients and smaller patients.

Siemens ECAM



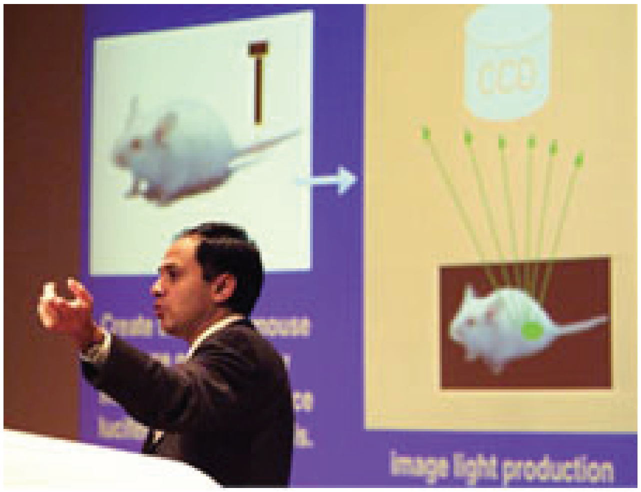
The ECAM dual head spect camera offers high flexibility in both whole body and SPECT imaging. The body palette allows flexibility for patient comfort during imaging. The tilt features of the camera heads allow us to image patients at multiple different angles, including sitting or standing positions. The auto contour feature allows us to image patients to achieve optimum resolution in whole body and spect imaging. At Stanford, the ECAM is one of our most versatile cameras.



GE Discovery LS PET/CT

The GE PET/CT scanner combines two powerful diagnostic tools. Overlaying the PET scan data with the CT scan data allows physicians to quickly and more accurately diagnose, plan treatment and monitor treatment. At Stanford, we use PET/CT scanning for all three of these important functions.

Conferences



Nuclear Medicine Lectures
I. Ross McDougall, MD, PhD
Location: Nuclear Medicine Library, Room H0341
Mondays, 7:30 am - 8:30 am
Once a month (Research Conference)
http://nuclearmedicine.stanford.edu/education/mondaylectures.html

Nuclear Medicine Grand Rounds
Tuesdays, 7:30 am – 8:30 am (except July & August)
Location: Clark Center, Room S360
http://nuclearmedicine.stanford.edu/education/grandrounds.html

Molecular Imaging Journal Club, Case Conference, or Clinical Journal Club
Wednesdays, 7:30 am – 8:30 am
Location: Molecular Imaging Journal Club (Edwards Bldg, Room R358); Case Conference (Nuclear Medicine Library, Room H0341); Clinical Journal Club (Nuclear Medicine Library, Room H0341)
http://nuclearmedicine.stanford.edu/education/wednesdaylectures.html

Nuclear Cardiology Lecture
Last Wednesday of the month, 7:30 am – 8:30 am
Location: LPCH–Boardroom
http://nuclearmedicine.stanford.edu/education/nuc_cardiology.html

Basic Science Lecture
Thursdays, 7:30 am – 8:30 am
Location: Nuclear Medicine Library, Room H0341
http://nuclearmedicine.stanford.edu/education/basicscience.html

Nuclear Medicine Core Lecture
Fridays, 7:30 am – 8:30 am
Location: Nuclear Medicine Library, Room H0341
http://nuclearmedicine.stanford.edu/education/corelectures.html

Recent Awards

2006 – 2007

Andrei Iagaru, MD received the Best Essay Travel Award at the American College of Nuclear Physicians / Society of Nuclear Medicine Mid-Winter Educational Symposium

Dr. Ryan Niederkohr, Chief Nuclear Medicine Resident was awarded the Norman D. Poe Memorial Scholarship Award for Outstanding In-Training Oral Abstract at 31st Western Regional Society of Nuclear Medicine Annual Meeting.

Dr. Ross McDougall was awarded the Distinguised Scientist Award from the Western Regional Society of Nuclear Medicine.

Dr. George Segall was awarded the Distinguished Service Award from the Western Regional Society of Nuclear Medicine.

Dr. Sam Gambhir received Aebersold Award (Society of Nuclear Medicine) for contributing extensively to molecular imaging and the basic science of using radioactive tracers. The Aebersold Award is named for Paul C. Aebersold, a pioneer in the biologic and medical application of radioactive materials and the first director of the Atomic Energy Commission's Division of Isotope Development at Oak Ridge, Tennessee.

Dr. Sam Gambhir was awarded the Hounsfield Medal from Imperial College, London for his scientific achievements in biomedical imaging. The medal is awarded in memory of Sir Godfrey Hounsfield who shared the 1979 Nobel Prize for Physiology or Medicine for his invention of the CT scanner.

Right: Andrei Iagaru, MD

Ryan Niederkohr, MD

Right: Sam Gambhir, MD, PhD

Recent Clinical Publications

Bredella MA, Steinbach L, Caputo G, Segall G, Hawkins R. Value of FDG PET in the assessment of patients with multiple myeloma. AJR Am J Roentgenol. 2005;184(4):1199-204.

Friedland S, Soetikno R, Carlisle M, Taur A, Kaltenbach T, Segall G. 18-Fluorodeoxyglucose positron emission tomography has limited sensitivity for colonic adenoma and early stage colon cancer. Gastrointest Endosc. 2005;61(3):395-400.

Horning SJ, Younes A, Kroll S, Jain V, Lucas J, Podoloff D, Goris ML. Efficacy and safety of tositumomab and Iodine-131 Tositumomab (Bexxar) in B-cell lymphoma progressive after rituximab. J Clin Oncol. 2005;23(4):712-9. J Clin Oncol. 2005;23(4):712-9.

Wu JC, Yla-Herttuala S. Human gene therapy and imaging: cardiology. Eur J Nucl Med Mol Imaging. 2005;32:S346-57.

Levin CS. Primer on molecular imaging technology. Eur J Nucl Med Mol Imaging. 2005; 32(14) S325-345.

Liu IJ, Lai YH, Espiritu JI, Segall GM, Srinivas S, Nino-Murcia M, Terris MK. Evaluation of fluorodeoxyglucose positron emission tomography imaging in metastatic transitional cell carcinoma with and without prior chemotherapy. Urol Int. 2006;77(1):69-75.

Zhu HJ, Goris ML. Display of myocardial motion by projecting specific components of the 3D motion of myocardial elements on the plane of origin. Nuclear Instruments and Methods in Physics and Research. A 569 2006;386-388.

Chang GY, Xie X, Wu JC. Overview of stem cells and imaging modalities for cardiovascular diseases. J Nucl Cardiol. 2006;13(4):554-569.

Weigel RJ, McDougall IR. The role of radioactive iodine in the treatment of well-differentiated thyroid cancer. Surgical Clinics North America 2006;15:625-638.

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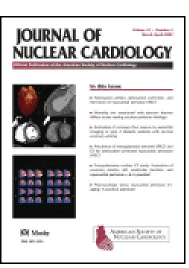

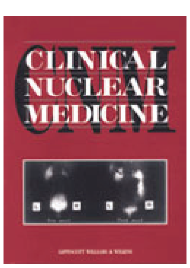

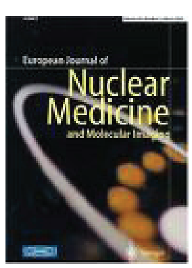

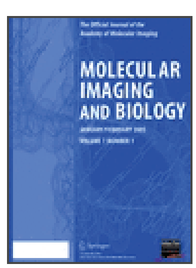

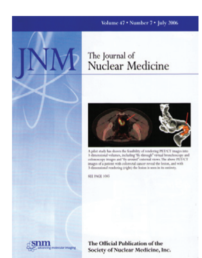

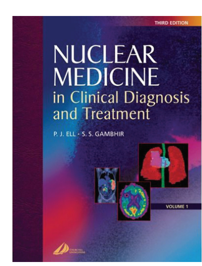

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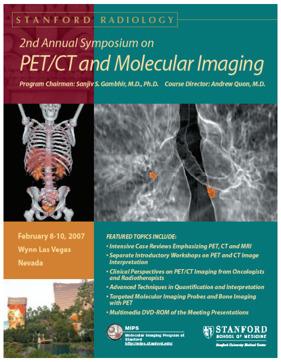

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