

2016

DEPARTMENT OF RADIOLOGY AND BIOMEDICAL IMAGING

# IMAGES

UCSF

University of California  
San Francisco

### **About the Cover:**

The cover image shows a three-dimensional render of a preclinical Dual Energy CT scan. The rabbit model was imaged *in vivo* with both oral (green) and vascular (red) contrast materials. These have been digitally separated, along with water (blue) and bone (white) to provide a four-color depiction of anatomy.

This study forms part of the Contrast and CT Research Laboratory's ongoing research on novel contrast agents and associated image processing techniques. The study was funded by grants from the UCSF Department of Radiology and Biomedical Imaging, the UCSF Clinical & Translational Science Institute, the Radiological Society of North America, and the National Institutes of Health.

*The image is courtesy of Jack Lambert, PhD, an associate specialist; Yuxin Sun, MS, a staff research associate; and Benjamin Yeh, MD, director of the Contrast and CT Research Laboratory in the Department of Radiology and Biomedical Imaging.*

# Table of Contents

## letter from the chairman

- 2 Pride in Our Accomplishments

## clinical and research news

- 4 Unlocking the Full Potential of Dual-Energy CT
- 8 UCSF Pulsatile Tinnitus Clinic
- 10 Importance of Multimodal Tau PET and Amyloid PET in Alzheimer's Disease Diagnosis

## new facilities and technology

- 14 Capital Projects Overview 2016: Lots of Planning
- 16 Zuckerberg San Francisco General Hospital and Trauma Center Opens its Doors

## department update

- 18 Dr. Ronald L. Arenson—Highlights from 25 Years of Extraordinary Leadership
- 20 Interventional Radiology: The Emergence of a New Specialty and Training Program
- 21 New Faculty
- 23 Education Leadership Advances
- 24 Operations Directorship Changes
- 25 Mary Bobel Joins Department as Chief Administrative Officer
- 26 Susan O'Hara, MPA, Receives Chancellor's Award for Exceptional University Management
- 27 Honors and Awards
- 32 Excellence and Advancements Highlight Diagnostic Radiology Residency
- 34 PGY-2 Residents: Class of 2020
- 39 Diagnostic Radiology Residents: 2016–2017
- 40 Radiology Residency Graduates: Class of 2016
- 41 Clinical Fellows and Instructors: 2016–2017
- 42 Master of Science in Biomedical Imaging Now 5 Years Old
- 43 Goldberg Center
- 44 Radiology CME
- 45 2017 UCSF Radiology Continuing Medical Education Calendar
- 46 Margulis Society Celebrates on March 4
- 48 The Honor Roll of Donors
- 50 Alumni News 2016
- 52 Surbeck Young Investigators
- 53 Medical Staff Earn Awards
- 54 Radiology and Biomedical Imaging Staff Earn Awards
- 55 The Year in Pictures

## radiology and biomedical imaging research

- 58 Research Directions
- 74 Grants and Fellowships

### Dear Friends and Colleagues,

It is with truly mixed feelings that I write to you. After 25 glorious years, I have decided to retire as chair of Radiology and Biomedical Imaging at UCSF, effective June 30, 2017. I am so very proud of the collective accomplishments in research, patient care, and education that our department has made over these decades. I am especially proud of the many talented faculty we have recruited since I arrived, and of our incredible trainees, technologists, and staff. Dean Talmadge King has launched a formal search, with a committee headed by Michael Gropper, MD, chair of Anesthesia. I am very confident the transition will be smooth and I anticipate that our great department will continue to advance and prosper under the new leadership.

This has been a spectacular year with many highlights! Kudos to Mark Wilson, MD, and his team! The new Zuckerberg San Francisco General Hospital and Trauma Center (ZSFG) building has officially opened its doors. We are most proud of the three floors incorporating Radiology (the basement, ground level, and 1st floor). The new design facilitates excellence in patient care; please read more in this issue.

Our faculty continues to receive local, national and international attention. In May, Sharmila Majumdar, PhD, received the International Society for Magnetic Resonance in Medicine 2016 Gold Medal for her innovative contributions to the development of quantitative imaging methods. In this issue you also will read about the extensive work of Jeanne Laberge, MD in establishing an integrated Interventional Radiology residency at UCSF.

On the research front, Pratik Mukherjee, MD, PhD, and his team's groundbreaking work on Sensory Processing Disorder (SPD), published in January in *Frontiers in Neuroanatomy*, was the biggest imaging study ever done in children with the condition. His research is prompting a broader acknowledgement of SPD as a separate disorder from autism. I would also like to acknowledge Mike Weiner, MD, for having just won a major funding award for the third phase of the Alzheimer's Disease Neuroimaging Initiative. The landmark study—focused on developing and refining biomarker tools needed to mark the progress of Alzheimer's disease—is having a profound impact on our understanding of the causes of Alzheimer's.

Soonmee Cha, MD, and Dave Naeger, MD, have recently been appointed vice chair and associate chair of Education. Their expertise and devotion to quality in education has been responsible for numerous accolades as we set the educational standard high for other departments across the nation. I am very proud of all of our education programs including our Continuing Medical Education, one of the largest in the country. I know that our future plans are in excellent hands.

On the operations front, this year we were pleased to welcome a new administrative officer, Mary Bobel, MBA, who comes to us with a strong background in institutional academic settings, and David Sostarich, MBA, BSRT, our new operations director. Both of them have hit the ground running and are key players on our leadership team.



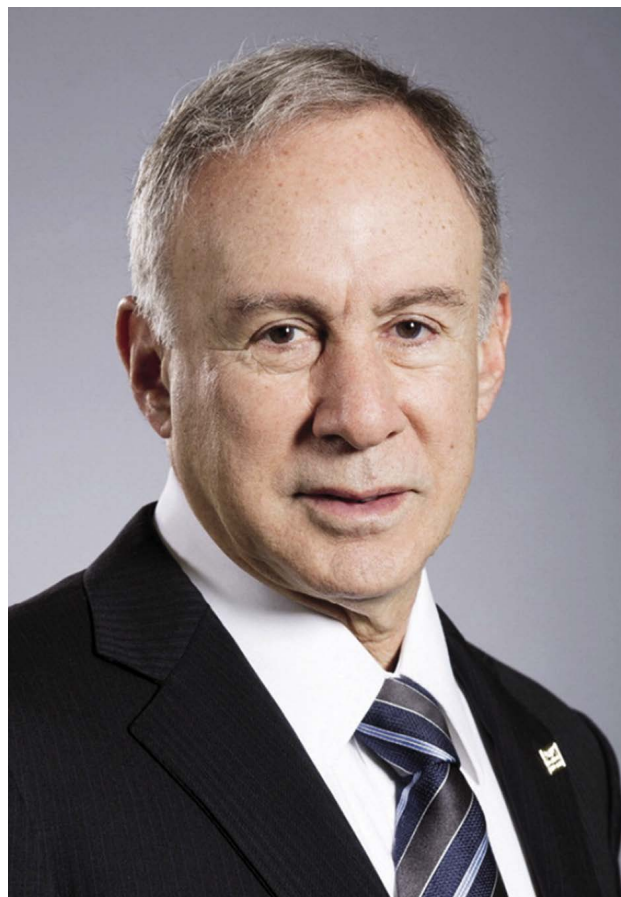
Please don't forget to join us at an exciting upcoming event:  
The Margulis Society Gala will be held on Saturday, March 4, 2017 at the Olympic Club Lakeside in San Francisco. We hope to see you at the gathering!

Thank you for making the last 25 years such a wonderful and satisfying career for me. With your inspiration and hard work, we have built the best academic Radiology department in the country and I am deeply appreciative for the opportunity to have led this endeavor.

Sincerely,

A handwritten signature in black ink that reads "Ronald L. Arenson, MD". The signature is fluid and cursive, with the initials "MD" clearly visible at the end.

Ronald L. Arenson, MD



## Unlocking the Full Potential of Dual-Energy CT

Jack Lambert, PhD, Yuxin Sun, MS, Sizhe Wang, BS, Rahi Kumar, MD, Zhixi Li, MD, Rutwik Shah, MD, Matthew Bucknor, MD, Michael Ohliger, MD, PhD, Zhen Jane Wang, MD, John Mongan, MD, PhD, Robert Gould, ScD, Benjamin Yeh, MD

### Background

If an alien intelligence were to beam down to Earth and look at most of our medical computed tomography (CT) scan images from today and compare them to those obtained in 1997, the creature would probably say that our images have not changed much (Figure 1). We might object to its opinion and highlight important advances in CT. For example the speed of image acquisition has improved drastically such that the entire human body can be imaged in 10 seconds or less, compared to five minutes. Similarly, CT scan slices are thinner, allowing for slightly sharper multiplanar image reformation. The radiation dose is lower now than in the 1990s, due to innovative iterative reconstruction techniques and patient-tailored protocols.

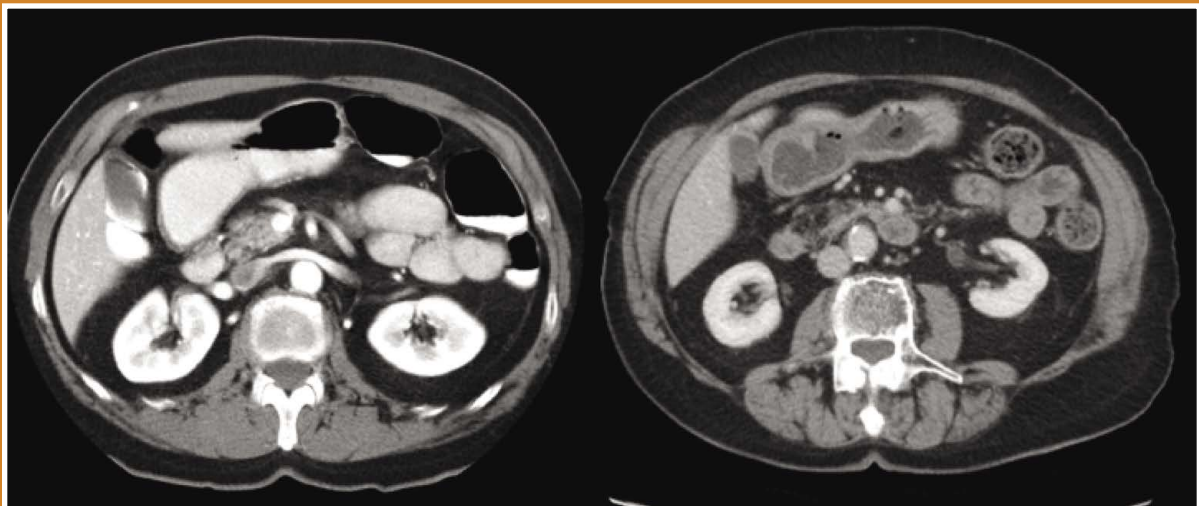
While these technical developments have no doubt streamlined CT acquisition, the alien would be correct in saying that the images look fundamentally the same: CT scans remain black-and-white images of human anatomy. While they may be faster to obtain, their diagnostic value is little changed. Why is this? First, though CT design has gone through some permutations, the underlying operating principle has not changed since its introduction in the 1970s. Conventional CT scanners use a single X-ray

spectrum to image patients, and the X-ray detectors merely record the general amount of X-rays that penetrate the body and ignore the energy of those X-rays. This arrangement limits the images to a grayscale of brightness from black to white, based on the attenuation of X-rays in the volume of interest.

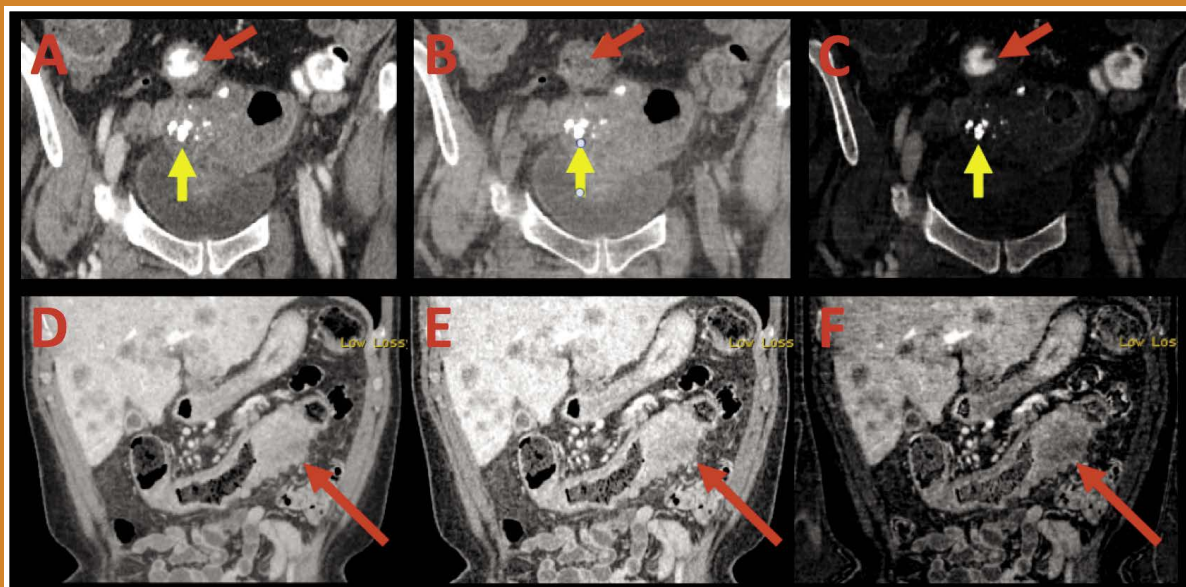
Second, no substantially new contrast agents—the dyes used in the majority of CT scans to highlight anatomy of interest—have been introduced in the last 30 years. Contrast enhancement remains limited to the same grayscale of increasing brightness with increasing contrast density.

### Dual-Energy CT

The potential for Dual-Energy CT (DECT) imaging was recognized at the inception of CT in the 1970s, but scan speeds were too slow for clinical implementation. Scanners capable of obtaining dual energy datasets at the same speed as regular CT were first introduced nearly a decade ago and are slowly transforming CT scanning, thanks to their capacity to generate material-specific images beyond traditional grayscale ranges. This is achieved by the use of two separate X-ray tube voltages that generate two separate sets of projection data.



**Figure 1** Contrast-enhanced CT images of the same patient acquired in 1997 (left) and 2013 (right) look superficially similar, apart from the positive oral contrast present in the 1997 image. Both are axial plane, grayscale depictions of the adult abdomen, generated at an in-plane resolution of  $512 \times 512$  pixels.



**Figure 2** Coronal CT images showing the benefits of material discrimination at Dual-Energy CT. A) Regular CT: rectal contrast (red arrow) is difficult to differentiate from unknown extraluminal densities (yellow arrow). B) DECT water map: Rectal contrast has been digitally suppressed, while the unknown density remains visible, indicating that it is not the rectal contrast: it is a calcified fibroid. C) DECT iodine map. D) Regular CT: Tumor necrosis (red arrow) is not easily identified. E) DECT water map F) DECT iodine map: the tumor necrosis is more easily seen, as are hypovascular liver metastases.

Different materials have characteristic relative brightness levels in the two projections because materials attenuate X-ray photons of different energies in characteristic ways, depending on their atomic number and physical density. By comparing the two sets of projection data, individual elements and compounds can be revealed and color-coded to highlight their presence visually. Initial applications include more accurate renal stone composition determination, liver-iron quantification, and coronary artery calcium scoring.

Although these predefined tasks are useful, the workhorse application of DECT is the qualitative confirmation or ruling out of contrast enhancement, enabling more confident diagnosis of many pathologies (Figure 2). In addition, the ability to suppress the iodine contrast signal allows for “virtual non-contrast” imaging. These virtual non-contrast images can replace true non-contrast scans, offering substantial radiation dose savings for examinations where multiple phases are traditionally required.

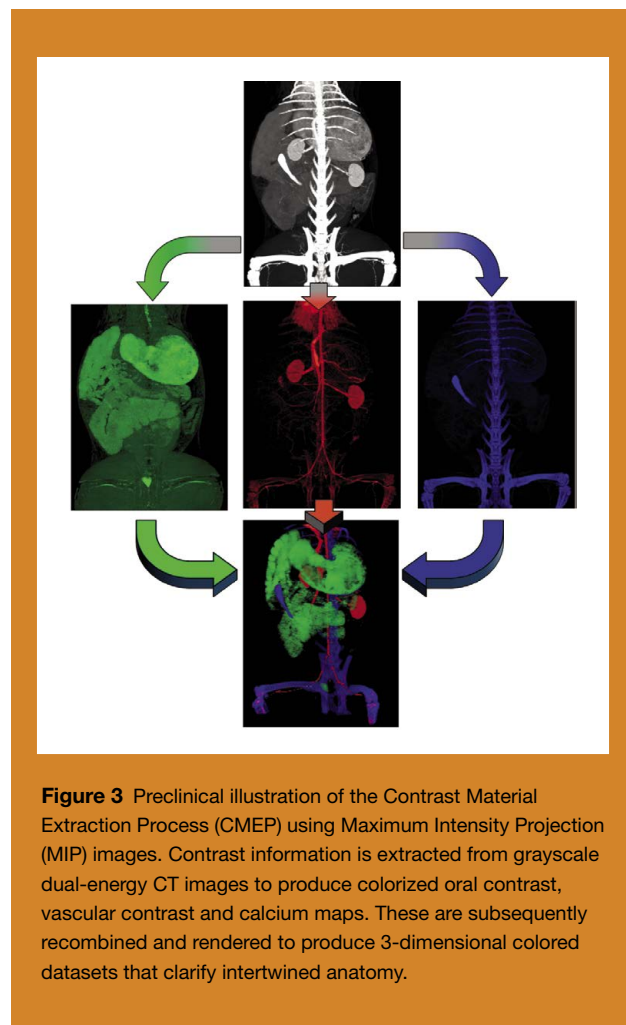
Despite these benefits, DECT has not yet been widely embraced by the radiological community. There are several reasons for its slow adoption, including the higher price of the DECT scanners, reduced image quality of gray-scale images, slower workflow, perceived radiation dose penalties, and in some cases, a lack of compatibility with techniques such as tube current modulation and iterative

reconstruction. Despite these current hurdles, DECT is used at all five UCSF campuses for standard-of-care abdominal scanning when available. Musculoskeletal and Cardiac sections also are developing dual-energy workflows.

### New Contrast Agents for New Colors

Although DECT scanners are now available at numerous clinical sites across the country, contrast-enhanced DECT scans remain limited because there is only one “color” of contrast material currently on the market. All clinical CT contrast agents are based on iodine and barium, which have atomic numbers of 53 and 56, and therefore have very similar attenuation across the range of medically useful diagnostic X-ray energies. In other words, even with DECT, CT scans can only see that contrast material is present; they cannot differentiate between different contrast agents that have been simultaneously delivered.

This leads to ambiguity and image interpretation errors. For example, in patients given both oral (enteric) and intravenous contrast material at DECT, the source of contrast opacification cannot be distinguished except by context. Leakage of contrast material is ambiguous as to being from a bowel injury, vascular injury (bleeding), or both. Having the ability to distinguish between the different types of contrast would clearly be of benefit.



To help realize the full potential of the technology, the Contrast and CT Research Laboratory within the Department of Radiology and Biomedical Imaging is developing new classes of DECT-specific contrast agents and software to improve their image conspicuity. At the Contrast and CT Research Laboratory and through industry collaborations with GE Global Research and Nextest, Inc., we are testing new contrast materials based on reporter elements that are much different from iodine and barium, and which can be easily seen as a “different color” at DECT. These agents include tantalum, tungsten, and bismuth-based agents.

As well as providing additional color to CT images, such agents have many potential benefits over existing iodine- and barium-based agents, including reduced radiation dose through brighter contrast enhancement, improved image quality in large and obese patients through sustained contrast at higher X-ray energies, and compatibility for patients with iodine allergies. By utilizing a wide range of different non-iodinated reporter elements, these new agents can be

distinguished not just from biological tissues, but also from one another.

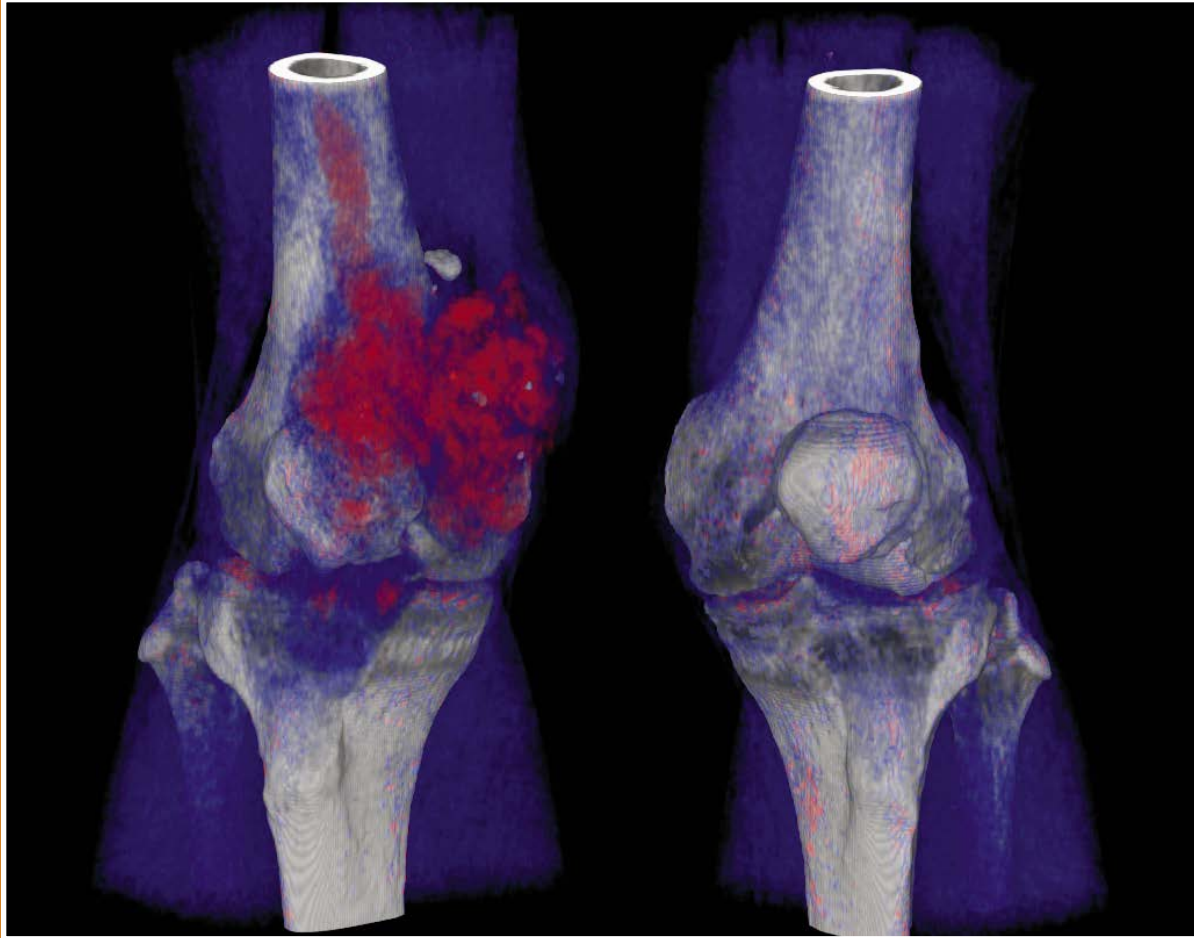
This type of “multi contrast, dual-energy CT,” pioneered at UCSF over the last five years, enables different biological compartments to be distinguished from one another. In addition to our own efforts in the Contrast and CT Research Laboratory, other groups are investigating agents based on gold, hafnium, and ytterbium, among others. All such agents would offer brighter contrast at lower contrast doses due to their high atomic numbers. Currently all DECT contrast agents remain in preclinical testing and none are available for clinical trials. Nevertheless, the high potential for improved diagnostic accuracy, reduced radiation dose, and faster patient throughput has spurred research now that DECT scanners are available.

In addition to testing DECT contrast materials, we are working on new image processing techniques, including an algorithm termed Contrast Material Extraction Process (CMEP) to improve contrast material separation from DECT source images (Figure 3). A driver for the development of this tool is the current limitation of commercial software to two materials, rendering it incompatible with double-contrast studies where three separate material maps are required. Current commercial software separates materials via splitting the pixels’ grayscale values into different predefined materials that must equal the original pixel value. CMEP extracts a contrast material based directly on its attenuation difference between low and high X-ray energies. As contrast information is selectively extracted rather than allocated among two or three predefined materials, the CMEP approach is inherently conservative and can be scaled for any number of contrast materials.

### Future Outlook

A natural progression after DECT is to consider multi-energy CT which can allow evaluation of images from more than two different X-ray energy spectra. Several CT manufacturers are developing photon-counting CT whereby the detector elements can distinguish between photons with different ranges of energy. Photon-counting CT has many theoretical benefits over DECT, including improved material discrimination, reduced radiation dose, reduced beam-hardening artifacts, and higher spatial resolution. Low energy X-ray photons which have been scattered within the patient, and therefore contribute only to image noise, can be discarded to improve image quality. In addition, energy bins can be tailored to match attenuation properties of administered contrast materials, and radiation dose can be tailored more closely to patient size with the return to a single-energy X-ray source spectrum. Photon-counting CT would also benefit greatly from novel non-iodinated contrast agents, and vice versa, to provide a powerful platform for anatomic diagnoses of patients. Currently, no FDA approved photon-counting CT





**Figure 4** Initial clinical images of dual-energy CT for gout imaging at UCSF, showing bone: white, muscle: blue, and crystallized uric acid (gout): red.

scanners are available, but it seems a matter of time before the first machines become available.

### Conclusion

What if the alien were to return 15 years from now? Would it be impressed with our progress? Hopefully “color CT” will become ubiquitous in the reading room, allowing radiologists to routinely diagnose previously poorly identified pathology using material-specific imaging for individual bodily compartments. We believe that new non-iodinated contrast agents, including some in development at UCSF, will have helped achieve a transformation in CT imaging from grayscale guesswork to color vision certainty. Although the barriers to entry are high, the benefits of coupling such an agent with the powerful new CT technology are becoming increasingly hard to overlook. The future for CT imaging looks not just bright, but full of color.

*Jack Lambert, PhD, is an associate specialist; Yuxin Sun, MS, and Sizhe Wang, BS, are staff research associates; Rahi Kumar, MD, is a clinical fellow in Abdominal Imaging, and Zhixi Li, MD, is a PGY5 chief resident in the Department of Radiology and Biomedical Imaging. Rutwik Shah, MD, is a staff research associate; Matthew Bucknor, MD, is an assistant professor in the Musculoskeletal Section; Michael Ohliger, MD, PhD, is an assistant professor in Abdominal Imaging, Zhen Jane Wang, MD, is an associate professor in Abdominal Imaging and John Mongan, MD, PhD is an assistant professor in Abdominal Imaging and Vice Chair, Informatics. Robert Gould, ScD, is a professor and Vice Chair of Radiology for Technology and Capital Projects. Benjamin Yeh, MD, is a professor in Abdominal Imaging and director of the Contrast and CT Research lab in the Department of Radiology and Biomedical Imaging at UCSF.*

## UCSF Pulsatile Tinnitus Clinic

Matthew Amans, MD

### Background

The sensation of an internal rhythmic swooshing or whooshing sound, like a heartbeat on a fetal ultrasound, is at best a little unsettling to patients. For nearly five million Americans however, this near constant whooshing sound, better known as pulsatile tinnitus (PT), exceeds a mere annoyance and becomes completely debilitating.

The origins of PT can differ, including tumors, vascular malformations, vascular anomalies, and abnormal cerebral pressures. It can even be caused by unique blood flow patterns in the veins adjacent to the temporal bone. While some of these etiologies are clinically benign, others carry a significant risk of intracranial hemorrhage and even death. Determining, and then obtaining treatment for the correct diagnosis, can be a long and frustrating process for patients. In fact, the correct diagnosis is reached in only 45% of cases worldwide.

Our team at the University of California, San Francisco has changed this paradigm with dramatic results. Established by neurointerventional radiologist (NIR) Matthew Amans, MD, and neurologist Karl Meisel, MD, the UCSF Pulsatile Tinnitus Clinic is the first multidisciplinary clinic

devoted to the diagnosis, treatment, and study of PT. The UCSF Pulsatile Tinnitus Clinic (PTC) brings together specialists from Radiology, Neurology, Psychiatry, and Head and Neck Surgery for the patient's benefit. Through advances in imaging, physical examination, and collaboration the PTC has achieved a rate of diagnosis of 90%. This team provides care and has given hope to many who have previously thought their diagnosis—let alone treatment—was unobtainable. The clinic welcomes patients from around the world to UCSF for their diagnosis and treatment.

### Imaging and Patient Evaluation

Imaging of pulsatile tinnitus can be as complex as the myriad diseases that can cause the symptom. To provide the most thorough initial imaging screening, our group customized the MRI evaluation for pulsatile tinnitus. This imaging test has become a very powerful diagnostic tool, often providing the key to understanding the source of a patient's symptoms. This thorough imaging evaluation inspects the brain parenchyma, temporal bone, cranial nerves, cerebral veins, as well as the arteries for potential etiologies. The team discusses each case prior to seeing the patient and



**Figure 1** Examination of the central core of blood flow in four different patients' jugular veins. This image contains lateral views of four patients' sigmoid sinus transitioning into the jugular vein. The ghosted grey is the anatomic imaging obtained from the contrast-enhanced MRA timed to the venous phase. The central colored vortex is the central core of blood flow that is measured by the 4D MR Flow study. As the jugular bulb height rises, moving from left to right in the figure, the central vortex core becomes more tightly wound. The "tightness" of the vortex is calculated from both the rotational and longitudinal components of flow, and is presented above each of the jugular veins. Image is courtesy of Sarah Kefayati, PhD, postdoctoral scholar in the Vascular Imaging Research Center.

reviews all imaging studies with world-renowned head and neck imaging expert Christine Glastonbury, MBBS.

Subsequently, each patient is seen and evaluated by each of the clinical specialists in the PTC. After thorough history and physical examinations, the specialists reconvene and discuss the working diagnosis and the next step in diagnosis or management. The specialist who will carry out the group's recommended plan meets with the patient to review the differential diagnosis, the working diagnosis, and the group's suggested plan.

### Angiogram as Needed

Based on the history, physical examination, and imaging findings, a select number of patients are recommended to continue their evaluation in the neuro-interventional angiogram suite. The procedure that our group developed begins with a thorough diagnostic cerebral angiogram to evaluate both potential arterial and venous etiologies of pulsatile tinnitus. After the angiogram, a cerebral venogram is performed, along with venous manometry, to measure otherwise occult stenoses, or diffusely elevated cerebral venous sinus pressures that can be a sign of intracranial hypertension. Once the venogram is completed, temporary balloon test occlusion of the cerebral venous and arterial system is performed while the patient is awake and able to appreciate his or her symptoms, with the objective of further delineating which vessel may be causing the patient's symptoms.

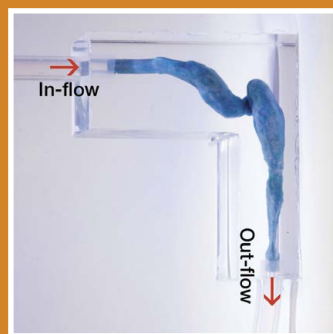
### Assessment of Risks and Benefits

In patients who have a vascular etiology for their symptoms, including elevated intracranial pressures, we weigh the risks and benefits of the treatment against the underlying disease in a dedicated consultation with the patient. If the patient elects intervention, we perform embolization, stenting, or in some cases recommend medical therapies to treat the patient's underlying diseases.

### Research

Advances in imaging blood flow in the cerebral vasculature have helped us to define a potential cause of pulsatile tinnitus in patients with otherwise "normal" vascular anatomy. This includes 4D MR Flow, which measures the velocity field of blood flow across the cardiac cycle. We were fortunate to work in collaboration with the Vascular Imaging Research Center under the direction of David Saloner, PhD. His team has been pioneering the use of 4D flow in the brain for nearly a decade. This technique has been applied successfully to the arterial system to visualize blood flow in both normal and pathologic arteries. We applied this technique to the cerebral venous sinuses. Results suggest vortices of flow in the veins may be the sound generator in as many as 35% of patients (see Figure 1).

Our collaboration revealed that in patients with normal venous sinus vascular caliber, i.e. without a stenosis or



**Figure 2** 3D-printed exact replica of a patient's venous anatomy. This is the wax replica (blue) prior to melting out from the silastic surround. The model is attached to a pulsatile pump set to each patient's specific physiologic flow levels, as measured on MRI, to replicate the blood flow conditions in each patient's sigmoid sinus and jugular vein. These models are facilitating experimentation to develop novel treatments for pulsatile tinnitus. Image is courtesy of David Saloner, PhD, director of the Vascular Imaging Research Center.

diverticulum, a vortex component of flow is generated by the confluence of the sigmoid sinus and the jugular bulb. The "tightness" of the vortex is related to the height and volume of the jugular bulb as well as the velocity of blood flow. In the arterial system, similar vortices have been demonstrated to cause bruit. We hypothesize that these vortices may be responsible for some venous etiologies of pulsatile tinnitus.

Dr. Saloner and his team also has developed flow-models of patient's sigmoid sinus into the jugular vein using 3D printing technology (see Figure 2). These wax silastic models are then attached to a pulsatile flow pump to simulate flow in the dural venous sinus. Now that we have a model of this type of flow, we have a bench-top tool to test various implantable devices to disrupt the flow patterns that we think may cause pulsatile tinnitus. We hope that we can develop a novel tool to treat what has previously been thought to be idiopathic pulsatile tinnitus.

### Summary

UCSF's multidisciplinary Pulsatile Tinnitus Clinic evaluates and treats patients with pulsatile tinnitus using advanced and innovative tools and modalities. Patients can be referred to the clinic by contacting UCSF Neurointerventional Radiology at 415-353-1863 or [matthew.amans@ucsf.edu](mailto:matthew.amans@ucsf.edu). For more information, please visit our website: [pulsatiletinnitus.ucsf.edu](http://pulsatiletinnitus.ucsf.edu).

*Matthew Amans, MD, MSc is the co-director of the UCSF Pulsatile Tinnitus Clinic and an assistant professor of Clinical Radiology, NeuroInterventional Radiology, and Diagnostic Neuroradiology at UCSF.*

## Importance of Multimodal Tau PET and Amyloid PET in Alzheimer's Disease Diagnosis and to Monitor the Effects of Treatment

Duygu Tosun, PhD and Michael W. Weiner, MD

During the past decade, molecular imaging of  $\beta$ -amyloid ( $A\beta$ ) and tau proteins in the human brain, along with advanced magnetic resonance imaging (MRI), have revolutionized the diagnosis of Alzheimer's disease (AD). Furthermore, these advances have greatly facilitated and accelerated clinical treatment trials leading to greater optimism that effective therapy to slow cognitive decline and prevent dementia will be achieved in the foreseeable future.

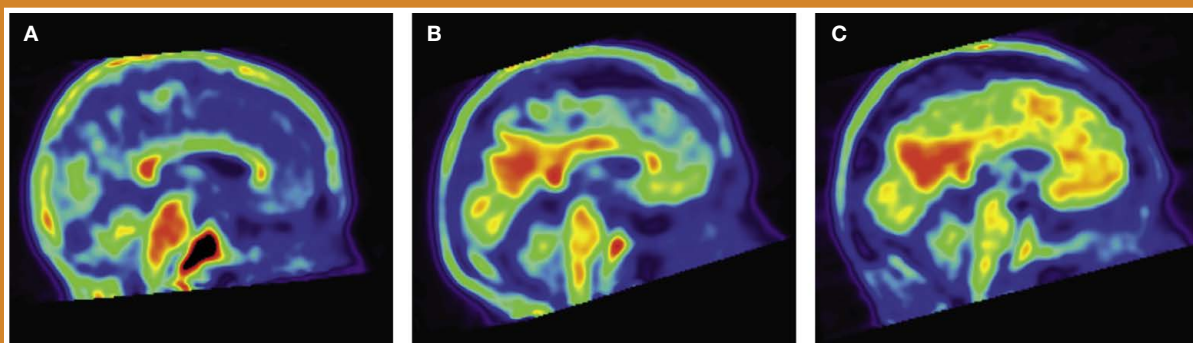
Today, more than 5.4 million Americans are living with Alzheimer's disease, including an estimated 200,000 under the age of 65. The number of Americans with AD is projected to increase up to 16 million in 2050. Of these, 3.7 million will be in the mild stage, 4.5 million in the moderate stage, and 7.8 million in the severe stage. In 2016, the direct costs to American society of caring for those with AD will total an estimated \$236 billion, with just under half of the costs borne by Medicare. In 2016, 18% of the Medicare budget will be spent on people living with AD and other dementias. Based on the current trajectory, costs are projected to increase to over \$1.1 trillion in 2050, with Medicare and Medicaid costs increasing 365%. Cumulative costs to all payers for AD and other dementias from 2016 to 2050 will be \$20.8 trillion. The Alzheimer's Association estimates that an effective treatment would save more than \$367 billion. A treatment that delays the onset of AD by merely five years would save an estimated \$935 billion in just the first

10 years. Therefore, there is a pressing need to develop treatments and prevention strategies that slow cognitive decline and prevent dementia due to AD.

### AD Clinical Trials, Past Failures, Current and Future Trials

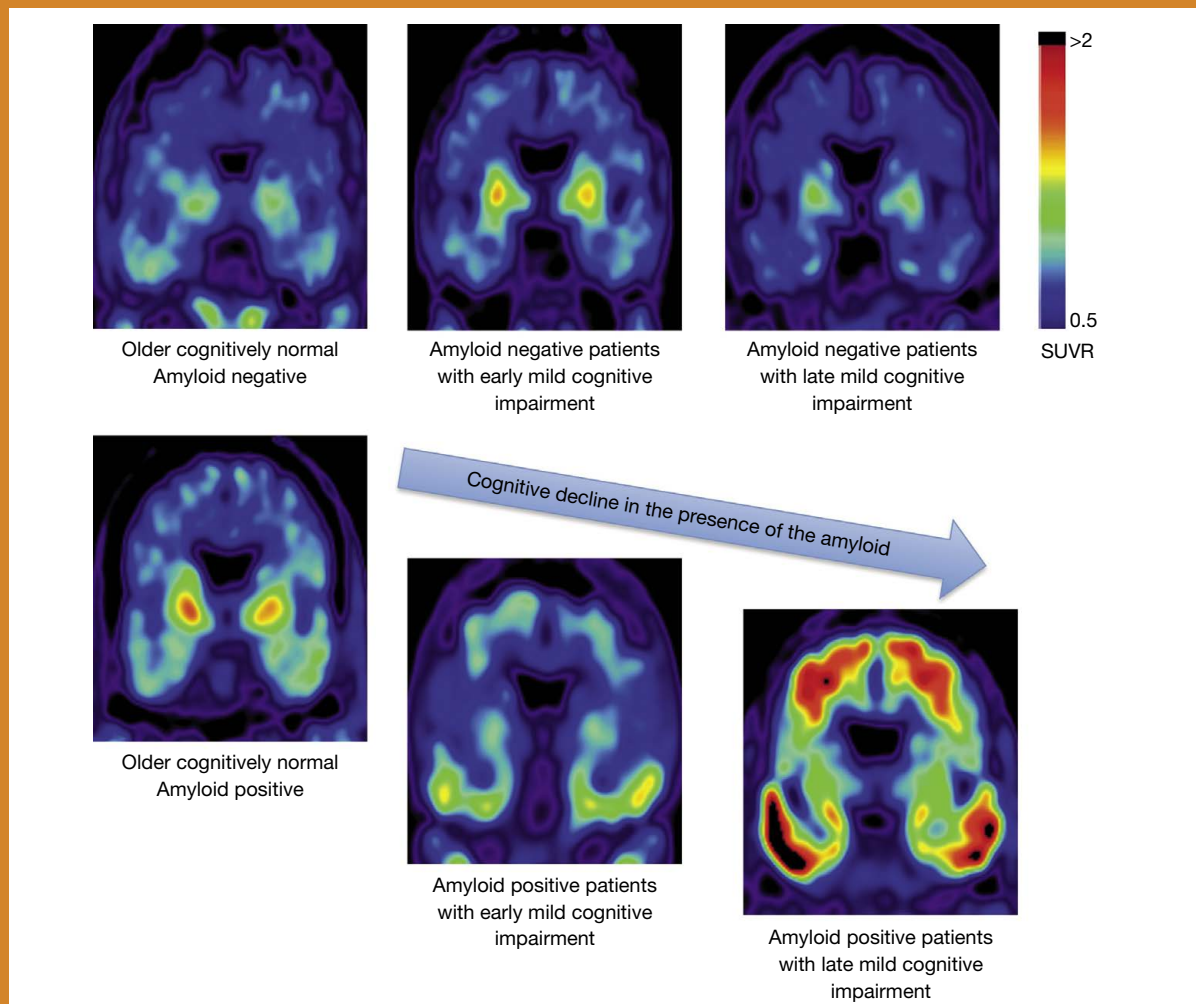
The development of AD therapeutics has stalled in the efforts to move past modestly effective symptomatic drugs to disease-modifiers. Since memantine in 2003, no drug has reached the clinic. There are many reasons for this failure, including issues of target selection, off-target toxicity, and insufficient pharmacokinetic and pharmacodynamics data to support trial design. Until now, pharmaceutical companies have mostly pursued the same target: Ab proteins that form aggregates or plaques in the brain of AD patients. Lack of AD pathology phenotyping at the recruitment stage significantly contributed to the failure of various  $A\beta$ -targeted drugs in phase III trials for AD-related dementia in the past. Such disappointing results have raised concerns about whether the treatments were initiated too late in the disease, whether  $A\beta$  levels were sufficiently reduced, and/or the validity of the ' $A\beta$  cascade hypothesis,' which places  $A\beta$  at the heart of AD pathology.

Despite disappointing results from clinical trials of anti- $A\beta$  monoclonal antibodies, the research highlights of 2012 provide new support for the central role of  $A\beta$



**Figure 1** (A) A negative  $^{18}\text{F}$ -AV45 (florbetapir) PET scan of an elderly individual without cognitive impairment; (B) a positive florbetapir PET scan of an elderly individual without cognitive impairment; and (C) a positive florbetapir PET scan of an elderly individual with clinical diagnosis of Alzheimer's disease.





**Figure 2** Cross-sectional  $^{18}\text{F}$ -AV1451 (flortaucipir) PET imaging versus clinical diagnosis and amyloid status.

in AD pathogenesis. In addition, the growing number of studies reporting cell-to-cell transmission of tau, A $\beta$  and other misfolded proteins highlight an exciting area that will lead to improved understanding of the mechanisms by which these proteins cause neurodegeneration and lead to clinical symptoms, and could provide targets for development of new therapeutics. Timing of intervention is also critically important; while symptomatic drugs are likely to be most effective at the dementia stage, disease-modifiers may require treatment at earlier stages of disease, prior to dementia or even prior to symptoms. In particular, evidence suggests that A $\beta$  is deposited early during the course of the disease, even before clinical symptoms appear. Targeting A $\beta$  in patients with mild to moderate AD, as past failed clinical trials have done, may not be enough to stop the disease progressing.

### Spotting Dementia Early

Scientists are taking two approaches that might detect AD before symptoms: imaging and biomarkers. Various fields of medicine have used biomarkers in clinical trials for many decades. Examples include measurements of blood pressure, cholesterol, serum enzymes, bone density a wide variety of imaging techniques, body fluid analyses, and electrophysiological techniques. In contrast, neurology and psychiatry, which are fields in which disorders such as AD are defined by symptoms and signs, have been relatively slow to incorporate biomarkers into diagnosis, prognosis, and treatment trials.

Since the original description by Alois Alzheimer, AD has been diagnosed by clinical criteria including cognitive impairments, especially in memory, as well as emotional disturbances. AD diagnosis is ultimately confirmed by

pathological criteria at autopsy based on the existence of extracellular A $\beta$  plaques, phosphorylated tau protein aggregated inside neurons as paired helical filaments (PHF-tau), synapse loss, and neuronal loss.

The clinical diagnosis lacks specificity, meaning that many people with the clinical diagnosis of AD do not have AD pathology, and sensitivity such as people with AD pathology at autopsy do not get a clinical AD diagnosis. Over the past 25 years, various biomarkers, including positron emission tomography (PET), MRI, and cerebrospinal fluid (CSF), were used in research studies to investigate pathophysiology of AD. In the late 1990s, the availability of transgenic mice, which overexpressed brain A $\beta$ , and the first demonstrations of immunotherapy in animal models led to development of treatments (immunotherapy, secretase inhibitors, etc.) aimed at slowing the progression of AD. This led those in the AD field to recognize the importance of using biomarkers for both diagnosis and to monitor the effects of treatment.

### Importance of A $\beta$ PET

The A $\beta$  ligands that are available for research use are the  $^{11}\text{C}$ -Pittsburgh Compound B (PIB),  $^{18}\text{F}$ -flutemetamol,  $^{11}\text{C}$ -AZD-2184,  $^{18}\text{F}$ -AZD-4694,  $^{11}\text{C}$ -BF-227,  $^{11}\text{C}$ -SB,  $^{18}\text{F}$ -florbetaben and  $^{18}\text{F}$ -florbetapir, and  $^{18}\text{F}$ -FDDNP (see [1] for a detailed review). Of these, only  $^{18}\text{F}$ -florbetapir is approved by the Food and Drug Administration (FDA) and European Medicines Agency (EMA) for the clinical evaluation of cognitive deficits in patients. According to the FDA, it is “an adjunct to other diagnostic evaluations,” meaning, a tool to give physicians additional information to clarify an otherwise unclear diagnosis.

A negative scan (Figure 1a) indicates few to no A $\beta$  plaques. If there is cognitive impairment, the cause is likely to be something other than AD. This finding may alter treatment plans or indicate the need for further testing for AD. A positive scan indicates moderate to frequent plaques. This may be found in patients with AD (Figure 1c), in patients with other types of cognitive impairment, and in older people with normal cognition (Figure 1b). Despite the new scientific information and predictive value of A $\beta$  PET, there is poor correlation between A $\beta$  PET and clinical/cognitive status. For example 30% of normal people have high A $\beta$ . It is well known from pathology that intracellular tau has a higher correlation with clinical status.

### Importance of Tau PET

Pathological studies have indicated that AD symptomatology is most closely associated with tau tangles, suggesting a cause-and-effect relationship between tau tangles, synaptic dysfunction/synapse loss/neurodegeneration, and cognitive function. Recently,  $^{18}\text{F}$ -AV1451 and other tau PET ligands have been developed to detect tau in humans [2]. The pathological findings that brain tau correlates with cognition, and preliminary results showing high correlation

between tau PET agents, including  $^{18}\text{F}$ -AV1451 [3-5], and cognition, suggest that tau PET may be a useful biomarker for early AD pathology detection and raise the possibility that ultimately, tau PET could be used as a surrogate marker (that is a marker which might replace clinical or cognitive measures) for AD clinical trials. Consistent with autopsy studies, in cross-sectional A $\beta$  PET versus tau PET studies, we observe the greatest tau deposition as detected by  $^{18}\text{F}$ -AV1451 PET in AD cases, followed by individuals with mild cognitive impairment. This relationship appears dependent on the presence of A $\beta$  pathology (Figure 2).

### Is AD an “Amyloid Facilitated Tauopathy”?

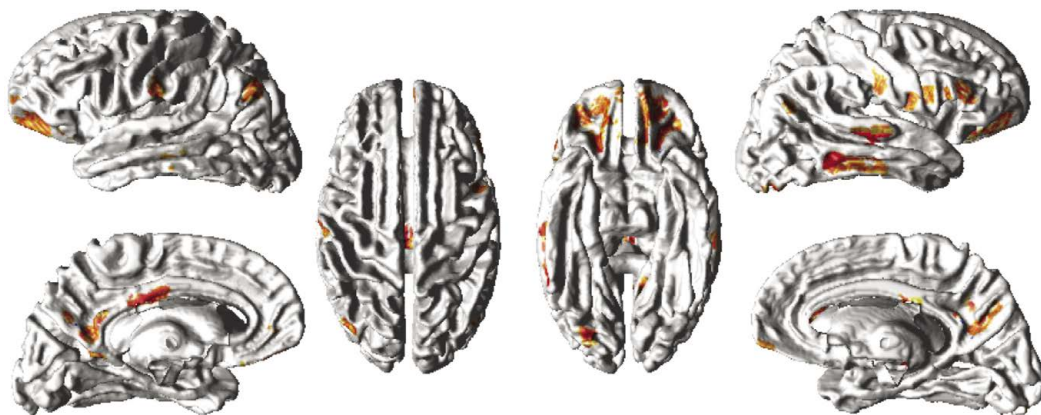
Greater spread and burden of tau pathology as detected by  $^{18}\text{F}$ -AV1451 PET only in the presence of A $\beta$  pathology, brings up the question of co-seeding. In a recent study, we hypothesized that in a population of older people with various degrees of cognitive impairment, greater annualized change in A $\beta$  burden in frontal, parietal, and lateral temporal brain regions, measured by longitudinal florbetapir PET scans antecedent to  $^{18}\text{F}$ -AV-1451 PET scans, would be associated with greater  $^{18}\text{F}$ -AV-1451 PET retention in limbic areas of inferior and lateral temporal and parietal lobes, i.e., brain sites of tau tangle deposition involved in early symptomatic disease stages.

We found that increased annualized change in florbetapir PET retention, antecedent to  $^{18}\text{F}$ -AV-1451 PET scans in medial frontal, lateral parietal, and lateral temporal brain regions was associated with greater  $^{18}\text{F}$ -AV-1451 PET retention in limbic areas of medial and inferior temporal (Figure 3). This  $^{18}\text{F}$ -AV-1451 PET retention pattern significantly explained the variance in cognitive performance and clinical outcome measures, independent of the associated antecedent increased annualized change in florbetapir PET retention. According to the A $\beta$  hypothesis [6, 7], the accumulation of A $\beta$  leads to downstream events including accumulation of tau tangles, neurodegeneration, cognitive decline and dementia. Taken together these findings are consistent with a model in which increased A $\beta$  burden facilitates tau tangle deposition, which leads to neurodegeneration resulting in clinical and cognitive deficits. Our goal is to better understand the underlying mechanism through which these new neuroimaging modalities may facilitate identification of the many gaps in our evidence-based medical knowledge of the role of the A $\beta$  hypothesis in clinical practice.

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**A** Increased rates of amyloid accumulation based on longitudinal  $^{18}\text{F}$ -AV45 (florbetapir) PET binding, antecedent to  $^{18}\text{F}$ -AV1451 (flortaucipir) PET



**B** Greater tau accumulation based on cross-sectional  $^{18}\text{F}$ -AV1451 (flortaucipir) PET binding associated with increased rates of amyloid accumulation in regions shown above



**Figure 3** Increased annualized change in florbetapir PET retention, antecedent to  $^{18}\text{F}$ -AV-1451 PET scans in medial frontal, lateral parietal, and lateral temporal brain regions (A) is associated with greater  $^{18}\text{F}$ -AV-1451 PET retention in limbic areas of medial and inferior temporal (B).

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## Capital Projects Overview 2016: Lots of Planning

Robert G. Gould, ScD

### Parnassus

Plans for a major change to the main department at Parnassus are now under review by the California Office of Statewide Health Planning and Development with the anticipated construction start date of January 2017. This \$15-million project alters the entrance by adding a patient waiting area on the north side of the main hospital corridor where patients and families can enjoy the light and view. A gowned waiting area will be separate and within the main portion of the Department. Reading rooms will be relocated.

The project includes three pieces of imaging equipment: a new body interventional angiographic unit (Philips), a replacement nuclear SPECT camera (GE), and a replacement multipurpose system (Siemens) used for ERCP

procedures. All of this equipment will be installed in newly constructed rooms.

Lastly, the Department's current boundaries on the third floor of Moffitt will expand down the main corridor into space now used by cardiology, allowing the holding area to be moved and greatly expanded. The new holding area nearly doubles the number of bays in the current, overcrowded holding room. Construction will be in phases and last 18 months.

In Long, the Philips XMR system, which is a suite of an MRI with a shared wall and door to an angiographic room, has been approved for replacement. We plan to install two magnets in the space, one a 3T widebore MR and the other a 1.5T.



Interior of the new Radiology patient waiting area at Parnassus.





The entrance to the new Moffitt/Long Radiology patient waiting area as seen from the elevators.

### China Basin

A new GE 3T MR unit is replacing one of the clinical 1.5T magnets installed when Radiology opened the imaging center at China Basin in 2004. Construction will start in early fall 2016 and be completed by the end of the year. This system will be the fourth 3T clinical, outpatient magnet in the Department's MR fleet, and the 10th clinical 3T overall, in addition to the two whole body 3T MRI systems used for research.

We are considering an expansion of the number of imaging modalities at China Basin, adding more MRI and PET-CT equipment for both clinical and research use.

### Mt Zion

The Women's Imaging Section now has a digital breast tomosynthesis unit with the recent installation of a GE Seno-Claire system that has recently been installed. This system is in a location used for screening studies and a second unit is planned for the diagnostic area.

### PACS

At the beginning of the year, Radiology implemented a new viewer, Client Outlook eUnity, for enterprise-wide access to imaging studies. Prior to eUnity, studies coming into the Department's Agfa PACS were routed to a secondary system, requiring time and causing some limitations on study size. Access to prior studies was sometimes an issue.

Extracting studies directly from Agfa storage, eUnity allows much faster access to both new and old studies. A critical link exists to the hospital's Epic system, keeping patient context, so imaging studies are accessible as part of the patient's electronic medical record.

The eUnity server can also be accessed directly and the viewer is web-based, working with any browser and platform. There are also apps for viewing images on a smartphone or tablet. Implementation of this vital system went smoothly thanks to the hard work of the Department's PACS group and of the company.

*Robert G. Gould, ScD, is a professor of Radiology in residence and vice-chair for Technology and Capital Projects. He oversees the purchase of the department's capital equipment.*

## Zuckerberg San Francisco General Hospital and Trauma Center Opens its Doors

Mark W. Wilson, MD

The opening of the new 284-bed, 484,000-square-foot Zuckerberg San Francisco General (ZSFG) Hospital and Trauma Center in April 2016 marked a stellar achievement that will offer huge benefits to the 98,000 patients who use its 24-hour non-urgent and urgent care annually. In addition to providing outstanding patient care, ZSFG was designed as the central hub for crisis response in the event of a major disaster and is the only Level I trauma center for San Francisco and Northern San Mateo counties.

### Construction

Planning for ZSFG began soon after San Francisco voters approved a bond measure to provide funding in 2008. Private donors contributed additional funding, with Facebook founder and CEO Mark Zuckerberg and his wife Priscilla Chan, MD, a pediatrician trained at UCSF and SFGH, providing the largest single donation of \$75 million. San Francisco General Hospital was renamed the Zuckerberg San Francisco General Hospital and Trauma Center in their honor.

### Bringing Imaging to the Patient

Annually, ZSFG provides trauma treatment for nearly 4,000 severely injured patients. The design of the Radiology Department offers these patients important advantages.

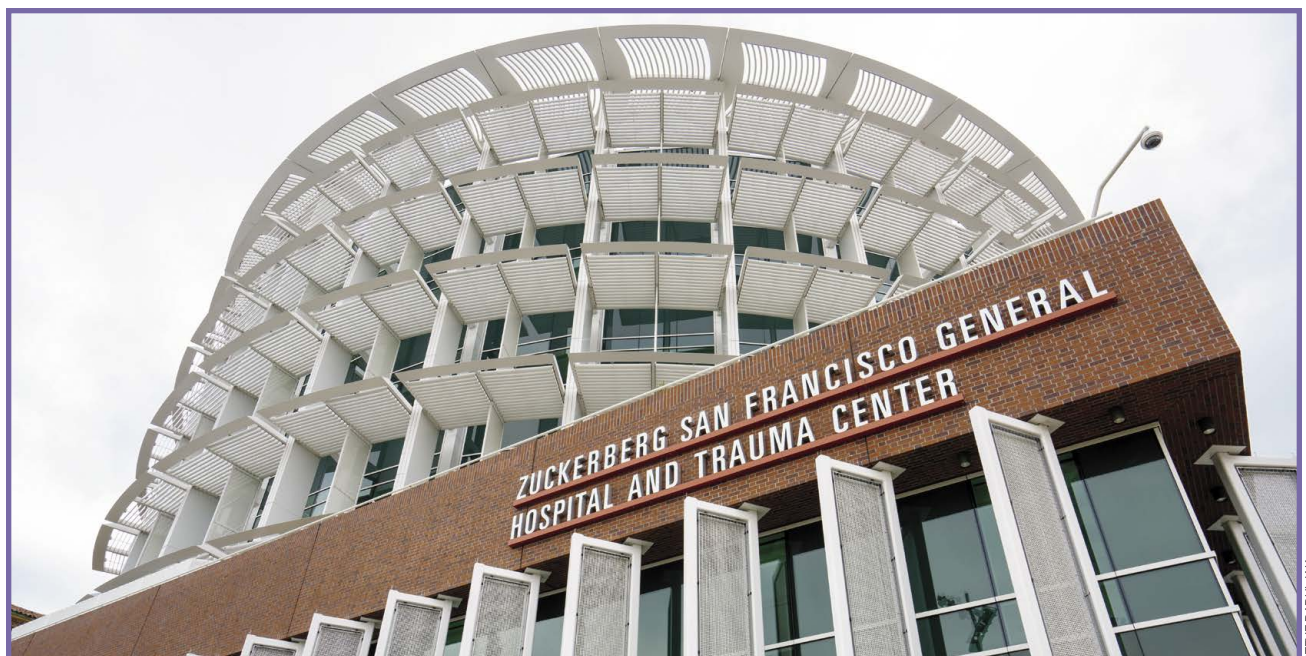
While Radiology is located on three levels throughout the hospital, CT and Diagnostic X-ray are situated directly adjacent to the emergency suites. Having imaging options quickly available to ER patients removes the challenges that come with moving trauma patients from one area to another. It also allows physicians to begin surgical or other treatments as soon as patients are scanned.

Not only is ZSFG medical imaging state-of-the-art and immediate, there is 24/7 coverage in the Radiology Department for emergent exams and procedures. Radiologists are available at all times for consultation with specialists from other departments. ZSFG Radiology also offers an inpatient IR admitting service and is a certified stroke center, supporting emergency stroke care.

Interventional Radiology is located on the ground level and the basement houses CT, MRI, PET/CT, Ultrasound, Fluoro, and Diagnostic X-ray.

### Broad Scope of Care

The Radiology Department at ZSFG provides a wide range of services in these subspecialties: Abdominal Imaging, Thoracic Imaging, Neuroimaging, General and OB Ultrasound, Pediatric Radiology, Breast Imaging and Tomosynthesis, Musculoskeletal Imaging, Interventional Radiology,



Exterior of the new Zuckerberg San Francisco General Hospital and Trauma Center.

STEVE BAULIAK



Zuckerberg San Francisco General Vascular IR Unit.

Neurointerventional Radiology and stroke treatment. New programs instituted since the move are Emergency Radiology, and PET/CT. ZSFG also is a training site for the fellowship programs in Abdominal Imaging, Women's Imaging, Neuroradiology, and Thoracic Imaging.

### Equipment

There are four general X-ray rooms and four trauma rooms, one dedicated to pediatric care.

Building 5 has two 1.5T MRI scanners and two 64-slice CT scanners. One IR suite features a single-plane, C-arm with CT scanner) another is a biplane IR suite. There also are eight Ultrasound bays and a portable unit, a portable X-ray unit and Fluoroscopy.

Building 25, the new hospital, has two 3T MRI scanners, one of them intra-operative, three CT scanners (two in the Emergency Department, one in the basement level), a PET/CT scanner, a single plane C-arm with CT scanner IR Suite as well as two biplane, IR suites, one of them in the Catheterization Lab. It also features a hybrid OR/IR suite (the initial location of the Catheterization Lab), Ultrasound (three bays and portable), general X-ray rooms, Fluoroscopy and a portable X-ray.

The Avon Breast Center at ZSFG performs more than 10,000 diagnostic and screening mammograms a year. In addition to mammography, the Avon Center offers digital breast tomosynthesis, breast US, breast biopsy and needle localization. To bring greater access to breast imaging services directly to patients, Avon Center also has a Mammography Van.

### Looking Forward

I would like to acknowledge everyone who keeps things running smoothly every day in both non-urgent and emergency situations alike: our highly skilled technologists, physicians, PACS and IT personnel, nurses and staff. We are thrilled to be in a space that will promote the best for our patients with state-of-the-art imaging and interventions for a long time to come. Our accomplishments at the new ZSFG Hospital rely on the longstanding, strong collaboration between UCSF and the City and County of San Francisco.

*Mark W. Wilson, MD, is the chief of the Department of Radiology at Zuckerberg San Francisco General Hospital and Trauma Center, Hideyo Minagi Professor of Radiology, and vice-chair, ZSFG of the UCSF Department of Radiology and Biomedical Imaging.*



## Dr. Ronald L. Arenson—Highlights from 25 Years of Extraordinary Leadership

William P. Dillon, MD

A famous quote about 25-year relationships says, “Getting together is the beginning, staying together is progress and working together is success.” By every definition, Dr. Ron Arenson’s relationship with UCSF Radiology and Biomedical Imaging can only be described as an astounding success that many of us feel proud and excited to have accomplished with him.

The technological advances in our specialty during Ron’s tenure at UCSF have been astonishing. It is a rare leader who is able to steer a department through this level of growth and change with vision, determination and a steady hand. Many would feel enormous pride in only a few of these accomplishments, but Ron’s list is extraordinary. Under his guidance the department remains internationally known as a premier academic institutional leader in innovation, technology, education and research.

When Ron became Chair of UCSF Radiology and Biomedical Imaging in 1992, radiology was at a turning point. It was the start of the transition from film-based systems to electronic systems and emerging new functional technologies. Ron was visionary in addressing the need for electronic files early on in his academic career. During his chairmanship, he assembled a team that installed one of the

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*“Ultimately, all radiological images and reports will be available to anyone with approved access.”*

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—Dr. Arenson’s 1993 Report to the Dean

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Radiology and Biomedical Imaging’s PACS team in the 1990s: (l–r, top row) Ron Arenson, MD, David Avrin, MD, PhD (l–r, bottom row) Katherine Andriole, PhD, Robert Gould, ScD.

first picture archiving and communication systems (PACS) in the country. Upon his arrival he steered the department to sound financial footing with the installation of a radiology information system, DecRad, which by the way he had helped develop, and expanded the department’s outpatient imaging capabilities in magnetic resonance imaging and computed tomography, as well as interventional image-guided procedures. Under his leadership, the department expanded its research base to China Basin and Mission Bay, allowing growth in a number of key clinical and research advances, among them:

- Installing the first positron emission tomographic (PET) unit in the Bay Area (1993)
- Installing biomagnetic imaging (MEG) (1993)
- Establishing the Laboratory for Radiological Informatics (1994)
- Creating and installing an early PACS system (1995)
- Establishing the Surbeck Laboratory for Advanced Imaging (2000)
- Establishing the UCSF Imaging Center at China Basin, the UCSF Radiology Center for Molecular and Functional Imaging at China Basin (2003), and the UCSF Precision Spine Center at China Basin
- Supporting Dr. Bruce Hasegawa’s pioneering work on multimodality imaging, combining CT with SPECT. This technology revolutionized how we view and interpret images and led to the development of PET CT and PET MR.



- Establishing an National Institutes of Health-funded T32 research residency and fellowship training program (2005–present)
- Establishing the Center for Imaging of Neurodegenerative Diseases at the San Francisco Veterans Affairs Medical Center (2006)
- Establishing UCSF as the first site in country to be approved and awarded an NIH grant for purchase of MR-guided focused ultrasound surgery (MRg-FUS) (2010)
- Implementing the electronic medical system and new Radiology Information System Radiant (2014)
- Installing the first Northern California full-body and simultaneous time-of-flight PET/MRI available to patients at UCSF (2015).

Ron has also been a leader in organized radiology, serving as president of RSNA in 2015, The Society of Chairs of Academic Radiology Departments, The American Academy of Radiology Research, and the Association of University Radiologists, for which he received the Gold Medal in 2013. His presence has also been felt locally within UCSF on many levels. Ron serves on multiple UCSF committees and was elected the President of the Medical Staff as well as serving as chair of the credentials committee.

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*“We are particularly proud of our new Biomagnetic Imaging Laboratory, the rapid growth and development of our informatics program, clinical applications of magnetic resonance spectroscopy (MRS) and our positron emission tomography (PET) program.”*

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—Letter from the Chairman, *Images*, 1994

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Behind the technical and academic accomplishments, the many awards and accolades and guest lectureships, and the outstanding educational and research rankings our department enjoys is a leader who—if asked—would say that his proudest accomplishments have to do with the success of his faculty and staff. Ron has championed UCSF faculty, trainees and staff with encouragement, time, energy and resources. In the last few years in particular, he has supported faculty and staff engagement, leadership development and faculty mentorship programs. It is no wonder that the Department’s staff engagement and faculty



Ron and Ellen Arenson, RSNA 2015

satisfaction scores on annual surveys by UCSF have been among the highest in the School of Medicine.

Ron takes pride in everyone’s collective effort to make Radiology a great place to work, and the faculty know that when he talks about an open door, he means it. Ron knew instinctively that you simply can’t build a great department without great people, and while equipment might become obsolete, the people and careers he has invested in will go on and make a difference across the country and in the world.

Now, Ron has announced he will step down as chairman of our department after 25 years. As we look back on our department’s progress and success, we feel a great sense of affection for all that we’ve shared with him and tremendous gratitude for his commitment to our department and us. We will celebrate in the coming months, and ask that you join us for a special symposium in Ron’s honor, to be held at UCSF on May 5<sup>th</sup>, 2017. We also appeal to all of our graduates to support our department and remember that we have all benefited greatly from the opportunity to work together with Ron at UCSF.

Congratulations, Ron and thank you for all you have done for our department, UCSF, and for organized radiology!

*William P. Dillon, MD, is the Elizabeth A. Guillaumin Professor of Radiology in the Section of Neuroradiology and executive vice chair of Radiology and Biomedical Imaging at the University of California, San Francisco.*

## Interventional Radiology: The Emergence of a New Specialty and Training Program

Jeanne M. Laberge, MD

This year marks the beginning of a new era of training in Interventional Radiology (IR), in which UCSF has played a leading role. In 2016, we look forward to recruiting an exceptional medical student to enter our new five-year IR residency program.

### What is This All About?

In 2012, the American Board of Medical Specialties recognized Interventional Radiology as a unique specialty in medicine, one that combines expertise in imaging, skill in image-guided procedures, and proficiency in clinical care. Over the course of the past three years, the Accreditation Council for Graduate Medical Education (ACGME) has developed a new residency program designed to train physicians in these three essential areas of practice. Last year the ACGME released the new Program Requirements for Interventional Radiology. To date, more than 60 institutions across the US have applied for IR residency accreditation. In March 2017, the National Resident Matching Program will conduct the first large-scale IR residency match.

The new residency curriculum matches the needs of the specialty. Residents will continue to receive high-quality training in diagnostic imaging, while at the same time being provided more time to develop necessary procedural skills across the broad domain of IR. Importantly, IR training will emphasize the clinical role of interventional radiologists in patient care.

### UCSF and IR

UCSF has played a key role in the development of IR over the years. In 1967, Alexander R. Margulis, MD, then chair of the Department of Radiology, coined the term “interventional radiology” to describe the emerging field of image-guided interventions. At the time, Charles Dotter, MD, and his colleagues at the Oregon Health Sciences Hospitals were performing the first transluminal angioplasty procedures in the United States. This was a transformational moment in the history of modern medicine, one that would advance the boundaries of modern medical therapy.

Margulis recruited Ernest Ring, MD, to head up the new IR section at UCSF. Ring was instrumental in developing a world-class IR section at UCSF and played a key role in the development of a strong professional organization for IR, the Society of Interventional Radiology. Under the subsequent guidance of Roy Gordon, MD, and Robert Kerlan, MD, the UCSF IR section has continued a tradition of excellence. This year, Kerlan will become chief of staff for UCSF and is



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Residents will develop skills across the broad domain of IR with a focus on patient care.

a role model whose overriding interest in high-quality clinical care is recognized throughout the institution.

UCSF also played a leadership role in the recognition of IR as a unique specialty and in the development of the new IR residency. In my role as a trustee of the American Board of Radiology and a member of the ACGME Radiology Residency Review Committee, I participated in the effort to recognize the clinical role of IR physicians and to champion a new training program for IR. I am honored to serve as the program director for the new IR Residency, with Soonmee Cha, MD, director of our top-ranked Diagnostic Radiology Residency, serving as associate program director.

We would not have been able to develop this new residency program without the strong support and guidance of department Chairman Ron Arenson, MD. As the immediate past president of the RSNA, he has been a strong advocate for patient-centered care in Radiology and a strong proponent of IR. In his presidential lecture at the RSNA last year, he laid out a bright vision for the future of Radiology through innovation. As we head into this new era of IR training, we anticipate that IR will be well positioned to contribute to that bright future.

*Jeanne Laberge, MD, is a professor in residence at the University of California, San Francisco, and chief of Interventional Radiology at UCSF's Mount Zion Campus.*

## New Faculty



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### **Robert Flavell, MD, PhD**

*Assistant Professor in Residence  
Nuclear Medicine*

In 2010, Robert Flavell received his medical degree from Weill Cornell Medical College in New York, and his PhD from the Rockefeller University, New York, as part of the Tri-Institutional MD-PhD program. In 2011, he completed a one-year internship at the Memorial Sloan Kettering Cancer Center in New York. He finished his four-year Diagnostic Radiology residency at UCSF in 2015. AT UCSF, he received the department's T32 research training grant, enabling him to perform research on new PET and hyperpolarized <sup>13</sup>C tracer development. His primary areas of interest include molecular and PET imaging, prostate cancer, nuclear medicine, and radiochemistry. He completed a clinical fellowship in Nuclear Medicine in 2016. In July 2016, Flavell accepted an assistant professor in residence position in Nuclear Medicine at UCSF.



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### **Ryan Kohlbrenner, MD**

*Assistant Professor of Clinical Radiology  
Interventional Radiology, UCSF Parnassus, Mission Bay,  
and Mount Zion campuses*

In 2010, Ryan Kohlbrenner obtained his medical degree from the University of Chicago Pritzker School of Medicine in Illinois. He then completed a one-year internship at Washington University, St. Louis/Barnes-Jewish Hospital, Missouri. In 2015, Kohlbrenner completed his four-year Diagnostic Radiology residency at UCSF, serving as chief resident in 2014–2015. The following year, he completed an Interventional Radiology fellowship at UCSF. His primary research interests include computer-aided diagnosis, image processing, and radiation dose reduction for patients undergoing interventional procedures. His clinical interests include percutaneous liver and kidney ablations, prostate artery embolization for benign prostatic hyperplasia, and transarterial interventions for hepatocellular carcinoma and liver metastases. In June 2016, Kohlbrenner accepted an assistant professor position in Interventional Radiology at UCSF.

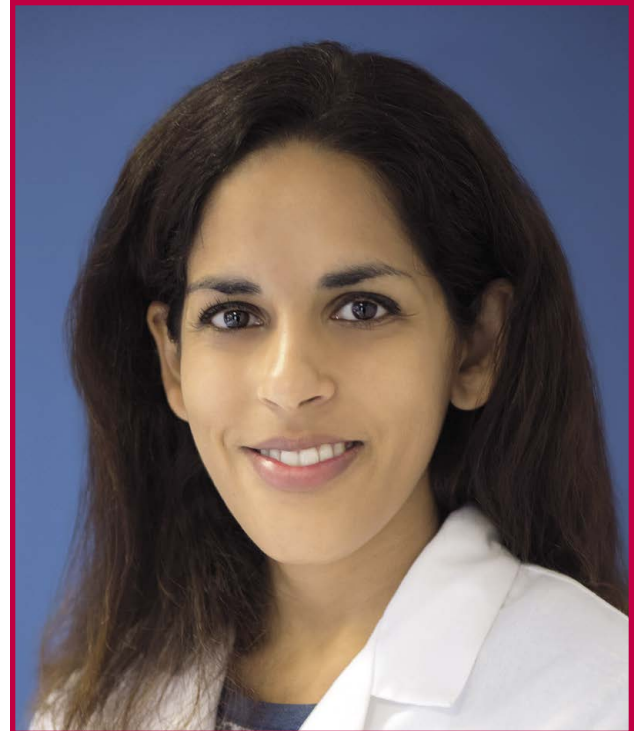




**Jared Narvid, MD**

*Assistant Professor of Clinical Radiology  
Neuroradiology Radiology, UCSF and ZSFG*

Jared Narvid received his medical degree from UCSF in 2007, followed by a one-year internship at St. Mary's Hospital in San Francisco the following year. He completed a four-year Diagnostic Radiology residency at Stanford University in 2012 and Diagnostic and Interventional Neuroradiology fellowships at UCSF in 2016. Narvid directs the neuroradiology spine clinic at Zuckerberg San Francisco General. His research evaluates the impact of cerebrovascular disease and neuro-HIV on cognition. In March 2016, Narvid accepted an assistant professor position in the Neuroradiology section at UCSF and ZSFG.



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**Ramya Srinivasan, MD**

*Assistant Professor of Clinical Radiology  
Musculoskeletal Radiology, UCSF and VAMC*

In 2010, Ramya Srinivasan obtained her medical degree from New York University School of Medicine, New York. She did a one-year internship in Internal Medicine at UCSF Fresno the following year. Srinivasan completed a four-year Diagnostic Radiology residency at the Albert Einstein College of Medicine, Jacobi Medical Center in New York in 2015. She followed that with a Musculoskeletal Imaging fellowship at UCSF. Her interests include providing first-class clinical care to the veteran and UCSF patient population, educating the next generation of radiologists, and advancing the field of musculoskeletal imaging. In July 2016, Srinivasan accepted an assistant professor of clinical radiology position in Musculoskeletal Imaging and General Radiology at UCSF and the VAMC.



## Education Leadership Advances



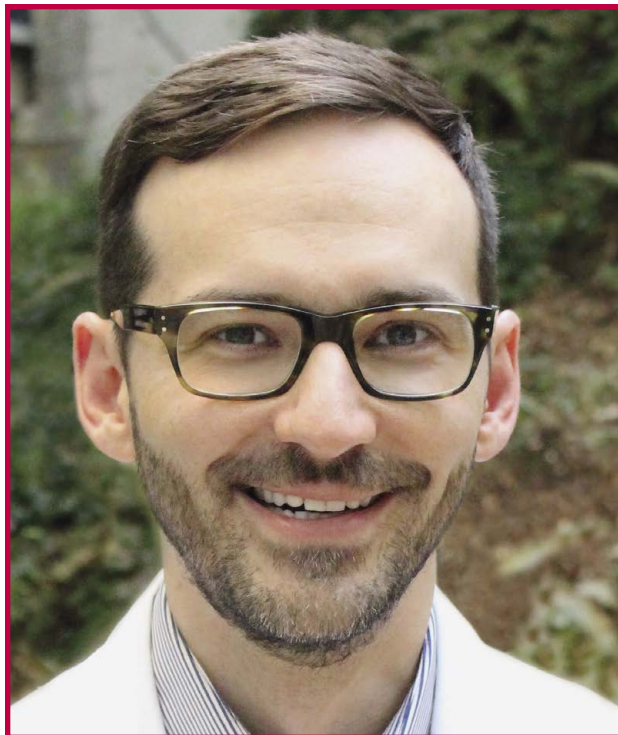
Soonmee Cha, MD

"Congratulations to Soonmee Cha and David Naeger, our first vice-chair for Education and our new associate chair for Education, respectively" said Chairman Ron Arenson, MD, in announcing two new leadership appointments. "I am very proud of all of our education programs and know that our future plans are in excellent hands."

### Soonmee Cha, MD

"In addition to continuing as the Program Director for our residency program and overseeing fellowships, Soonmee plans to create educational programs for our technical staff, referring physicians, and patients, dovetailing nicely with our goal to strengthen our patient-centered focus," Arenson noted.

Cha has been director of the Diagnostic Radiology residency program, ranked #1 in the country, since 2012. She received her MD from Georgetown University. She completed her Radiology residency at the North Shore University Hospital at Cornell University. She then joined the New York University School of Medicine as a Neuroradiology Fellow. She came to UCSF as an assistant professor, and became a professor in residence in 2011.



David M. Naeger, MD

### David M. Naeger, MD

"As associate chair for Education, David will oversee continuing medical education and medical student education," said Arenson. "He will also work with Dr. Susan Wall to promote faculty development." Naeger will continue in his role as co-director of the Henry I. Goldberg Center for Advanced Imaging Education.

Naeger received his medical degree from Duke University School of Medicine in Durham, NC. Naeger completed a diagnostic radiology residency at UCSF, serving as a chief resident, and received the department's T32 Training grant. After completing his residency in 2010, Naeger did a fellowship in both Cardiac and Pulmonary Imaging and Nuclear Medicine. He was inducted into the Haile T. Debas Academy of Medical Educators in 2014 in recognition of his substantial contributions to medical education. In 2015, Naeger received the UCSF Academic Senate Distinction in Teaching award, given to only two UCSF faculty members per year across the entire institution. Naeger joined the UCSF faculty as an assistant professor in 2011 and is currently an associate professor.

## Operations Directorship Changes



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Kathy Knoerl

In June 2016, Kathy Knoerl, who served since 1998 as operations director for Radiology in the UCSF Medical Center, left the department to relocate to Texas. Knoerl received the UCSF Medical Center Pride Award in 2006 and was named “most effective Radiology Administrator/Manager” by Auntminnie.com in 2012. She was acknowledged by Chairman Ron Arenson, MD, for her “extraordinary dedication to exemplary patient care, positive nature and constant professionalism” during her 18 years in the department.



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David Sostarich

Knoerl was succeeded in August 2016 by David Sostarich, MBA, BSRT. “David comes to us after having served in this same capacity at Zuckerberg San Francisco General Hospital and Trauma Center since 2011,” noted Arenson. “He has more than 25 years’ experience in health care management in both academic and community settings. We are very excited to have David on board.”

Originally from Missouri, Sostarich earned a Bachelors of Science in Radiology Technology at Creighton University and a Masters in Business Administration from Baker University. Prior to serving as Radiology administrative director at ZSFG, he held management positions at El Camino Hospitals in California, UPMC in Pittsburgh, PA, and in Kansas at Lawrence Memorial Hospital, Truman Medical Centers, and the University of Kansas Medical Center.

## Mary Bobel Joins Department as Chief Administrative Officer

Mary Bobel, MBA, became the chief administrative officer for the Department of Radiology and Biomedical Imaging and the Department of Otolaryngology-Head and Neck Surgery at UCSF in December 2015, following a national search for the position.

“Mary has outstanding experience in large institutional academic settings, having served as the director of finance and administration at Stanford University’s School of Medicine and as the executive director of Radiology at the University of Chicago’s Pritzker School of Medicine,” said Chair Ron Arenson, MD. “At Stanford, Mary also worked within the Office of Institutional Planning.”

Bobel earned her undergraduate, MA and MBA degrees from Stanford University. Prior to her academic experience, she worked in the tech industry in Northern California at Achieva, Genus, Adobe, and Wells Fargo among others.

“Mary has been an important addition to our leadership team as we continue our outstanding clinical, research, and educational programs and initiatives,” noted Arenson.



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Mary Bobel

## Susan O'Hara, MPA, Receives Chancellor's Award for Exceptional University Management

Susan O'Hara, MPA, the chief financial officer for the Department of Radiology and Biomedical Imaging was a 2016 recipient of the UCSF Chancellor's Award for Exceptional University Management. At the Founder's Day Luncheon in May 2016, Mary Bobel, chief administrative officer for the Department of Radiology and Biomedical Imaging praised O'Hara's "strong commitment to our department and to UCSF as a whole."

O'Hara, who has been in Radiology and Biomedical Imaging for 18 years, leads a staff of 19 handling strategic financial planning, budgets, reporting, research administration, purchasing, reimbursements and audit oversight. Along with her crucial role overseeing all management aspects of the department's finances, O'Hara has been a mentor and a supporter of development opportunities of her staff.

Prior to her current position, O'Hara served as director, Program and Budget Planning at UC Davis from 1995–98, and was responsible for a campus-wide annual operating budget of \$1 billion. From 1984–95, she was the director of Budget and Human Resources in the UCSF School of Dentistry. Her career began in Washington, DC, as a Presidential Management Intern and budget analyst in the Office of Management and Budget. O'Hara received her MPA from Princeton University in New Jersey.



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Susan O'Hara



## Honors and Awards

### **Ronald L. Arenson, MD**

- AUR Radiology Research Alliance Innovation and Leadership award, AUR Annual Meeting, 2016
- Honorary Member, European Society of Radiology, 2016

### **A. James Barkovich, MD**

- Named Top Doctor 2016, *San Francisco Magazine*

### **Matthew Bucknor, MD**

- Chair, Diversity and Inclusion Committee, UCSF Radiology and Biomedical Imaging, 2016
- Invited Lecturer, MSK Applications of MRgHIFU, National Medical Association, August 2016
- Reviewer, *Radiology*

### **Soonmee Cha, MD**

- Named Top Doctor 2016, *San Francisco Magazine*
- Appointed vice chair, Education, UCSF Radiology and Biomedical Imaging

### **Linda Chao, PhD**

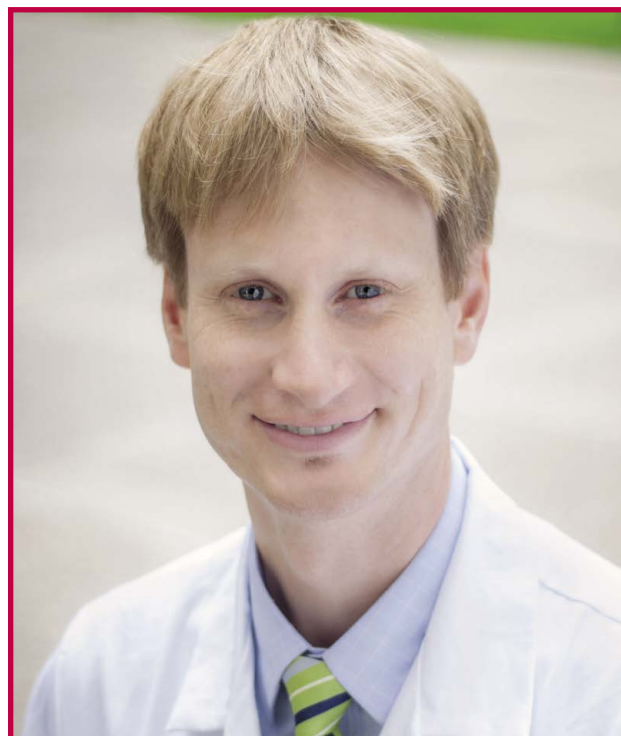
- Promoted to professor

### **Jesse Courtier, MD**

- Recipient, Hideyo Minagi Teaching Award, 2016
- RSNA Certificate of Merit for educational exhibit, "Pediatric Renal Transplant Biopsies"
- RSNA Certificate of Merit for educational exhibit, "Pediatric Foreign Bodies"
- Promoted to associate professor

### **William P. Dillon, MD**

- Lecturer, 13th Annual Robert A. Fishman Annual Visiting Professor Lecture
- Recipient, Radiology Award for Outstanding Faculty Mentoring, UCSF Department of Radiology and Biomedical Imaging, June 2016
- Reviewer, *American Journal of Neuroradiology*, *Lancet*, *Annals of Neurology*, *Journal of Neurooncology*, *Muscle and Nerve*
- Named Top Doctor 2016, *San Francisco Magazine*
- Presenter, UCSF Radiology Grand Rounds "The Future of Global Health Imaging Utilizing Innovation and Technology," August 16, 2016



UCSF DOCUMENTS & MEDIA - MARCO SANCHEZ

Thomas Hope, MD, PhD was the 2016 recipient of the Society of Nuclear Medicine and Molecular Imaging's Marc Tetalman Memorial Award. The award honors the research accomplishments of a young investigator pursuing a career in nuclear medicine.

### **Robert Flavell, MD, PhD**

- Certificate of Merit, Radiology Society of North America, December 2015
- Recipient, Surbeck Scholar award, second place, May 2016
- Oral Presentation, 2016 RSNA
- Invited Speaker, Society of Nuclear Medicine and Molecular Imaging Annual Meeting, 2016

### **Alisa Gean, MD**

- Second Place Fundraiser, AVON 39 The Walk to End Breast Cancer

### **Christine Glastonbury, MBBS**

- Elected, Nominating Committee, American Society of Neuroradiology
- Named Top Doctor 2016, *San Francisco Magazine*



UCSF DOCUMENTS & MEDIA - MARCO SANCHEZ

Jeanne M. Laberge, MD will receive the Society of Interventional Radiology's highest honor, its Gold Medal, on March 5, 2017. It is awarded not only for extraordinary service to SIR but to those who have ensured the future of interventional radiology by advancing the quality of medicine and patient care.

#### **Ursula Heilmeyer, PhD**

- American Society for Bone and Mineral Research Young Investigator Award, 2016

#### **Christopher P. Hess, MD**

- Promoted to professor
- Visiting professor, Brigham and Women's Hospital, Boston, MA, February 2016; Massachusetts General Hospital, Boston, MA, February, 2016; Case Center for Imaging Research, Cleveland, OH, April 2016; New York University, June 2016
- Editorial Board, *American Journal of Neuroradiology*
- Speaker, Grand Rounds, UCSF Radiology and Biomedical Imaging, "Parallel Imaging and Compressed Sensing Fast MR Imaging", June 2016
- Neuroradiology Chair, Refresher Course Committee, Radiological Society of North America
- Chair, Diffusion Study Group, International Society for Magnetic Resonance in Medicine

#### **Steven Hetts, MD, PhD**

- Nominee, Best Medical Device Startup Company, Chemo-Filter, First Annual QB3 Awards Competition, 2015
- Fellow, Rosenman Institute for Medical Device Innovation, 2015



Peder Larson, PhD (left) presents the 2016 Bruce Hasegawa Award for Excellence in Biomedical Imaging to Llewellyn (Trey) Jalbert, PhD, (right) a postdoctoral fellow in the Surbeck Laboratory. Jalbert earned a BS in Astrophysics at UC Berkeley, and a PhD from the UCSF/UC Berkeley joint program in Bioengineering. Jalbert is using magnetic resonance imaging to study malignant gliomas and physics techniques to develop new imaging methods for clinical use.

- Chair, Clinical Neurophysiology, Devices, Neuroprosthetics, and Biosensors Small Business Special Emphasis Panel Study Section, Center for Scientific Review, National Institutes of Health, 2016
- Visiting Lecturer, "CT as the Modality of Choice for Workup of Acute Ischemic Stroke," International Endovascular Stroke Conference, Gold Coast, Australia, 2015
- Visiting Lecturer, "Endovascular Magnetic Catheter for Interventional MRI: Translational Applications in Stroke Treatment," Congress of Interventional Radiology Societies of Europe, Lisbon, Portugal, 2015
- Visiting Lecturer, "New Horizons in the Endovascular Treatment of Pediatric Cancers," Society for NeuroInterventional Surgery, Boston, Massachusetts, 2016
- Excellence in Medical Student Teaching Award, UCSF Radiology and Biomedical Imaging, June 2016

#### **Randall Higashida, MD**

- Named Top Doctor 2016, *San Francisco Magazine*

#### **Thomas Hope, MD**

- Marc Tetalman Award, Society of Nuclear Medicine and Molecular Imaging, June 2016





DAVID HATHCOX

ASBMR President, Douglas Kiel, MD, MPH, presents Dr. Ursula Heilmeier with the Young Investigator Award for her research on diabetic bone disease.

#### **Llewellyn (Trey) Jalbert, PhD**

- Bruce Hasegawa Award for Excellence in Biomedical Imaging, UCSF Radiology and Biomedical Imaging

#### **Bonnie N. Joe, MD, PhD**

- Chair, University Radiation Safety Committee, May 2016
- Chair, UCSF Radioactive Drug Research Committee, May 2016
- Breast Imaging Commission Communications Committee, American College of Radiology, 2016
- Plenary Speaker, "Imaging and Management of the Axilla," SBI/ACR Breast Imaging Symposium, April 2016
- Speaker, "Screening for Breast Cancer in an Era of Breast Density Legislation," California Society of Radiologic Technologists Annual Meeting, November 2015

#### **Robert K. Kerlan, Jr., MD**

- Elected president of UCSF Medical Staff, 2016
- Named Top Doctor 2016, *San Francisco Magazine*
- Reviewer for *Radiology*, *Journal of Vascular and Interventional Radiology*, *Cardiovascular and Interventional Radiology*

#### **Maureen Kohi, MD**

- Promoted to associate professor

#### **Vishal Kumar, MD**

- Recipient, Haile T. Debas Academy of Medical Educators Excellence in Teaching Award



UCSF DOCUMENTS & MEDIA - MARCO SANCHEZ

Thomas F. Lang, PhD, the School of Dentistry's associate dean for Research has been named to the Presidential Chair of Dental Research. The position was created with a generous donation to the School of Dentistry and matching funds from the UC Office of the President. Lang will hold the position in conjunction with his appointment as professor in the Department of Radiology and Biomedical Imaging in the School of Medicine. The presidential chair is responsible for funding scientific lectures and presentations, and promoting School of Dentistry scientific research for students and faculty, as well as summer fellowships for students. Lang received his BA in Chemistry from the University of Chicago in 1983 and his PhD in Chemistry from University of California, Berkeley in 1990. He joined UCSF's Department of Radiology and Biomedical Imaging as a faculty member following his UCSF postdoctoral fellowship in Radiology Imaging in 1992. The focus of Lang's Research is the development of quantitative analytic methods to better the understanding of osteoporosis and sarcopenia.

#### **Jeanne M. LaBerge, MD**

- Recipient, Outstanding Alumnus Award, UCSF Radiology and Biomedical Imaging
- Recipient, UCSF Excellence and Innovation in Graduate Medical Education Award
- Named Top Doctor 2016, *San Francisco Magazine*

#### **Thomas F. Lang, PhD**

- Named to Presidential Chair of Dental Research

#### **Peder Larson, PhD**

- Promoted to associate professor

#### Cindy Lee, MD

- Selected for RSNA press release highlighting her research on *Current Era Screening Mammography Outcomes from the National Mammography Database*, 2016
- Appointed to RSNA RadLex Breast Subcommittee 2016–2019
- Abstract Reviewer, Quality Storyboards, RSNA Annual Meeting, 2016
- Program Chair and Executive Board Member, American College of Medical Quality, 2016–2018
- Scholarship Recipient, International Forum on Quality and Safety in Healthcare, Institute of Healthcare Improvement and *British Medical Journal*, April 2016
- Lecturer, Asian-Pacific Quality and Safety Forum on Medical Imaging, Taipei, Taiwan, November 2015
- Visiting Lecturer, Wan Fang Hospital, Taipei Medical University, Taiwan, 2015
- Editorial board member, *Journal of Radiology and Imaging*
- Education Exhibit, RSNA 2015
- Poster Exhibit, American College of Medical Quality 2016

#### Evan Lehrman, MD

- Recipient, Haile T. Debas Academy of Medical Educators Excellence in Teaching Award

#### Thomas M. Link, MD, PhD

- Named Distinguished Investigator, Academy of Radiology Research, 2016, RSNA
- Editor-in-Chief, *Current Radiology Reports*
- Associate Editor, *Radiology*
- Editorial Board, *American Journal of Roentgenology*, *Osteoarthritis and Cartilage*, *Skeletal Radiology*
- Head, Musculoskeletal section of the Scientific Editorial Board of *European Radiology*

#### Sharmila Majumdar PhD

- Gold Medal, International Society for Magnetic Resonance in Medicine, May 2016

#### John Mongan, MD, PhD

- Appointed vice chair for Informatics

#### David M. Naeger, MD

- Appointed associate vice chair, Education, UCSF Radiology and Biomedical Imaging
- Clinical Immersion Experience Pilot Awardee, UCSF Bridges Curriculum Redesign

#### Sujal Nanavati, MD

- Robert J. Lull MD award for Outstanding Hospital Consultant, ZSFG 2016

#### Liina Poder, MD

- Promoted to professor



Sharmila Majumdar, PhD, was awarded the Gold Medal of the International Society for Magnetic Resonance in Medicine in May 2016, for her innovative contributions to the development of quantitative imaging methods. “Dr. Majumdar has been a leader in MRI for 30 years and has in particular pioneered the development and applications of quantitative imaging to diagnose and understand musculoskeletal disorders,” said her nominator, John C. Gore, PhD, professor of Radiology and Radiologic Sciences and Director of the Institute for Imaging Sciences at Vanderbilt University School of Medicine. “Her work has had broad translational impact on the clinical management of common problems of joints and cartilage.”

#### Elissa Price, MD

- Elected Fellow, Society of Breast Imaging, April 2016

#### Bhavya Rehani, MD

- Presenter, UCSF Radiology and Biomedical Imaging, Grand Rounds “The Future of Global Health Imaging Utilizing Innovation and Technology,” August 16, 2016
- Founder, Radiology Interest Group, Consortium of Universities for Global Health

#### Sabrina Ronen, PhD

- Senior Fellow, International Society for Magnetic Resonance in Medicine, 2016

#### Ramin Saket, MD

- Recipient, Outstanding Clinical Faculty Award, UCSF Radiology and Biomedical Imaging

#### David Saloner, PhD

- Chair, International Society for Magnetic Resonance in Medicine Quantitative MR Flow Workshop, UCSF Mission Bay, 2016





UCSF DOCUMENTS & MEDIA - MARCO SANCHEZ

Sujal Nanavati, MD, received the Robert Lull Award for his excellence in teaching and dedication to providing exceptional patient care. The Lull Award is granted annually by the ZSFG Department of Internal Medicine to the hospital's "Most Outstanding Consultant."

#### **Youngho Seo, PhD**

- Distinguished Investigator Award, Academy of Radiology Research, RSNA, 2016

#### **John Shepherd, PhD**

- President, International Society for Clinical Densitometry
- Promoted to adjunct professor

#### **Lynne Steinbach, MD**

- President, International Skeletal Society 2015–2016
- Named Top Doctor 2016, *San Francisco Magazine*
- Lifetime Volunteer Service Award, American Board of Radiology, Fall 2015
- Arthur A DeSmet MD Visiting Professor, University of Wisconsin, Madison, WI, November 2015
- Visiting Professor Grand Rounds, September 2015, Memorial Sloan Kettering, New York, NY
- Presenter, Pitfalls in Knee MR, RSNA, November 2015
- Consulting Editor, *MR Clinics*

#### **Lori Strachowski, MD**

- John H. Harris Visiting Professor lecturer, University of Texas, Houston, September 2016

#### **Jason Talbott, MD**

- Recipient, Haile T. Debas Academy of Medical Educators Excellence in Teaching Award

#### **Duygu Tosun-Turgut, PhD**

- Appointed co-director, Center for Imaging of Neurodegenerative Diseases

#### **Henry VanBrocklin, PhD**

- Plenary Lecture, Korean Society of Radiopharmaceuticals and Molecular Probes, Seoul, South Korea, April 2016
- Editor in Chief, *Molecular Imaging*
- President, Society of Radiopharmaceutical Sciences, May 2015–May 2017

#### **Susan Wall, MD**

- Chair, UCSF Academic Senate Privilege and Tenure Committee, 2016

#### **W. Richard Webb, MD**

- Nestor Muller Lecture and Professorship, University of British Columbia, April 2016

#### **Duan Xu, PhD**

- Distinguished Investigator, Academy of Radiology Research, RSNA, 2016

#### **Judy Yee, MD**

- President, Society of Abdominal Radiology, 2015–2016
- Chair, American College of Radiology Colon Cancer Committee
- Chair, UCSF Personalized Mentoring and Promotion Committee
- Editors Recognition Award for Reviewing with Distinction, *Radiology*, 2015
- Lectureships, Turkish Congress of Radiology, 2015
- Chair, SAR IEC, Radiologic Society of South Africa
- Visiting Professor, Schulich School of Medicine, London, Canada and Memorial Sloan Kettering School of Medicine, NY

#### **Benjamin M. Yeh, MD**

- Named Top Doctor 2016, *San Francisco Magazine*

#### **Ronald Zagoria, MD**

- Named Top Doctor 2016, *San Francisco Magazine*
- Appointed, Board of Directors, American Institute of Radiologic Pathology
- Editor-in-Chief and Chair of Editorial Board, *Emergency Radiology*

#### **Xiaoliang Zhang, MD**

- Elected President, Overseas Chinese Society for Magnetic Resonance in Medicine, 2015
- Invited Speaker, International Symposium on Frontiers of Magnetic Resonance
- Outstanding Teaching Award, Paul C. Lauterbur Research Center for Biomedical Imaging, Chinese Academy of Sciences

## Excellence and Advancements Highlight Diagnostic Radiology Residency

Soonmee Cha, MD

Our residency program and residents had another year filled with great accomplishments and progress. In addition to their clinical, research and academic responsibilities, many of our residents have received recognition at a national level and continue to excel at their studies. For the fourth year in a row, our class of third-year residents passed their CORE exams with exceptional marks. We have firmly established the groundwork for preparation of the new CORE curriculum, new board system, and Milestones project—all now integrated into the residency program.

In May 2016, our new Zuckerberg San Francisco General (ZSFG) Hospital opened. With the help of many, the transition of our residents to the new hospital has been smooth and seamless. Drs. Jason Talbott and Mark Wilson have done an incredible job supporting and implementing the needs of our residents and residency program throughout the transition process. Their dedication to teaching and advocacy for residents is second to none and our residents benefited from their meticulous attention to detail in preparing the new reading rooms and call room at ZSFG.

Our two residency coordinators, Sandria Wong (program) and Cindy Flores Gaytan (education), continue to do an outstanding job overseeing the administrative aspects of our program and supporting the infrastructure and curriculum scheduling, respectively. Both work as an incredible team improving the work and training of our residents.

In September 2015, our residency program was once again ranked number one in the country by a peer review process evaluating more than 50,000 nominations submitted by board-certified physicians to *U.S. News & World Report* and Doximity. It takes a village to train the best and

the brightest residents who will be the next leaders, innovators, and educators of our specialty. In our program, we are fortunate to have many people who take pride and ownership of this village to guide and support our outstanding residents.

In conclusion I would like to thank the three past chief residents—Eric Ehman, MD, Hriday Shah, MD, and Javier Villanueva-Meyer, MD—for their outstanding leadership and contributions. They worked tirelessly by my side to improve our program curriculum and the residency experience for our residents. Our current chiefs—Luis Gutierrez, MD, Spencer Lake, MD, and Zhixi Li, MD—have come on board enthusiastic to continue the great track record set by the graduating chief residents. I look forward to working with them in the coming year. I am truly blessed to work with and for the best radiology residents in the country.

### Resident Accomplishments

#### Awards:

**Vignesh Arasu, MD:** Imaging Spectrum of Breast Cancer Metastases and Patterns of Metastatic Spread, Certificate of Merit, RSNA 2015

**Lindsay Busby, MD, MPH:** “Wood” You Find It?: Pearls and Pitfalls in Imaging of Common Radiolucent and “Can’t Miss” Pediatric Foreign Bodies, Certificate of Merit, RSNA 2015

**Kevin Connolly, MD:** UCSF Julius Krevans Award for Clinical Excellence, 2016

**Adam Coy, MD:** First Place, Golden Gate Half Marathon, 2016



2016–2017 Chief Diagnostic Radiology Residents (l–r): Spencer Lake, MD, Zhixi Li, MD, and Luis Gutierrez, MD.

**Eric C. Ehman, MD:** Roentgen Resident Research Award, 2016

**Kirema Garcia-Hayes, MD:** ZSFG Julius Krevans Award 2016, presented to outstanding first year resident

**Kimberly G. Kallianos, MD:** Margulis Society Resident Research Award, 2016; Certificate of Merit, Cardiac Imaging Applications for Electrophysiology, RSNA 2015

**Yi Li, MD:** Margulis Society Resident Research Award, 2016

**Zhixi Li, MD:** Certificate of Merit, "Wood" You Find It? Pearls and Pitfalls in Imaging of Common Radiolucent and "Can't Miss" Pediatric Foreign Bodies, RSNA 2015

**Hugh C. McGregor, MD:** RSNA Resident Research Prize, 2015

**Jae Ho Sohn, MD:** Stanford Healthcare Clinical & Business Analytics Prize by Stanford Health, 2016; Global Oncology Prize by Stanford Health, 2016

**Javier Villanueva-Meyer, MD,** UCSF Radiology and Biomedical Imaging, Elmer Ng Award for Outstanding Resident, 2016

**Jennifer Wan, MD:** Certificate of Merit, MR Safety 101: What All Radiologists Must Know, RSNA 2015

#### Service:

**Lindsay Busby, MD, MPH:** Member, RISE, 2015

**Maureen Chapman, MD:** Member, San Francisco Medical Society, 2015

**Adam Coy, MD:** Member, San Francisco Medical Society, 2015; Member, UCSF School of Medicine Dean's Office Communication Advisory Board, 2016

**Luis Gutierrez, MD:** Chief Resident, 2016–2017; PGY5 Margulis Society Resident Representative, Department Representative, Radiology and Biomedical Imaging Booth, Bay Area Science Festival 2016

**Michael Heller, MD:** Resident Liaison, Medical Student Education Committee, 2016

**Brandon Ishaque, MD:** UCSF Radiation Protection Committee, Radiology Representative, 2016; UCSF Resident and Fellows' Council, Radiology Representative 2016

**Eric Jordan, MD:** Member, RSNA Public Information Committee; ZSFG Committee of Interns and Residents, Radiology Representative

**Yilun Koethe, MD:** Member, San Francisco Medical Society, 2015

**Russell Kelley, MD:** PGY4 Margulis Society Resident Representative

**Benjamin Laguna, MD:** PGY3 Margulis Society Resident Representative, Scientific Volunteer, UCSF Radiology and Biomedical Imaging Exhibit, Bay Area Science Festival, 2015

**Spencer Lake, MD:** Chief Resident, 2016–2017; Resident Liaison, Medical Student Education Committee, 2016



ELISABETH FALL

2016 Elmer Ng award recipient Javier Villanueva-Meyer, MD (center) with Chair Ron Arenson, MD, and Program Director Soonmee Cha, MD.



ELISABETH FALL

2016 Roentgen Resident Research Awardee Eric C. Ehman, MD with Chair Ron Arenson, MD.

**Courtney Lawhn Heath, MD:** Member, San Francisco Medical Society, 2015

**Aaron Losey, MD, MS:** Scientific Volunteer, UCSF Radiology and Biomedical Imaging Exhibit, Bay Area Science Festival, 2015

**Zhixi Li, MD:** Chief Resident, 2016–2017

**Yujie Qiao, MD:** Member, San Francisco Medical Society, 2015

**Jae Ho Sohn, MD:** Volunteer, City Team San Francisco, Homeless Clinic, 2016

**Alexandra Wright, MD:** PGY2 Margulis Society Resident Representative

#### Grants:

**Matthew Barkovich, MD:** Margulis Society Research Grant, 2016

**Eric Jordon, MD:** RSNA Student Travel Grant

**Zhixi Li, MD:** RSNA/AUR/ARRS Introduction to Academic Radiology Program Grant, 2016

**Hari Trivedi, MD:** NIH-T-32 Training Grant, UCSF



## PGY-2 Residents: Class of 2020



### **Katherine Bruksch, MD**

**2015–2016** PGY1, MacNeal Hospital, Berwyn, IL

**MD 2015** Feinberg School of Medicine, Chicago, IL

#### **Honors and Awards:**

**2013** Merit Certificate for RSNA Exhibit

**2011** Phi Beta Kappa

#### **Research:**

**2014–2015** Society of Interventional Radiology Medical Student Council

**2014–2015** Northwestern Memorial Hospital, Memory Mapping Project, Chicago, IL

**2012** Rehabilitation Institute of Chicago, Bone Health Assessment Project, Chicago, IL



### **Mithun Diwakar, MD, PhD**

**2015–2016** PGY1, Harbor-UCLA Medical Center

**MD 2015** University of California, San Diego

**PhD 2011** University of California, San Diego

#### **Honors and Awards:**

**2015** Senior Student Award, University of California, San Diego, Department of Radiology

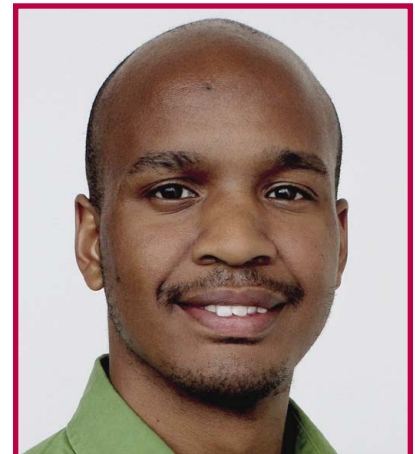
**2007** NIH Summer Training Grant, University of California, San Diego

#### **Selected Publications:**

Diwakar M, Harrington DL, Maruta J, Ghajar J, El-Gabalawy F, Muzzatti L, Corbetta M, Huang MX, Lee RR. Filling in the Gaps: Anticipatory Control of Eye Movements in Chronic Mild Traumatic Brain Injury. *Neuroimage Clin.* 2015 Apr 22;8:210-23.

Diwakar M, Tal O, Liu TT, Harrington DL, Srinivasan R, Muzzatti L, Song T, Theilmann RJ, Lee RR, Huang MX, 2011b. Accurate Reconstruction of Temporal Correlation for Neuronal Sources using the Enhanced Dual-core MEG Beamformer. *Neuroimage* 2011 Jun 15;56(4):1918-28.

Diwakar M, Huang MX, Srinivasan R, Harrington DL, Robb A, Angeles A, Muzzatti L, Pakdaman R, Song T, Theilmann RJ, Lee RR. Dual-Core Beamformer for Obtaining Highly Correlated Neuronal Networks in MEG. *Neuroimage* 2011 Jan 1;54(1):253-63.



### **James Frencher, MD, PhD**

**2015–2016** PGY1, Mount Sinai Hospital, New York, NY

**MD 2015** University of Illinois College of Medicine, Chicago

**PhD 2015** University of Illinois College of Medicine, Chicago

**MS 2008** University of Michigan, Ann Arbor

#### **Honors and Awards:**

**2015** Urban Health Program Outstanding Peer Educator Award, University of Illinois, Chicago

**2014** Urban Health Program Jose Celso Barbosa Scholarship Award, University of Illinois, Chicago

**2011** Gold Prize Winner, Research Day, University of Illinois, Chicago

#### **Selected Publications:**

Shen H, Wang Y, Chen CY, Frencher J, Huang D, Yang E, Ryan-Payseur B, Chen ZW. Th17-related Cytokines



Contribute to Recall-like Expansion/effector Function of HMBPP-specific V $\gamma$ 2V $\delta$ 2 T Cells after Mycobacterium Tuberculosis Infection or Vaccination. *Eur J Immunol*. 2015 Feb;45(2):442-51

**Frencher JT**, Ryan-Passeyur BK, Huang D, Wang RC, McMullen PD, Letvin NL, Collins WE, Freitag NE, Malkovsky M, Chen CY, Shen L, Chen ZW. SHIV antigen immunization alters patterns of immune responses to SHIV/malaria coinfection and protects against life-threatening SHIV-related malaria. *J Infect Dis*. 2013 Jul 15;208(2):260-70.



### **Robert Hicks, MD**

**2015–2016** PGY1, Scripps Mercy Hospital, San Diego, CA

**MD 2015** Albert Einstein College of Medicine, Bronx, NY

### **Honors and Awards:**

**2014** Alpha Omega Alpha

### **Research:**

**2014–2016** Abdominal Radiology VAMC, UCSF

**2014–2016** Abdominal Radiology, Ronald Reagan Medical Center, ULCA

### **Selected Publications:**

Hicks RM, Yee J, Ohliger M, Weinstein S, Kao J, Ikram N, Hope TA. Comparison of Diffusion-Weighted Imaging and T2-Weighted Single Shot Fast Spin-Echo: Implications for LI-RADS Characterization of Hepatocellular

Carcinoma. MRI. *Magn Reson Imaging*. 2016 Sep;34(7):915-21.

Thamtorawat S, Hicks RM, Yu J, Siripongsakun S, Lin WC, Raman S, McWilliams JP, Douek M, Bahrami S, Lu DS. Preliminary Outcome of Microwave Ablation of Hepatocellular Carcinoma: Breaking the 3-cm Barrier? *J Vasc Interv Radiol*. 2016 May;27(5):623-30.

Hicks RM, Padayatchi N, Shah NS, Wolf A, Werner L, Sunkari VB, O'Donnell MR. Malnutrition Associated with Treatment Outcome and Death in MDR-TB and HIV Co-infected Children. *Int J Tuberc Lung Dis*. 2014 Sept; 18(9):1074-1079



### **Jessica Hightower, MD**

**2015–2016** PGY1, Santa Clara Valley Medical Center, San Jose, CA

**MD 2015** University of Pennsylvania, Perelman School of Medicine, Philadelphia

### **Honors and Awards:**

**2015** Marc Levine Radiology Research Prize, University of Pennsylvania, School of Medicine, Philadelphia

### **Research:**

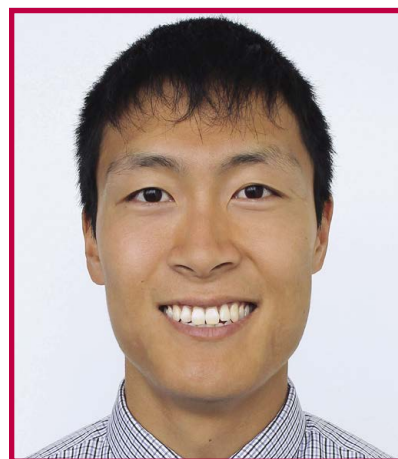
**2014–2015** Interventional Radiology, UCSF

**2014–2015** Hospital of the University of Pennsylvania, Radiology, Philadelphia

### **Selected Publications:**

Hightower JS, Amadi C, Den E, Schmitt JE, Shah RM, Miller WT Jr. Back to the Future: Sagittal CT in the Evaluation of COPD. *Eur Radiol*. 2016 Aug;26(8):2730-9.

Hightower JS, Taylor AG, Ursell PC, LaBerge JM. The Chiari Network: a Rare Cause of Intracardiac Guide Wire Entrapment. *J Vasc Interv Radiol*. 2015 Apr;26(4):604-6.



### **Jonathan Jo, MD**

**2015–2016** PGY1, St. Vincent's Medical Center, Bridgeport, CT

**MD 2015** Weill Cornell Medical College, New York, NY

### **Honors and Awards:**

**2008** Tau Beta Pi: National Engineering Honor Society

### **Research:**

**2013–2014** Research Fellow, Hospital for Special Surgery, New York, NY

### **Selected Publications:**

Jo JE, Miller AO, Cohn MR, Nemani VM, Schneider R, Lebl DR. Evaluating the Diagnostic Yield of Computed Tomography-Guided Aspirations in Suspected Post-operative Spine Infections. *HSS J*. 2016 Jul;12(2):119-24.

Hegde V, Jo JE, Andreopoulou P, Lane JM. Effect of Osteoporosis Medications on Fracture Healing. *Osteoporos Int*. 2016 Mar;27(3):861-71.



**Kathleen Kinzer, MD**

**2015–2016** PGY1, Presence Resurrection Medical Center, Chicago, IL

**MD 2015** University of Illinois College of Medicine, Chicago

**Research:**

**2009–2011** Islet Transplantation Lab, University of Illinois, Chicago

**Selected Publications:**

Guilianotti P, Gorodner V, Sbrana F, Tzvetanov I, Jeon H, Bianco F, Kinzer K, Oberholzer J, Benedetti E. Robotic Transabdominal Kidney Transplantation in a Morbidly Obese Patient. *Am J Transplant.* 2010 Jun;10(6):1478-82.

Oberholzer J, Kinzer K, Fiorina P. The Anti-LFA-1 Trial in Islet Transplantation. *Am J Transplant.* 2010 Aug;10(8):1725-6.

Wang Y, Lo J, Mendoza-Elias J, Adewola A, Harvat T, Kinzer K, Lee D, Qi M, Eddington D, Oberholzer J. Application of Microfluidic Technology to Pancreatic Islet Research: First Decade Endeavor. *Bioanalysis.* 2010 Oct; 2(10): 1729-44.



**Ryan Navarro, MD, MS**

**2015–2016** PGY1, Saint Mary's Medical Center, San Francisco, CA

**MD 2015** Georgetown University School of Medicine, Washington, DC

**MS 2011** Georgetown University School of Medicine, Washington, DC

**Honors and Awards:**

**2014** Alpha Omega Alpha

**Research:**

**2013–2015** Department of Infectious Disease, Georgetown University Medical Center, Washington, DC

**Selected Publications:**

Rohlfing J, Navarro R, Maniya OZ, Hughes BD, Rogalsky DK. Medical Student Debt and Major Life Choices other than Specialty. *Med Educ Online.* 2014 Nov 11;19:25603.

Shivapurkar N, Mikhail S, Navarro R, et al. Decrease In Blood miR296 Predicts Chemotherapy Resistance and Poor Clinical Outcome in Patients Receiving Systemic Chemotherapy For Metastatic Colon Cancer. *Int J Colorectal Dis.* 2013 Jun;28(6):887.



**Kesav Raghavan, MD**

**2015–2016** PGY1, Kaiser Permanente, San Francisco, CA

**MD 2015** Harvard Medical School, Boston, MA

**Honors and Awards:**

**2012** Medical Student Research Scholar, Foundation for Consortium of Multiple Sclerosis Centers

**Research:**

**2014–2015** Stanford University School of Medicine, CA, Department of Radiology

**2012–2015** Partners Multiple Sclerosis Center, Brigham and Women's Hospital, Boston, MA

**Selected Publications:**

Hacein-Bey L, Varelas PN, Ulmer JL, Mark LP, Raghavan K, Provenzale JM. Imaging of Cerebrovascular Pathology in Pregnancy and the Puerperium. *AJR Am J Roentgenol.* 2016 Jan;206(1):26-38

Raghavan K, Jeffrey RB, Patel BN, DiMaio MA, Willmann JK, Olcott EW. MDCT Diagnosis of Perineural Invasion Involving the Celiac Plexus in Intrahepatic Cholangiocarcinoma: Preliminary Observations and Clinical Implications. *AJR Am J Roentgenol.* 2015 Dec;205(6):W578-84

Raghavan K, Healy BC, Carruthers RL, Chitnis T. Progression Rates and Sample Size Estimates for PPMS Based on the CLIMB Study Population. *Mult Scler.* 2015 Feb;21(2):180-8.



### **Jae Ho Sohn, MD, MS**

**2015–2016** PGY1, Santa Clara Valley Medical Center, San Jose, CA

**MD 2015** Geisel School of Medicine at Dartmouth, Hanover, NH

**MS 2010** Johns Hopkins University, Baltimore, MD

#### **Honors and Awards:**

**2011** Certificate of Merit Award, Radiology Society of North America

#### **Research:**

**2014–2015** Johns Hopkins Hospital, Baltimore, MD, Department of Radiology

#### **Selected Publications:**

Fleckenstein FN, Schernthaner RE, Duran R, Sohn JH, Sahu S, Zhao Y, Hamm B, Gebauer B, Lin M, Geschwind JF, Chapiro J. 3D Quantitative Tumour Burden Analysis in Patients With Hepatocellular Carcinoma before TACE: Comparing Single-Lesion Vs. Multi-Lesion Imaging Biomarkers as Predictors of Patient Survival. *Eur Radiol*. 2016 Sep;26(9):3243-52.

Tacher V, Duran R, Lin M, Sohn JH, Sharma KV, Wang Z, Chapiro J, Gacchina Johnson C, Bhagat N, Dreher MR, Schäfer D, Woods DL, Lewis AL, Tang Y, Grass M, Wood BJ, Geschwind JF. Multimodality Imaging of Ethiodized Oil-loaded Radiopaque Microspheres during Transarterial Embolization of Rabbits

with VX2 Liver Tumors. *Radiology*. 2016 Jun;279(3):741-53

Tacher V, Duran R, Lin MD, Yarmohammadi H, Lee H, Chapiro J, Chao M, Wang Z, Frangakis C, Sohn JH, Maltenfort MG. Comparison of Existing Response Criteria in Hepatocellular Carcinoma with a 3D Quantitative Approach. *Radiology*. 2016 Jan;278(1):275-8



### **Daniel Treister, MD**

**2015–2016** PGY1, Huntington Memorial Hospital, Pasadena, CA

**MD 2015** Keck School of Medicine—University of Southern California, Los Angeles

#### **Honors and Awards:**

**2015** Alpha Omega Alpha

#### **Research:**

**2013–2016** University of Southern California, Department of Neuroradiology

#### **Selected Publications:**

Treister DS, Kingston SE, Hoque KE, Law EM, Shiroishi MS. Multimodal Magnetic Resonance Imaging Evaluation of Primary Brain Tumors. *Semin Oncol*. 2014 Aug;41(4):478-95.

Lee C, Chalmers B, Treister D, Adhya S, Godwin B, Ji L, Groshen S, Grant E. Thyroid Lesions Visualized On CT: Sonographic And Cytopathologic Correlation. *Acad Radiol*. 2015 Feb;22(2):203-9.



### **Maya Vella, MD**

**2015–2016** PGY1, California Pacific Medical Center, San Francisco

**MD 2015** University of California, San Francisco

#### **Honors and Awards:**

**2011–2015** Regent's Scholarship, UCSF

#### **Research:**

**2012–2016** UCSF Department of Radiology and Biomedical Imaging

#### **Selected Publications:**

Amans MR, Vella M, Cooke DL, Narvid J, Dowd CF, et al. Angiographic Collateral Score as an Independent Predictor of Clinical Outcome and Contrast Staining in Acute Large Vessel Ischemic Stroke. *Austin J Cerebrovasc Dis & Stroke*. 2015;2(2): 1036.

Webb EM, Vella M, Straus CM, Phelps A, Naeger DM. (2015). Interpretive Versus Noninterpretive Content in Top-Selling Radiology Textbooks: What Are We Teaching Medical Students? *Acad Radiol*. 2015 Apr 22(4),520-526.

Amans MR, Cooke DL, Vella M, Dowd CF, Halbach VV, Higashida RT, & Hettis SW. (2014). Contrast Staining on CT after DSA in Ischemic Stroke Patients Progresses to Infarction and Rarely Hemorrhages. *Interv Neuroradiol*. 2014 Jan-Feb;20(1):





**Shrilakshma Vyas, MD**

**2015–2016** PGY1, Kaiser Permanente, Santa Clara, CA

**MD 2015** Duke University School of Medicine, Durham, NC

**Honors and Awards:**

**2014** RSNA Medical Student Grant

**2007** National Merit Scholarship

**Research:**

**2013–2016** Duke University School of Medicine, Radiology Department

**2008–2011** University of California, Berkeley, Department of Molecular and Cell Biology, Neuroscience

**Selected Publications:**

Takahashi DK, Gu F, Parada I, Vyas S, Prince DA. Aberrant Excitatory Rewiring of Layer V Pyramidal Neurons Early after Neocortical Trauma. *Neurobiol Dis.* 2016 Jul;91:166–81.

Blankenship AG, Hamby AM, Firl A, Vyas S, Maxeiner S, Willecke K, Feller MB. The Role of Neuronal Connexins 36 and 45 in Shaping Spontaneous Firing Patterns in the Developing Retina. *J Neurosci.* 2011 Jul 6;31(27):9998–10008.



**Alexandra Wright, MD**

**2015–2016** PGY1, MedStar Harbor Hospital, Baltimore, MD

**MD 2015** University of Maryland School of Medicine, Baltimore, MD

**Honors and Awards:**

**2014** Alpha Omega Alpha

**2014** Gold Humanism Honors Society, University of Maryland School of Medicine

**Research:**

**2010–2011** Johns Hopkins Hospital, Department of Neurology, Movement Disorders Center, Baltimore MD

**Selected Publications:**

Dorsey, Ray, MD, Alexandra Gangler, BA and Kevin Biglan, MD, MPH. Telemedicine: Providing Patient Centered PD Care Anywhere. *American Parkinson Disease Association*, Winter 2011.



## Diagnostic Radiology Residents: 2016–2017

### **Second-Year Residents (PGY3)**

Colin Burke, MD  
Andrew Callen, MD  
Maureen (Molly) Chapman, MD  
John Colby, MD, PhD  
Adam Coy, MD  
Kirema Garcia-Reyes, MD  
Yilun Koethe, MD  
Benjamin Laguna, MD  
Courtney Lawhn Heath, MD  
Aaron Losey, MD, MS  
Bryce Merritt, MD  
Ashley Oladipo, MD  
Yujie Qiao, MD  
Adam Schwertner, MD

### **Third-Year Residents (PGY4)**

Matthew Barkovich, MD  
Lindsay Busby, MD, MPH  
Kevin Connolly, MD  
Ason Curtis, MD  
Emily Edwards, MD  
Michael Heller, MD  
Neeta Kannan, MD  
Russell Kelley, MD  
Mai Le, MD  
Joseph Leach, MD, PhD  
Patrick Mulligan, MD  
Adi Price, MD  
Daniel Sonshine, MD

### **Fourth-Year Residents (PGY5)**

Deddeh Ballah, MD  
Micky Cabarrus, MD  
Billy Carson, MD  
Kavi Devulapalli, MD  
Luis Gutierrez, MD  
Daniel Hendry, MD  
Michael Holmes, MD  
Brandon Ishaque, MD  
Eric Jordan, MD  
Spencer Lake, MD  
Zhixi Li, MD  
Hari Trivedi, MD  
Vanja Varenika, MD  
Jennifer Wan, MD

## Radiology Residency Graduates: Class of 2016

Congratulations to our 2016 graduates. We wish them success in their new fellowship positions.

### Residents in Diagnostic Radiology

**Mariam S. Aboian, MD, PhD**  
Fellowship, Neuroradiology, UCSF

**Vignesh A. Arasu, MD**  
Fellowship, Abdominal Imaging/  
Breast Imaging, UCSF

**Eric C. Ehman, MD**  
Fellowship, Gastrointestinal/Genito-  
urinary Imaging, Mayo Clinic, Roch-  
ester, MN

**Kimberly G. Kallianos, MD**  
Fellowship, Cardiac and Pulmonary  
Imaging, UCSF

**Rahi J. Kumar, MD**  
Fellowship, Abdominal Imaging/  
Breast Imaging, UCSF

**Yi Li, MD**  
Fellowship, Neuroradiology, UCSF

**Scott R. Mahanty, MD**  
Fellowship, Musculoskeletal Radiol-  
ogy, New York University, NY

**Hugh C. J. McGregor, MD**  
Fellowship, Vascular Interventional  
Radiology, UCSF

**Christopher A. Mutch, MD, PhD**  
Fellowship, Neuroradiology, UCSF

**Hriday Shah, MD**  
Fellowship, Vascular Interventional  
Radiology, UCSF

**Christopher J. Starr, MD, PhD**  
Fellowship, Neuroradiology, UCSF

**Javier Villanueva-Meyer, MD**  
Fellowship, Neuroradiology, UCSF

**Genevieve A. Woodard, MD, PhD**  
Fellowship, Breast Imaging, UCSF

**Melinda Jean Yeh, MD**  
Fellowship, Abdominal Imaging/  
Breast Imaging, UCSF

### Resident in Nuclear Medicine

**Lorenzo Nardo, MD**  
MD University of Brescia, Italy  
Fellowship, Oncological Imaging,  
Memorial Sloan Kettering Cancer  
Center, New York, NY



(l-r) Graduating Nuclear Medicine Resident Lorenzo Nardo, MD with graduating Nuclear Medicine Fellow Robert Flavell, MD, PhD



2016 Diagnostic Radiology Residency Graduates (l-r back row) Hriday Shah, MD, Javier Villanueva-Meyer, MD, Christopher Mutch, MD, PhD, Eric Ehman, MD, Hugh McGregor, MD, Scott Mahanty, MD, Chair, Ron Arenson, MD (l-r front row) Residency Director Soonmee Cha, MD, Jean Yeh, MD, Kimberly Kallianos, MD, Genevieve Woodard, MD, PhD, Raji Kumar, MD, Yi Li, MD, Mariam Aboian, MD, PhD, Vignesh Arasu, MD

## Clinical Fellows and Instructors: 2016–2017

### **Clinical Fellows:**

Mariam Aboian, MD, PhD  
*Neuroradiology/T32*

Fouad Al Adel, MBBS  
*Abdominal Imaging*

Matthew Alexander, MD  
*Neurointerventional*

Vignesh Arasu, MD  
*Abdominal Imaging/Breast Imaging*

Jeffrey Bonham, MD  
*Musculoskeletal*

Amy Chen, MD  
*Neuroradiology*

Henry Chow, DO  
*Abdominal Imaging*

Michael Coords, MD  
*Musculoskeletal*

Naznin Daginawala, MD  
*Ultrasound/Breast Imaging*

Robert Darflinger, MD  
*Neuroradiology*

Elliot Dickerson, MD  
*Neuroradiology*

Paul Haste, MD  
*Interventional*

Nicole Hughes, MD  
*Pediatrics*

Eugene Huo, MD  
*Abdominal Imaging*

Kimberly Kallianos, MD  
*Cardiac and Pulmonary Imaging*

Ari Kane, MD  
*Neuroradiology*

Kambrie Kato, MD  
*Pediatrics*

William Kerridge, MD  
*Abdominal Imaging*

Clark Kholeif, MD  
*Abdominal Imaging*

Donald Kim, DO  
*Abdominal Imaging/Ultrasound*

Jane Kim, MD  
*Ultrasound/Breast Imaging*

Anna Knobel, MD  
*Breast Imaging*

Rahi Kumar, MD  
*Abdominal Imaging/Breast Imaging*

Jennifer Lee, MD  
*Abdominal Imaging*

Kristen Lee, MD  
*Interventional*

Nicholas Leslein, MD  
*Abdominal Imaging*

Yi Li, MD  
*Neuroradiology*

Zachary Liner, MD  
*Neurointerventional*

Hugh McGregor, MD  
*Interventional*

Christopher Mutch, MD, PhD  
*Neuroradiology*

Andrew Nicholson, MD  
*Neurointerventional*

Tejas Patel, MD  
*Ultrasound/Breast Imaging*

Sam Payabvash, MD  
*Neuroradiology*

Cyrus Raji, MD, PhD  
*Neuroradiology/T32*

Michael Redd, DO  
*Musculoskeletal*

Andrew Roberts, MD  
*Musculoskeletal*

Hriday Shah, MD  
*Interventional*

Sujay Sheth, MD  
*Ultrasound/Breast Imaging*

Christopher Starr, MD, PhD  
*Neuroradiology*

Elizabeth Tong, MD  
*Neuroradiology/T32*

Javier Villanueva-Meyer, MD  
*Neuroradiology*

Graham Wallace, MD  
*Cardiac and Pulmonary Imaging*

Genevieve Woodward, MD, PhD  
*Breast Imaging*

Jean Yeh, MD  
*Abdominal Imaging/Breast Imaging*

Thomas Yohannan, MD  
*Nuclear Medicine*

Jeanie Zhang, MD  
*Abdominal Imaging/Ultrasound*

### **Clinical Instructors:**

Daniel Chow, MD  
*Neuroradiology*

Rahul Desikan, MD, PhD  
*Neuroradiology*

Rebecca Dumont Walter, MD  
*Neuroradiology*

Xin (Cynthia) Wu, MD  
*Neuroradiology*

## Master of Science in Biomedical Imaging Now 5 Years Old

Five classes, and more than 75 students have now matriculated through the Master of Science in Biomedical Imaging (MSBI) program. The 19 members of the class of 2017 are already in the classroom and the imaging suites, and applications for the 2017–18 academic year are open. The MSBI program attracts many students from University of California programs, and a healthy mix of out-of-state and international students. Their undergraduate experiences vary, but the MSBI program is designed to rapidly bring them up to speed on the scientific underpinnings of medical imaging technologies.

The MSBI faculty features 14 professors from the department, under the leadership of Program Director David Saloner, PhD, and Director of Graduate Studies Alastair Martin, PhD. Guest lectures from clinical faculty are common and give the students a much-appreciated perspective on how imaging technology is applied in the clinical setting. Program administration for the 2015–16 class was handled by Rukayah Abdolcader and Melinda Parangan-Chu, who guided the students through from the initial application process to graduation.

### Classroom Learning Supports Hands-On Experiences

The MSBI program core courses deliver in-depth training in the principles of in-vivo imaging modalities. Students also choose from a wide set of electives related to imaging applications for major diseases and different organ systems.

The program covers all major medical imaging technologies, as well as topics such as Image Processing and Research Study Design.

Following their coursework, students bring the various elements of their learning together in applied research projects, working with faculty supervisors or as interns with industry partners. MSBI students benefit from the department's wide range of state-of-the-art imaging facilities. The students consistently report that the hands-on activities, where they get to operate and perform experiments using these imaging systems, are the highlight of the MSBI program.

A high percentage of MSBI students remain through the summer academic quarter to apply their newly honed skills on a wide range of research projects under the supervision of UCSF faculty. These projects culminate in an MSBI imaging symposium, held in late August, that highlights the students' research accomplishments.

### MBSI Graduates Move On

Our graduates have been exceptionally successful. Seventeen have continued on to medical school and another 12 have entered PhD programs. Others have continued the research work they began as a student in labs throughout the department or have moved on to industry opportunities. We are particularly proud of Naeim Bahrami, MSBI 13 and Yi-Shin Chang, MSBI 13, who swept the awards at the 2016 meeting of the American Society of Functional Neuroradiology.



UCSF MSBI Class of 2016. From left to right: David Saloner, PhD, Sizhe Wang, Kevin Chiang, Benjamin Yang, Joanne Lau, Joshua Fisher, Kiersten Snyder, Alan Zhu, Vishal Samboju, Joseph Chen, Bryant Chee, Nathan Poulin, Catherine Fu, Wesley Kuo, Jiajing Xu, Alastair Martin, PhD, AJ Schottstaedt (Not pictured: Nikhil Deveshwar, Ty Lai, Grace Park, Joy Yeh, James Zhang).

ELISABETH FALL PHOTOGRAPHY



## Goldberg Center

We've had an especially busy year at the Goldberg Center for Advanced Imaging Education, once again full of changes and innovations.

Perhaps the biggest change is our new location. After more than a year of planning, the Goldberg Center moved into a new, expanded and modern space on the second floor of the Medical Sciences building on the Parnassus Campus. The expanded center now serves as a physical headquarters for many of the educational missions of the Department of Radiology and Biomedical Imaging. Brand new classrooms were built for both the Diagnostic Radiology residents and the department's medical student programs. The new Goldberg Center also brings together the administrative offices for the medical student, residency and fellowship education programs in a single physical location. The facility features a new computer lab, meeting rooms and space for career advising.

After several years of hard work, UCSF has launched an entirely new curriculum for the School of Medicine. The new Bridges curriculum, funded by a \$1 million grant from the American Medical Association, is intended to fundamentally transform our approach to medical education and train "21st century physicians" able to work within complex medical systems to improve healthcare and advance science for future generations of patients. The Goldberg center Co-Directors David Naeger, MD, and Emily Webb, MD, participated in the development of a new, required radiology curriculum that will teach all medical students the fundamentals of proper imaging utilization. Read more in the news release at <https://www.ucsf.edu/news/2016/08/403791/ucsf-launches-medical-school-curriculum-21st-century>.



A spacious classroom in the Goldberg Center.



The Goldberg Center opening: (l-r) Ron Arenson, MD, Janet Goldberg and Goldberg family members.

### Kudos to Committee Members and Staff Members

The faculty and resident members of the Medical Student Education Committee supervise the Goldberg Center's medical student programs. Our resident representatives include Michael Heller, MD, our new Resident Liaison for Medical Student Education, and Spencer Lake, MD, who remains on the committee after completing his liaison year as the new Resident Director for the Radiology Primer elective. In addition to Naeger and Webb, faculty members include Andrew Phelps, MD, Brett Elicker, MD, Vickie Feldstein, MD, Stefanie Weinstein, MD, Lynne Steinbach, MD, Miles Conrad, MD, Elissa Price, MD, Judy Yee, MD, and Khai Vu, MD.

Many UCSF faculty, volunteer faculty, fellows and residents give generously of their time in our programs. We, and the UCSF medical students who benefit directly from their contributions and time, truly appreciate their efforts.

For more information about the Goldberg Learning Center's activities, please contact Bren Ahearn (Brendan. Ahearn@ucsf.edu) or visit [radiology.ucsf.edu/education/medical-students](http://radiology.ucsf.edu/education/medical-students).

*The Henry I. Goldberg Center for Advanced Imaging Education is the headquarters for all medical student education in the Department of Radiology and Biomedical Imaging. The Center oversees radiology instruction in the pre-clinical core curriculum, provides imaging workshops during clinical clerkships, offers a variety of radiology electives spanning both clinical applications of Radiology and imaging research, and offers career advising and mentoring to UCSF medical students.*

## Radiology CME

### Highlights

With more than 100 people attending, the December 2015 Imaging Warm-Up in the Caribbean, held at the Marriott Los Sueños in Costa Rica, was an overwhelming success. Chaired by Jesse Courtier, MD, other faculty in attendance included Ron Zagoria, MD, FACR; Andrew Phelps, MD; Maureen Kohi, MD; and Mike Hope, MD.

### What to Look Forward to in 2017

In 2017 we'll continue to offer our signature courses in Kona, Hawaii, along with many other CME opportunities in the Bay Area. Please visit our website ([radiology.ucsf.edu/cme/upcoming](http://radiology.ucsf.edu/cme/upcoming)) to see a complete listing of CME offerings or refer to the calendar published here in Images.

The **Annual Review** course will be held at the JW Marriott Hotel in San Francisco Union Square March 20–24, 2017. This comprehensive review course continues to attract a vast number of practicing radiologists. It offers a unique opportunity for a detailed review of all systems and modalities, presented by world-renowned UCSF Radiology faculty. You can earn more than 20 self-assessment SAM-CME credits at this course, an efficient way to satisfy your ABR continuous certification requirements with us.

Our Summer CME course in Bermuda returns to the Fairmont Southampton July 2–7, 2017. Hope to see you there.

Our newest course, designed for general radiologists, will take place in the Canadian Rockies! Mark your calendars and book your travel to the Fairmont Banff on July 30–August 4, 2017.

We'll also return Down Under! We are planning another exciting program for practicing radiologists September 11–15, 2017 at the Four Seasons Sydney in Australia. G'day mate, we hope you'll join us there.

In the fall, we'll be returning to two popular destinations: Maui and Costa Rica. The first course will be held on October 22–27, 2017 at the Hyatt Regency, Maui Resort and Spa. The second one will be December 3–8, 2017 at the Marriott Los Sueños. How do you want your CME—"Aloha" or "Pura Vida" style?

### Save When Attending UCSF Courses

We reward loyal customers for attending our courses. The **UCSF Radiology CME Loyalty Program** offers three reward levels: Silver, Gold, and Platinum. Respectively, they offer 10%, 20%, or 30% off registration fees for EVERY course attended. You may learn more about the UCSF Radiology CME Loyalty Program at [radiology.ucsf.edu/cme/loyalty\\_program](http://radiology.ucsf.edu/cme/loyalty_program).

We hope to see you at future CME courses!



ETHAN ROHLOFF

Panoramic view of the Opera House and Sydney Harbour Bridge, New South Wales, Australia.

# 2017 UCSF Radiology Continuing Medical Education Calendar

## **Breast Imaging & Optional Mini-Course**

January 8–13, 2017

Fairmont Orchid, Kona, HI

## **Practical Body Imaging**

January 15–20, 2017

Fairmont Orchid, Kona, HI

## **Thoracic Imaging**

January 29–31, 2017

Omni Rancho Las Palmas Resort, Palm Springs, CA

## **Abdominal & Pelvic Imaging**

February 1–3, 2017

Omni Rancho Las Palmas Resort, Palm Springs, CA

## **Neuro & Musculoskeletal Imaging**

February 12–17, 2017

RAD17022

Course Director: Lynne Steinbach, MD;

Christopher Hess, MD, PhD

Fairmont Orchid, Kona, HI

## **Virtual Colonoscopy Workshop**

February 23–25, 2017

RAD17B10

Course Director: Judy Yee, MD

UCSF China Basin Center, San Francisco, CA

## **Prostate Cancer Imaging with Hands-on Workshops**

March 9–10, 2017

UCSF Campus, San Francisco, CA

## **UCSF Radiology Annual Spring Review**

March 20–24, 2017

JW Marriott Hotel, San Francisco, CA

## **Sonography for Sonographers**

April 29, 2017

UCSF Campus, San Francisco, CA

## **Virtual Colonoscopy Workshop**

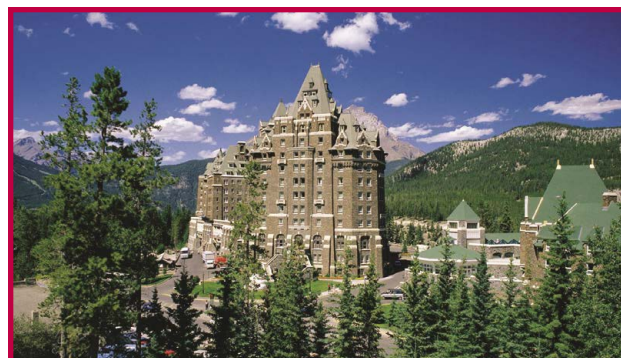
June 1–3, 2017

UCSF China Basin Center, San Francisco, CA

## **Imaging in Bermuda**

July 2–7, 2017

Fairmont Southampton, Southampton, Bermuda



The historic Fairmont Banff Springs in the summer.

## **Imaging in the Canadian Rockies**

July 30–August 4, 2017

Fairmont Banff Springs, Calgary, Alberta, Canada

## **UCSF Radiology Clinical Highlights**

August 21–25, 2017

JW Marriott Hotel, San Francisco, CA

## **Imaging Update in Australia**

(with optional Virtual Colonoscopy)

September 11–15, 2017

Four Seasons, Sydney, Australia

## **Virtual Colonoscopy Workshop**

October 5–7, 2017

UCSF China Basin Center, San Francisco, CA

## **Imaging Update on Maui**

October 22–27, 2017

Hyatt Regency Maui Resort & Spa, Lahaina, Maui, HI

## **Breast Imaging Update**

November 9–11, 2017

Omni Rancho Las Palmas Resort, Palm Springs, CA

## **Ultrasound Update**

November 12–13, 2017

Omni Rancho Las Palmas Resort, Palm Springs, CA

## **Imaging Warm-Up in Costa Rica**

December 3–8, 2017

Marriott Los Sueños Ocean Resort, Costa Rica

### **FOR FURTHER INFORMATION PLEASE CONTACT:**

UCSF Radiology Continuing Medical Education

Telephone: 415-476-5731 E-mail: [cme@radiology.ucsf.edu](mailto:cme@radiology.ucsf.edu) Website: [radiology.ucsf.edu/cme](http://radiology.ucsf.edu/cme)

Course dates, locations and course titles are subject to change prior to brochure publication.



## Margulis Society Celebrates on March 4

The Department of Radiology and Biomedical Imaging has a long-standing tradition of bringing together current trainees, alumni and friends at the annual Margulis Society gala. Next year, that will happen Saturday, March 4, at the Olympic Club Lakeside. The 2017 event will be special for two reasons. First, will be a wonderful opportunity for colleagues, friends, faculty and trainees to spend a fun-filled evening with retiring Department Chair Ron Arenson, MD. Second, this will be the first Margulis Society Sollitto Gala named in honor of Richard A. Sollitto, MD, longtime president of the Margulis Society who passed away in 2012. We look forward to seeing you!

### 2016 Activities

#### Alumnus Lecture

On March 23, 2016, Michael P. Federle, MD, gave the Alumnus Lecture, a biennial presentation that brings a notable graduate back to UCSF. Federle provided insight on the "Use of Decision-Support Tools in Radiology: Adding Value to Our Reports." His lecture highlighted how clinical decision-support tools such as UpToDate, Google Scholar and

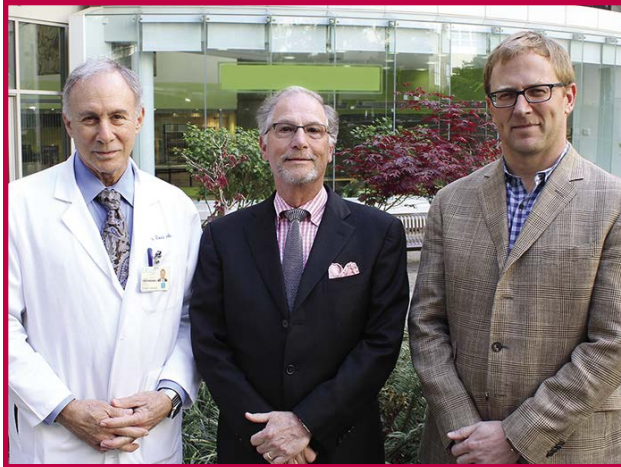
STATdx can make a critical difference in arriving at a specific and clinically useful interpretation of imaging studies. He discussed what constitutes a "good radiology report" and avoiding medico-legal trouble.

Dr. Federle noted that the goal of these tools is to help radiologists at the "point of care"—the interpretation and reporting of an imaging study. When faced with a difficult case, decision-support tools such as computer-based information systems can be useful. Federle emphasized that decision-support tools are not the same thing as computer-assisted diagnosis.

Federle has been a professor and the associate chair for education at Stanford University since 2008. Prior to his current position, he was a professor at the University of Pittsburgh Medical Center, serving in several leadership positions: chief for quality and process improvement (2008), director of Abdominal Imaging (1992–2008), and department chairman (1989–1992). Previously, he served as a vice-chairman in the UCSF Department of Radiology (1984–1989) and chief of medical staff at SFGH (1987–88.) He completed his fellowship in abdominal imaging at UCSF.



Resident and Fellow Career Evening 2016: (l–r) back row: Drs. David Avrin, Spencer Behr, Bill Dillon, and Erik Gaensler. Front row: Drs. Soonmee Cha, Ramin Saket, Ying Fung and Christopher Schultz.



Margulis Alumnus Lecture 2016: (l-r) Ron Arenson, Michael Federle, and Derk Purcell.

### Research Awards

In June, two senior residents, Yi Li, MD, and Kimberly Kallianos, MD, received the Margulis Society Outstanding Resident Research Awards for their work. The committee noted their “scientific productivity” and the high quality of their research.

### Career Conference

More than 40 trainees from the Department attended the September 27 Career Conference for residents and fellows. UCSF academic speakers discussed the various academic tracks at UCSF. Speakers from Bay Area private practice groups provided insight on their practice structures, how hiring works in their groups, and non-negotiable vs. negotiable items in contracts.



ELISABETH FALL PHOTOGRAPHY

Resident Research Award Presentation: (l-r) Board President Derk Purcell, MD, awardees Kimberly Kallianos, MD and Yi Li, MD, with Chair Ron Arenson, MD.

### Research Grants Awarded

The Margulis Society is pleased to support junior researchers with grants to fund their work. In October 2016, the Society awarded research grants to two UCSF Radiology and Biomedical Imaging trainees. Matthew Barkovich, MD, a PGY4 resident, was selected for his project on “Characterizing Ventricular Morphology, Neural Networks, and CSF Flow in Pediatric Hydrocephalus.” Eugene Huo, MD, an Abdominal Imaging fellow, was selected for his project on “Optimization and Clinical Application of Intravoxel Incoherent Motion Diffusion-Weighted MRI to Evaluate and Predict Hepatocellular Carcinoma Response to Transarterial Chemoembolization.”

## Margulis Society Board of Directors

### President:

Derk D. Purcell, MD

### Immediate Past-President:

James S. Chen, MD, PhD

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Soonmee Cha, MD  
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Volney F. VanDalsem, III, MD  
Benjamin M. Yeh, MD

### Fellow Representative:

Javier Villanueva-Meyer, MD

### Resident Representatives:

Alexandra Wright, MD—PGY2  
Benjamin Laguna, MD—PGY3  
Phelps Kelley, MD—PGY4  
Luis Gutierrez, MD—PGY5

## The Honor Roll of Donors

The Margulis Society and the Department of Radiology and Biomedical Imaging gratefully acknowledge the following donors for their generous contributions. This list reflects gifts made between July 1, 2015 and June 30, 2016.

Ashley Aiken, MD	Lawrence E. Crooks, PhD*
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Nathaniel A. H. Chuang, MD	Lawrence P. Harter, MD
Fergus V. Coakley, MD	N. Paul Herman, MD
Cirrelda Cooper, MD	Christopher P. Hess, MD, PhD*
Nick G. Costouros, MD	Steven W. Hetts, MD*
Geoffrey I. Criqui, MD	Daniel R. Hightower, MD
Cathy Ann Cronin-Pastrano, RT	Donna Hoghooghi, MD

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\*Donation of \$1000 or more



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 Stephanie Hou, MD  
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 John C. Hunter, MD  
 Nazia F. Jafri, MD  
 Pamela S. Jensen, MD  
 Peter J. Julien, MD  
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 S. Douglas Wing, MD  
 Dorota J. Wisner, MD  
 Alvin John Yamamoto, MD  
 Benjamin M. Yeh, MD

#### **Program and Innovations Fund**

Collin Ma, MD  
 Eugene T. Morita, MD,  
*in memory of Bruce Hasegawa, PhD*

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\*Donation of \$1000 or more

## Alumni News 2016

### 1973

**Gary Hungerford Baker, MD, Fortuna, Humboldt County, CA**, writes that he retired in February 2014. He celebrated his 50th Anniversary with “beautiful, smart, healthy Lynn Haigler Baker” on December 20, 2015. His daughter Jennifer McKay, Hollywood, MD, is returning to the work force now that grandchildren Katie and Nathan approach adulthood. Radiologist son (and past UCSF Neuroradiology Fellow), Brent Hungerford Baker, 44, is at Straub Clinic & Hospital, Honolulu, HI, and has a fiancée, Jennifer Elfalen, MIT engineer. Baker notes that he “bikes to the gym 3 x week, in good weather, and recently backpacked Cherry Creek Basin just above the north boundary of Yosemite National Park in September 2016 and has a ski trip to Mt Bachelor coming up.” He writes that: “It is amazing what a 2015 clean coronary angio can provoke, along with a fortuitous, partially-curative, fall onto my formerly painful low-back (violent self-chiropractic!).” He also notes that he is “enjoying re-acquaintance with teenage guitar playing and singing. Good family, friends and food. Lucky guy!”

### 1975

**S. Douglas Wing, MD, FACR, Provo, UT**, has “been retired for a few years, and this is a great phase of life. My wife Mary Ellen and I could not be enjoying so many things now if I had not had the marvelous opportunity to be a Radiology resident under the guidance of Dr. Margulis, and a Neuroradiology Fellow with Dr. Newton. I have very fond memories of my years at UCSF from 1972 to 1976. Mary Ellen and I lived in an apartment building near the junction of California Street and 21st Avenue, and it was easy to get to work from there. One embarrassing experience was that my favorite belt had a buckle that was the design of a marijuana leaf. Being an innocent Mormon boy, I thought it was a neat buckle, but had no idea what it really was. So naive!

“I will always consider the faculty members, residents, and fellows I worked with to be lifetime friends, and I hope they are doing well. Incidentally, I was a neuroradiology faculty member in Radiology Department at the University of Utah for five years following the San Francisco time. One of the fellows there was Bill Dillon. So, I feel like I paid UCSF back somewhat by supporting Bill’s desire to go to UCSF. Please say ‘hi’ to him for me.”

### 1982

**Ben Maurice Brown, MD**, and his wife moved to **Sausalito, CA** four years ago after he retired following a 26-year career



Ben M. Brown

as a neuroradiologist and MRI Section Chief at NW Kaiser Permanente in Portland, Oregon, where his primary professional activities focused on MRI brain spectroscopy, perfusion, fMRI, cardiac MRI and vascular CT/MRI. He also served on the OHSU Clinical Faculty in Radiology and Neurosurgery.

Now, he writes, “I have been managing a monthly car event called Biscotti and Cars and its photographic website ([www.biscottiandcars.com](http://www.biscottiandcars.com)) and serve on several boards of directors for the City of Sausalito and my condo association. My wife and I have a stable of seven cars that we use on driving events with the Ferrari, Mercedes and Porsche clubs. I also attend events sponsored by our local UC Alumni and Stanford Alumni associations. My wife and I take an annual September driving trip in Europe and are enthusiastic travel and automotive photographers. Our son, a second generation UC Berkeley graduate, lives in Oakland and had both a startup company analyzing climate change and a very successful band, Trails and Ways, which has gone on several national and international tours. My email is: [brownbenm@gmail.com](mailto:brownbenm@gmail.com).”

### 1984

**Shirley McCarthy, MD, PhD, New Haven, CT**, writes “I retired February 1, 2016 and am joyous.” McCarthy became a faculty member at Yale School of Medicine faculty following her UCSF fellowship in 1984.



Shirley McCarthy

## 1985

David L. Steinberg, MD, FACR, FACNM, Las Vegas, NV, is the managing partner of Steinberg Diagnostic Medical Imaging (SDMI) with “seven imaging centers located throughout the Las Vegas and Henderson area with an eighth to open in 2017.”



David and Betsi Steinberg.

## 1988,

Margaret (Peggy) Lynch, MD, Berkeley, CA, retired from Kaiser Oakland in September 2016.



Top row (l-r): Jim Chen, Tom Urbania, Bianca Carpentier, Jacques Jumper, Marianna Caponigro, David Wu, Chris Sonne, Mike Rizzo, Jeffrey Dieden. Bottom row (l-r): Krammie Chan, Gina Song, Shilpa Kumbhani, Peggy Lynch, Mary Patton (former UCSF medicine resident), Lisa Kinoshita, Paul Radosevich, Geoffrey Hastings

## 2002

Harold Litt, MD, PhD, Philadelphia, PA, will become chief of the Cardiothoracic Radiology Division at Penn Medicine in 2017 following the June retirement of Dr. Warren Gefter. Litt completed his residency at Penn, a Cardiothoracic Radiology fellowship at UCSF, and returned to Penn in 2002 to join the faculty there.

## 2004

Anthony (Tony) Filly, MD, Monterey, CA, sends a recent photo with his father, UCSF Professor Emeritus Roy Filly, MD.



Roy and Tony Filly

## 2009

Amita Kamath, New York, NY, sent an update: “I’ve recently returned to Mount Sinai Hospital in New York as an assistant professor of Radiology in the Abdominal Imaging Section after a year in Austin, TX, in private practice. I am happy to be back in academics and in NYC and look forward to reconnecting with UCSF radiology alumni in the area.”

## 2010

David M. Carlson, MD, Santa Barbara, CA sent an update: “We welcomed our third son, Sawyer, this month. We’re still in beautiful Santa Barbara and I stay busy at Santa Barbara Cottage Hospital and the Cancer Center of Santa Barbara.”



Sarah Jane and Dave with Sawyer, Wyatt and Noah

## 2012

Michael T. Lu, MD, Boston, MA, writes that he and spouse Susie Huang, MD, PhD “welcomed Anna and Benjamin to our family last year.” Michael and Susie are cardiovascular and neuroradiologists, respectively, at Massachusetts General Hospital. Michael is the 2015–2017 American Roentgen Ray Society Scholar.

## 2014

Akash Kansagra, MD, St. Louis, MO, joined the academic faculty of Mallinckrodt Institute of Radiology and Washington University School of Medicine as assistant professor of Radiology and Neurological Surgery.



Akash Kansagra (right) with Colin Derdeyn, MD, who he succeeded in the interventional neuroradiology group at MIR.

Anand Patel, MD, Irvine, CA, was recently promoted to chief of Interventional Radiology at the Providence Little Company of Mary Hospitals in Torrance and San Pedro, CA.

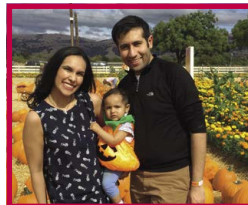
Nazima Kathiria, DO, sent an update along with a recent photo: “a lot of changes are brewing for us, as I will be leaving active duty service in the United States Navy in August 2017. At that point we will be moving to Grand Rapids, MI, where I will join the Advanced Radiology Services group as a cardiothoracic imager.”



Nazima Kathiria and family

## 2016

Lina Nayak, MD, Sunnyvale, CA, sent a family photo.



Lina Nayak with husband Paven Malhotra and one-year old daughter Ambika.



## Surbeck Young Investigators

The 10th Surbeck Young Investigator awards took place at UCSF's Mission Bay Campus on March 11. Three junior investigators, Llewellyn (Trey) Jalbert, PhD, Robert Flavell, MD, PhD, and Chloe Najac, PhD, presented their work to an audience of UCSF faculty and trainees. Sarah J. Nelson, PhD, director of the Margaret Hart Surbeck Laboratory for Advanced Imaging, Richard Gowen, PhD, president of the INDNJCF Foundation, and William P. Dillon, MD, executive vice chair of Radiology and Biomedical Imaging presided over the event. An award ceremony followed the presentations.



(l-r) Richard Gowen, INDNJCF Board President, Chair Ron Arenson MD, Third Place Awardee Chloe Najac, PhD, Vice-Chair, Bill Dillon, MD, First Place Awardee Llewellyn "Trey" Jalbert, PhD, Second Place Awardee Robert Flavell, MD, PhD, Surbeck Director Sarah Nelson, PhD and INDNJCF Foundation Members Nancy Gowen and Sharon McCauley.

### First Place Prize Awarded for Jalbert's Glioma Investigations

Trey Jalbert, PhD, received a first-place award for his research on "Magnetic Resonance Analysis of Malignant Transformation in Recurrent Glioma" (LE Jalbert, E Neill, JJ Phillips, JM Lupo, MP Olson, AM Molinaro, MS Berger, SM Chang, SJ Nelson).

Originally from Virginia, Jalbert has made the Bay Area his home for 10 years, receiving his PhD at UCSF/UC Berkeley. He notes that he sees "knowledge and education as powerful tools that can be put toward building healthy communities and scientific breakthroughs." Jalbert is a postdoctoral fellow in the Surbeck Laboratory. He also is the 2016 Hasegawa award winner.

### PET and 13C Tracer Development Investigations Earn Second Place Award

Robert Flavell, MD, PhD, earned a second place award for his research focused on new PET and hyperpolarized 13C tracer development for imaging acidic interstitial pH. His work has been performed in the laboratories of Drs. John Kurhanewicz and David Wilson. His award-winning research presentation described "Application of Goods Buffers to PH Imaging Using Hyperpolarized 13C MRI" (RR Flavell, C von Moreze, JE Blecha, CE Korechan, M Van Criekinge, R Sriram, JW Gordon, HY Chen, S Subramaniam, RA Bok, ZJ Wang, DB Vigneron, PE Larson, J Kurhanewicz, DM Wilson).

In his presentation he described his "efforts toward developing hyperpolarized 13C tracers with the goal of imaging acidic interstitial pH." Flavell was a clinical fellow in Nuclear Medicine in 2015–2016 and recently became an assistant professor in the Department of Radiology and Biomedical Imaging.

### Najac Earns Third Place Award

Chloe Najac, PhD, who was awarded the third place prize, notes that her work focuses on "the development and validation of novel magnetic resonance spectroscopy methods for the study of brain tumors." She says that she is "particularly interested in the use of hyperpolarized 13C magnetic resonance spectroscopy as a readout of the activity of tumor-associated cells and the inhibition of their activity in response to treatment."

Her presentation discussed "Detection of MDSC Function Using Hyperpolarized [6-13C]-arginine Magnetic Resonance Spectroscopy" (MM Chaumeil, G Kohanbash, C Guglielmetti, J Gordon, H Okada, SM Ronen).

*The Margaret Hart Surbeck Laboratory of Advanced Imaging is dedicated to advancing imaging techniques for biological and medical applications with the goal of improving the sensitivity and specificity of the data obtained for characterizing human diseases, selecting therapies and monitoring novel treatment paradigms for patients. The Surbeck Young Investigator Awards are funded through the INDNJCF Foundation.*

## Medical Staff Earn Awards



Teresita Roberts



Erick Byorwango



David (Lap Kong) Poon

The Department of Radiology and Biomedical Imaging has two awards that honor outstanding medical support staff for their caring contributions to patient care: The Sollitto Award honors the memory of Richard A. Sollitto, MD, a faculty member who cared deeply for all of the department's staff and patients. It is presented annually to an outstanding medical and administrative support staff member. The Lanna Lee Award honors a senior radiology technologist, Lanna Lee, who died on her way home from work in 1989 during the Loma Prieta earthquake. Lee was a role model for others, always working with a smile and delivering excellent care to her patients. Both are presented at the Department's annual holiday party in December.

**Teresita Roberts** received the 2016 Sollitto Award. Roberts is an administrative assistant who works at the front desk in the Ambulatory Care Center on Parnassus Avenue. In her nomination for the award it was noted that Roberts excels in being the "first impression of our department to our patients."

In presenting the award, Kathy Knoerl noted "Tess is a wonderful role model for great customer service. She greets and welcomes a diverse patient population to our department with friendliness and warmth and is conscientious about how our department provides our patients with a positive experience. Tess's initial encounter with the patient makes an easy transition for the time when the technologist or sonographer calls the patient. Patients are noticeably at ease when they are called for their exam."

**Erick Byorwango, RT**, who works in Diagnostic Radiology at Parnassus, was presented with the 2015 Lanna Lee Award. "Erick is a highly skilled senior radiologic technologist who promotes teamwork every day," noted Knoerl. "He consistently displays professionalism and a caring attitude. Erick has a warm welcoming smile on his face when he interacts with patients and staff regardless of their gender, ethnicity or socioeconomic status. He always listens to the opinions of others, and genuinely values their input." In 2015, Byorwango also received the UCSF Medical Center Pride Award, given to selected employees who consistently demonstrate the values of professionalism, respect, integrity, diversity and excellence in their work.

The American Registry of Radiologic Technologists (ARRT) established the "I am the Gold Standard" program in 2016. It recognizes registered technologists who consistently display excellence in their work and in the community.

**David (Lap Kong) Poon, RT (R)(ARRT)**, a principal radiologic technologist and supervisor at the UCSF Medical Center, was honored with a Gold Standard award. The ARRT noted Poon's "strong background in volunteering on behalf of his profession, serving as president of the California Society of Radiologic Technologists and speaking to incoming students in the Radiology program at City College of San Francisco." Patient care is the top priority for Poon. He recalls walking to work when a man grabbed his hand. "I was caught completely off guard. He said, 'David, you don't know me, but I want to thank you for taking care of me at UCSF.' That's why I do what I do."

## Radiology and Biomedical Imaging Staff Earn Awards



Christina Chen



Cindy Flores Gaytan



Melinda Parangan-Chu

The Department of Radiology and Biomedical Imaging now has an award to honor campus staff for outstanding service to the department. In 2015, Cindy Flores Gaytan and Melinda Parangan-Chu were co-recipients of the first Cathy Garzio Award for Outstanding Employee. The award was created in honor of long-time department administrative director Cathy Garzio, who accepted a position at Stanford in 2015. The award, presented annually at the holiday party in December, honors a campus staff member who has displayed the attributes of integrity, collaborative spirit, and has made an effort towards continuous improvement.

### Inaugural Garzio Award Recipients

Cindy Flores Gaytan is an education coordinator for the diagnostic radiology residency program. "Cindy has always been more than willing to help out wherever needed, whether or not it's a task that falls within the purview of her job description," said Residency Director Soonmee Cha, MD, one of Flores Gaytan's nominators. "She has taken on additional duties in order to provide more support for residents, allowing trainees to focus on learning and research instead of administrative tasks. In doing so, she demonstrates her continued concern for resident education. She is a very valued member of the department and is instrumental in the radiology residency." Flores Gaytan received joined the department in 2011.

Melinda Parangan-Chu, is the clinical fellowship programs and credentials manager for the department's 10 clinical fellowship programs. She is also the administrative support supervisor for six administrative support members. "Melinda has worked in just about every setting possible

within our department" noted Bonnie Joe, MD, one of Parangan-Chu's nominators. "Currently, she has the enormous task of handling our fellowship application process across the entire department, fellowship credentialing for 46 fellows, call scheduling, graduation and other department wide social events. Despite her heavy workload, she is always available to help out a colleague, faculty member, trainee or anyone who asks. She is versatile, a great problem-solver, a great team player."

### Christina Chen Recognized by School of Medicine

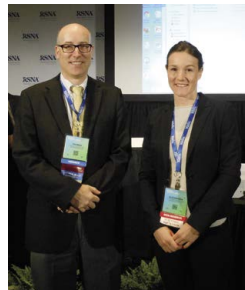
Christina Chen was recognized with a Great People award in 2016. "The Great People award is designed to recognize staff that serve as role models for teamwork and customer service, have a positive helpful attitude, work cooperatively with others, are devoted to the job and the team, and who inspire others to excel. This describes Christina to a tee!" noted Susan O'Hara, the department's chief financial officer.

Chen has been a financial analyst with Radiology and Biomedical Imaging for nearly three years. Her nomination for the award noted that, "Christina approaches her job with intelligence, conscientiousness, hard work and outstanding communication skills," and that she has "become a go-to person for the departmental staff with questions on UCSF financial procedures." Chen has also serves as a chair of the department's Moving On Up Learning sub-committee, which promotes learning opportunities for staff.

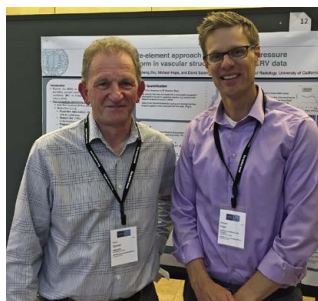
Prior to her UCSF position, Chen worked in finance at the Metropolitan Transportation Commission in San Francisco. She received her BS from UC Berkeley.



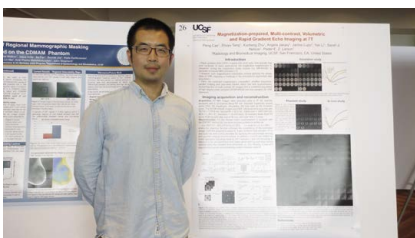
# The Year in Pictures





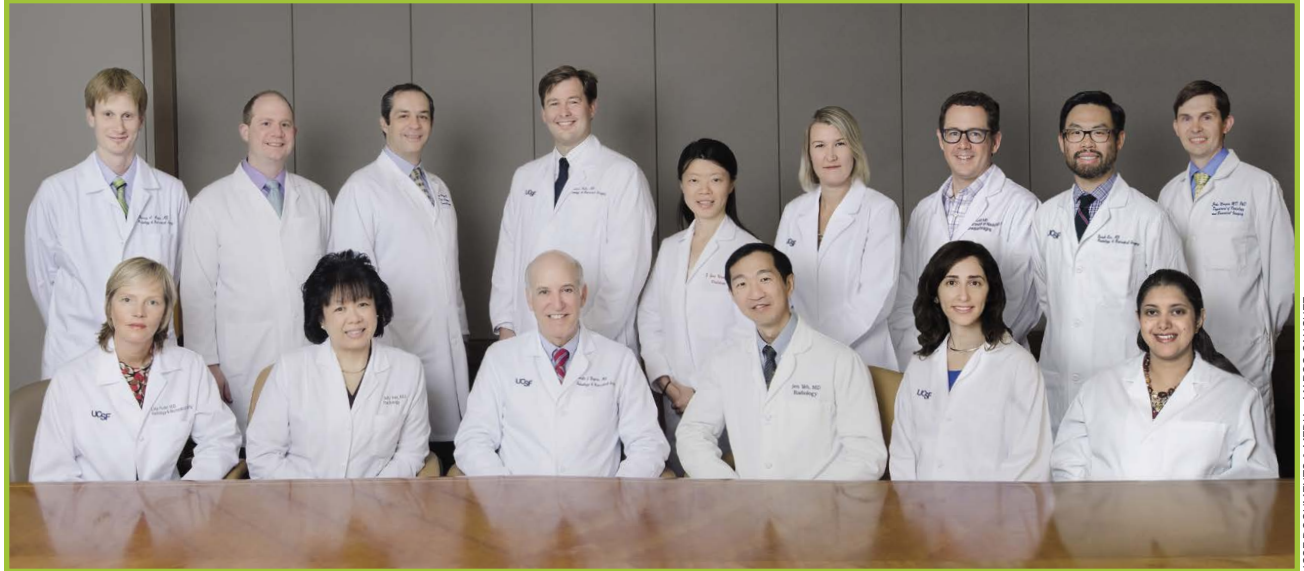








## Research Directions



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### ABDOMINAL IMAGING

Ronald Zagoria, MD, Chief

#### Research Directions:

- The promotion of evidence-based abdominal imaging, including systematic validation of commonly held opinions and assumptions
- Developing MRI and CT techniques to optimize assessment of hepatobiliary, GI tract, and GU diseases
- Optimizing multiparametric MRI scanning for detection and staging of prostate cancer
- High-intensity focused ultrasound of uterine fibroids and prostate cancer
- Advanced hepatic imaging, including multi-detector CT, CT cholangiography, new hepatobiliary MR contrast agents, and MR cholangiopancreatography
- Radiological evaluation of diffuse liver disease, including cirrhosis, pseudocirrhosis, and nonalcoholic steatohepatitis
- Dynamic contrast-enhanced MRI and CT for assessment of solid organs and tumors in the abdomen and pelvis
- 3D rendering of CT and MR images, including projectional and volumetric applications, and CT colonography
- Expanding image-guided percutaneous thermal ablation applications in the abdomen

### ADVANCED IMAGING TECHNOLOGIES SPECIALIZED RESOURCE GROUP

Daniel B. Vigneron, PhD, Director

#### Research Directions:

The Advanced Imaging technologies SRG works to advance imaging science to benefit human disease studies. This includes everything from development of new techniques, to the translation of existing techniques, to the improvement of quality, speed, information-content, and applicability of existing methods.

Basic development => Translation => Optimization => Validation

Our expertise and research focus on various areas including: basic physics, basic engineering, bioengineering, initial patient testing, clinical single and multi-site trials of new techniques, and training.

Our goal is to excel in imaging science in each of the three UCSF mission areas:

- Scholarship: publications, grants, patents, conference presentations
- Training: formal UCSF courses, informal training, CME courses, international Society educational courses
- Services: clinical patient studies support, UCSF committee service, and grant reviews for NIH and other funding agencies



The key missions of the Advanced Imaging Technologies SRG are to:

- (a) be world leaders in cutting-edge imaging techniques for studying human disease,
- (b) collaborate with RIGs to get these and other basic techniques into application studies for testing and optimization,
- (c) work with clinical to translate the new techniques and to improve state-of-art methods, and
- (d) train and educate personnel in advanced imaging techniques.

#### **BODY IMAGING RESEARCH INTEREST GROUP**

John Kurhanewicz, PhD, Director

##### **Research Directions:**

- Developing an optimized and clinically feasible multiparametric MR protocols for prostate cancer and for diseases of the kidney and liver and for metabolic studies of dietary interventions
- Rigorous histopathological correlative studies for validation of MR biomarkers
- Developing ways to analyze multiparametric imaging data
- Developing clinical predictive nomograms that incorporate imaging variables
- Image-guided biopsy and therapy (HIFU, radiation)

- Identifying, validating and implementing robust, quantitative, noninvasive magnetic-resonance-based metabolomic biomarkers of human disease and therapeutic response using ex vivo tissues, biofluids, and preclinical cell and murine models of human disease
- Developing targeted contrast agents for prostate cancer and other urogenital diseases
- Developing and implementing hyperpolarized  $^{13}\text{C}$  magnetic resonance imaging in patients

#### **BRAIN RESEARCH INTEREST GROUP**

Sarah Nelson, PhD, Director

Srikantan Nagarajan, PhD, Co-Director

##### **Research Directions:**

Our specific mission is to map and analyze brain structure, activity, metabolism, connectivity and function in health and disease, and to identify biochemical, physiological and anatomical correlates of behavior in health and in disease. The scope of research conducted by the Brain RIG encompasses all aspects of brain-related inquiry, including the development of state-of-the-art brain imaging techniques.

The evaluation of patients with brain tumors is a major focus for applying these technologies. Key strategies that are being used to understand the underlying mechanisms of response to therapy and malignant transformation include analyzing the relationship between of ex vivo histological,





genomic and metabolic properties of image-guided tissue samples and investigation of specific hypotheses using *in vivo* studies of cell and pre-clinical model systems.

Other critical focus areas that form the basis for collaborative research are to understand the relationship between brain and behavior in a wide range of neurological and psychiatric diseases, to integrate information from molecules to mind, and to translate advances in neuroimaging methodology to the clinic.

#### BREAST CANCER RESEARCH INTEREST GROUP

Nola Hylton, PhD, Co-Director  
Bonnie N. Joe, MD, Co-Director

#### Research Directions:

The Breast RIG's research aims are to advance imaging-based approaches for breast cancer diagnosis, leading to earlier detection, reduction of disease recurrence, and improved survival.



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Our major research areas include:

- MRI and spectroscopy to assess breast tumor response to neoadjuvant chemotherapy. UCSF is the lead institution for the national ACRIN 6657/I-SPY breast cancer clinical trial testing MRI and molecular biomarkers for the prediction of treatment response and survival for women receiving neoadjuvant chemotherapy for locally advanced breast cancer
- Computer-aided tools for real-time measurement of MRI biomarkers for breast cancer
- MRI of ductal carcinoma in situ (DCIS) for staging and assessing response to hormonal treatment
- Quantitative mammographic breast density measurement for breast cancer risk assessment
- MRI-directed tissue biopsy for radiologic-pathologic correlation of imaging and molecular biomarkers
- MRI measurement of breast density and tissue composition

## BREAST IMAGING

Bonnie N. Joe, MD, PhD, Chief

### Research Directions:

- MRI, optical imaging and X-ray mammography for breast cancer screening and surveillance, diagnosis and tissue characterization for risk assessment, cancer staging, and treatment response assessment
- New techniques in MRI-guided biopsy and imaging protocols
- Quantitative assessment of breast density and breast cancer risk models
- Digital breast tomosynthesis
- MRI/MRS for assessing tumor response to neo-adjuvant chemotherapy
- for patients with locally advanced breast cancer
- Biomarker development using advanced breast MR techniques



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### CARDIAC AND PULMONARY IMAGING

Brett M. Elicker, MD, Chief

Karen Ordovás, MD, MAS, Director of Cardiac Imaging

#### Research Directions:

- Cardiac CT
  - Use of cardiac CTA for emergency room evaluation of atypical chest pain
  - Evaluation of coronary atherosclerosis in patients with HIV infection
  - Evaluation of pulmonary venous anatomy in atrial fibrillation
  - Characterization of myocardial ischemic injury by contrast enhanced MRI and CT
- Chest CT/High-resolution CT
  - High-resolution CT of interstitial lung disease
  - Predictors of poor outcome in patients with acute PE diagnosed by helical CT

- Cardiac MRI
  - Use of novel cardiac MRI techniques and computational modeling for the quantitative assessment of ventricular performance in congenital heart disease
  - Use of multidimensional flow techniques for quantitative assessment of flow dynamics in congenital heart disease
  - MRI to assess cardiac function after repair of tetralogy of Fallot; correlation with clinical outcomes
  - T1 mapping techniques for assessment of pulmonary hypertension cardiomyopathy

### CARDIOVASCULAR RESEARCH INTEREST GROUP

Karen Ordovás, MD, Co-Director

David Saloner, PhD, Co-Director

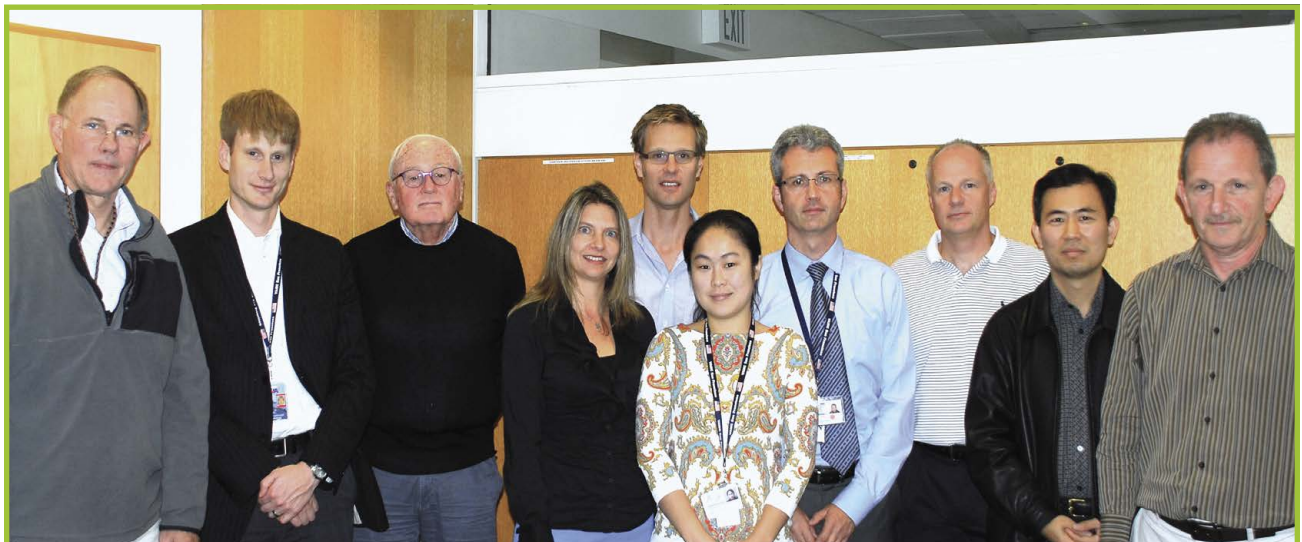
#### Research Directions:

The Cardiovascular RIG aims to provide leadership to the Radiology community in developing and implementing state-of-the-art methods for providing early diagnosis and improved outcomes for patients suffering from cardiovascular diseases.

The CVRIG works closely with physician/scientists from other disciplines to develop and evaluate methods that include numerical modeling, physical *in vitro* models, and animal and human models of cardiovascular disease.

The combination of these elements, together with a program for educating and training practitioners and scientists, will provide measurable benefits to patients. In summary, our mission is to:

- Use state-of-the-art imaging for understanding the etiology of multiple cardiovascular diseases
- Investigate the scientific basis for new imaging modalities and their applications



PICASA



- Apply cardiovascular imaging modalities to evaluate the physiologic, pharmacologic, and molecular basis of disease
- Develop tools for early detection of cardiovascular diseases
- Assess the role of cardiac imaging to predict cardiovascular outcomes to reduce overall and cardiac-related mortality

#### **IMAGE GUIDED SURGERY SPECIALIZED RESOURCE GROUP**

Alastair Martin, PhD, Co-Director

Steven Hetts, MD, PhD, Co-Director

Mark Wilson, MD, Co-Director

##### **Research Directions:**

The mission of the Image Guided Surgery specialized resource group is serve as a world leader in developing new and improved guidance for a wide array of clinical applications. We aim to:

- Improve guidance and evaluation of therapy
- Perform interventions and deliver therapy in a more minimally invasive fashion
- Develop applications in evolving medical therapies for which there presently does not exist an acceptable delivery mechanism

- Perform pre-clinical device development in collaboration with industrial partners
- Conduct clinical trials that provide guidance to the medical community as to best practice in the therapeutic management of patients.

In line with our mission statement, the IGT SRG has projects that explore several key areas of therapy delivery, including (1) active catheter guidance and tissue ablation within an MR scanner (2) evaluation of innovative endovascular neurointerventional procedures (3) MR guidance of minimally invasive neurosurgical procedures and (4) the application of high intensity focused ultrasound to treat uterine fibroids, bone metastasis, and prostate cancer.

#### **INTERVENTIONAL RADIOLOGY**

Robert K. Kerlan, Jr., MD, Chief

##### **Research Directions:**

- Joint project with Transplant Service for implantation of pancreatic islet cells
- Joint project with Transplant Service for downstaging hepatocellular carcinoma in potential transplant candidates
- Joint project with Abdominal Imaging using MR diffusion imaging to differentiate flow abnormalities from hepatocellular carcinoma







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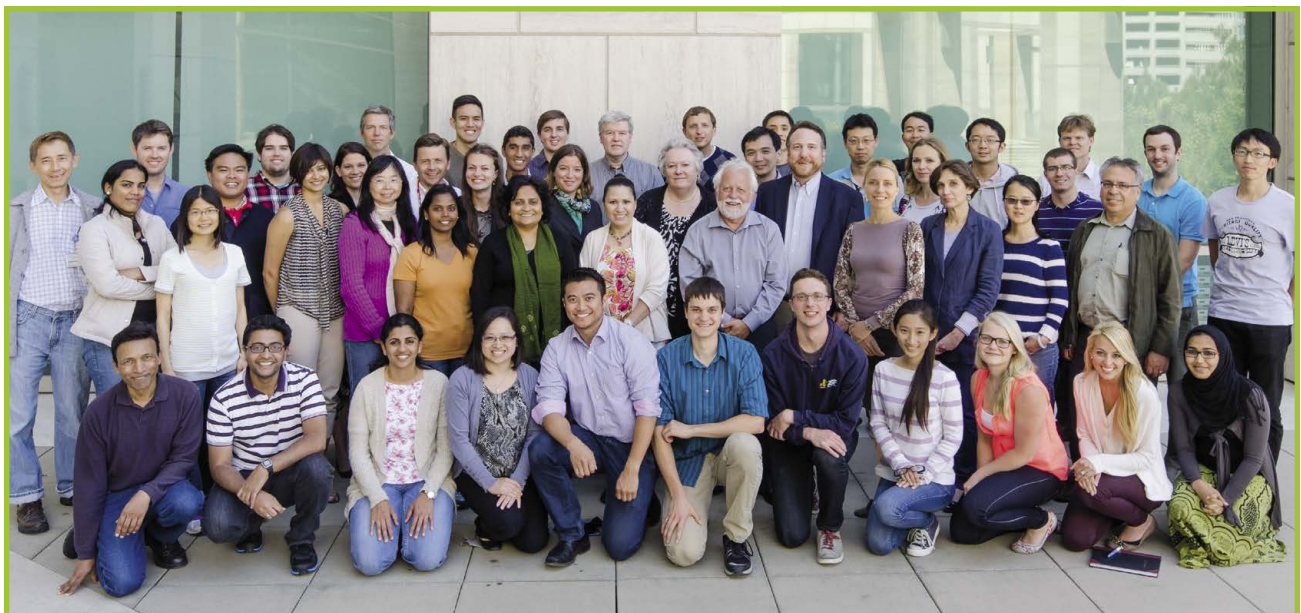
- Joint project with Pediatric Surgery to create gastrojejunostomies and percutaneous jejunostomies using magnets
- Assessing the role of interventional radiology in managing complications related to the creation of ileal pouches following proctectomy
- Use of expandable metallic stents in the airways
- Joint project with Urology on RF ablation of small renal masses
- Assessing the safety of transdiaphragmatic drainages

#### **MARGARET HART SURBECK LABORATORY OF ADVANCED IMAGING**

Sarah J. Nelson, PhD, Director

Daniel B. Vigneron, PhD, Associate Director

The Margaret Hart Surbeck Laboratory of Advanced Imaging endeavors to stretch the limits, creating new imaging technologies that can be adapted for the broadest range of investigating disease, health and treatment. Our overall objective is to contribute to the understanding of normal physiology and to elucidate the underlying biological



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mechanisms of health and disease. Critical factors that can be investigated through imaging are disease progression, the biological basis of different diseases, and response to treatment by individual patients. Translating these factors into bioengineering problems involves the integration of the underlying principles of MR physics with the design of new algorithms for reconstruction, post-processing and quantitative interpretation of the resulting multi-dimensional and multi-faceted imaging data, as well as the development of innovative RF coils and coil arrays for high-field imaging.

## MUSCULOSKELETAL AND QUANTITATIVE IMAGING RESEARCH GROUP

Sharmila Majumdar, PhD, Director

Thomas M. Link, MD, PhD, Clinical Director

### Research Directions:

The Mission of MQIR is to pursue research and teaching in quantitative tissue characterization focused on the musculoskeletal system by building collaborations between basic scientists, clinical scientists, and physicians, thus establishing a strong resource for musculoskeletal imaging-based research at UCSF. MQIR strengthens and nurtures partnership not only within the Department of Radiology

and Biomedical Imaging, but also with the Departments of Orthopaedic Surgery, Medicine and Bioengineering at UCSF and UC Berkeley.

- Identification of biomarkers for degeneration in bone, cartilage, and inter-vertebral disc, and diseases such as osteoporosis, spinal disorders, and osteoarthritis.
- Improve musculoskeletal health by using Computed Tomography (CT), High Resolution Peripheral Quantitative CT (HR-pQCT) and Positron Emission Tomography (PET)/CT imaging to study risk factors for age-related fractures, to quantify deterioration of bone structure and strength as result of aging and disease, and to analyze the anatomy and function of skeletal muscle in relation to mobility loss.
  - Effects of reduced weight-bearing on skeletal geometry, micro-structure, and strength
  - Effects of exercise on bone quality in HIV positive individuals
  - Mechanisms of increased cortical porosity in the peripheral skeleton
  - Use of advanced image analysis techniques such as finite element modeling and voxel-based morphometry to study age-related bone loss and predict hip fracture.
  - Use of CT to study muscle mass and fat infiltration as risk factors for hip fracture



- Development of acquisition and analysis methods to standardize scanning and analytic methods for multi-center studies in osteoporosis and sarcopenia
- Development of PET/CT to study protein synthesis in skeletal muscle
- Mechanisms of increased cortical porosity in the peripheral skeleton
- Use of advanced image analysis techniques such as finite element modeling and voxel-based morphometry to study age-related bone loss and predict hip fracture.
- Use of CT to study muscle mass and fat infiltration as risk factors for hip fracture
- Development of acquisition and analysis methods to standardize scanning and analytic methods for multi-center studies in osteoporosis and sarcopenia
- Development of PET/CT to study protein synthesis in skeletal muscle
- Magnetic Resonance (MR) Imaging and Spectroscopy methods for characterizing muscle and bone in diabetes, HIV disease, and other diseases.
  - Bone marrow fat quantification in the proximal femur and spine using high-resolution water-fat imaging, and the relationship of marrow adiposity to bone quantity and quality.
  - Fat infiltration in the rotator cuff muscles as a predictor of surgical outcome
- Detection of early joint degeneration using quantitative metrics (T1ρ and T2), and radiological grading methods in osteoarthritis of the knee and hip and correlating them with biomechanical function, biochemical changes, clinical findings, and function.
  - Contact mechanics, neuromuscular control, and cartilage composition in knee OA
  - Changes in knee contact mechanics and cartilage composition following meniscectomy
- Characterization of cartilage using MR and kinematics in hip osteoarthritis
- Running biomechanics and overuse injuries of the lower extremity
- Development of osteoarthritis in anterior cruciate ligament (ACL)-injured and reconstructed knees
- Investigating the impact of physical activity, obesity, weight loss and gain on longitudinal development of cartilage and meniscal degeneration
- *In vivo* MR Imaging in the presence of metal implants
- MRI temperature measurements of bone during MR guided focused ultrasound
- Multimodality imaging (MRI and HR-pQCT) and hyperpolarized <sup>13</sup>C MRI of rheumatoid arthritis
- Radiation dose reduction in CT

## MUSCULOSKELETAL RADIOLOGY

Thomas M. Link, MD, PhD, Chief

### Research Directions:

#### Imaging of Osteoarthritis and Cartilage

- New morphological pulse sequences for cartilage imaging
- Biochemical, quantitative imaging of the cartilage matrix
- Analysis of the Osteoarthritis Initiative Cohort
- Osteoarthritis, obesity, and physical activity
- Cartilage imaging of marathoners and physically active individuals
- Assessing menisci and cartilage with matrix-sensitive MRI sequences

#### Bone Marrow Imaging

- Monitoring the progress of the treatment of Gaucher's disease
- MRI of bone marrow changes in osteoarthritis
- Disuse osteopenia related bone marrow changes





#### Osteoporosis Imaging

- Evaluating insufficiency fractures of the pelvis, CT vs. MRI
- Contrast-enhanced, multi-slice-spiral CT for assessing bone density and structure
- Diabetic bone disease: cortical porosity and increase in fracture risk
- Imaging of the Shoulder
- Optimizing MRI for visualizing metal-on-metal surface replacements
- Evaluating fatty infiltration of muscles of the rotator cuff
- Imaging of the Spine
- Imaging at 1.5T and 3T
- Clinical implications of lumbosacral segmentation abnormalities MR Arthrography
- Evaluating the complications of MR arthrography
- High-field MRI for musculoskeletal applications
- *In vitro* and *in vivo* comparison of cartilage imaging at 1.5T, 3T, and 7T
- Comparing 1.5T with 3T MRI for the evaluation of smaller joints
- Optimizing MR protocols for the knee at 3T and 7T

#### New MRI Techniques

- Use of CUBE and IDEAL sequences at 3T to image the knee
- Application of metal suppression MAVRIC sequences for assessment of total joint replacements
- *In vitro* and *in vivo* assessment of metal suppression sequences at 1.5 and 3T MR neurography

#### NEURO INTERVENTIONAL RADIOLOGY

Randall Higashida, MD, Chief

##### Research Directions:

Advances in the field of Neuro Interventional Radiology require the constant development of new skills and techniques, and the Neuro Interventional Radiology researchers within the UCSF Department of Radiology and Biomedical Imaging have been involved in designing, conducting, and publishing research regarding current trends and techniques for patient care. In particular, we are focused on developing new and innovative techniques to treat a variety of neurovascular disorders including aneurysms, vascular malformations, tumors, and vasospasm in animal models and in active clinical practice within the interventional neurovascular radiology section at UCSF.

We work closely with the Institutional Review Board at UCSF Medical Center to oversee new products and procedures. We are working with several sponsor companies to assess the use and outcome of new intravascular stents. We have been involved in a multicenter study regarding outcomes after placement of carotid artery stents to treat carotid artery atherosclerotic disease. We conduct translational research in remote-controlled catheter guidance, percutaneous ablation, intra-arterial chemotherapy, and endovascular biopsy. We are working closely with other collaborators at UCSF in MRI modeling of unruptured cerebral



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aneurysm and MRI-assisted embolization of brain tumors. In addition, we conduct long-term clinical research on pediatric neurovascular diseases.

### NEURODEGENERATIVE DISEASES RESEARCH INTEREST GROUP

Pratik Mukherjee, MD, PhD, Director

Norbert Schuff, PhD, Co-Director

#### Research Directions:

Studying the causes and effects of neurodegenerative and psychiatric disorders, using MRI as a surrogate marker

Developing powerful, new brain MR techniques for early detection, improved diagnosis, and assessment of therapeutic interventions of neurodegenerative and psychiatric disorders

Developing more powerful multimodal brain image processing and multivariate statistical imaging analysis techniques

Highlights include:

- Ultra-high resolution structural MRI
- Diffusion spectrum imaging
- Dynamic, arterial-spin-labeling imaging
- Susceptibility-weighted imaging
- Spectroscopic imaging and j-modulated spectroscopy
- Bayesian image reconstruction
- Multivariate image analysis methods
- MRI protocols and processing pipelines for multicenter trials
- Standards for imaging neurodegenerative diseases that can be transferred into clinical practice and multi-center clinical trials

### NEURORADIOLOGY

Christopher P. Hess, MD, PhD, Chief

#### Research Directions:

Neuropediatrics

- Cause of cerebellar hypoplasia in some prematurely born neonates and the effects of brain cooling on CNS injury in term neonates suffering hypoxic-ischemic injury
- Embryogenesis of disorders of the midbrain and hindbrain
- Normal and abnormal development of the cerebral cortex
- Fetal MR Neuroimaging: development and application of advanced MRI techniques to study normal and abnormal fetal brain development

Traumatic Brain Injury

- DTI and fiber tractography, fMRI, 3D MRSI, and deformation morphometry as imaging biomarkers for mild TBI to predict clinical outcomes in post-concussive syndrome, with correlation to neurocognitive testing and genomic analysis for TBI susceptibility genes such as ApoE
- DTI and fiber tractography processing for a multi-center consortium study of mild TBI
- Cardiovascular Disease and Stroke
- Use of 64-slice CT to detect cardiovascular disease and stroke and a functional mapping and scoring system for predicting the outcome of ischemic stroke
- Use of perfusion and CTA imaging to detect ongoing hemorrhages in the brain of patients presenting with acute intracerebral hematoma
- Use of permeability image mapping to detect stroke patients at risk of subsequent hemorrhage
- Automated software for the outcome classification of patients with acute subarachnoid hemorrhage



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#### Cardiovascular Disease and Stroke

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#### Brain Tumors

- Use of permeability and perfusion imaging to guide operative biopsy
- Correlation of genetic markers and imaging markers from tissue obtained by image-guided biopsy

#### Head and Neck

- The utility of PET/CT in follow-up of patients with head and neck cancer
- The use of advanced imaging techniques in the detection of recurrent head and neck cancer

#### Spine

- CT-guided back pain management
- Use of image guidance to improve the accuracy of injections
- Utility of gadolinium MR myelography to detect CSF leaks

- MR neurography for peripheral nerve diagnosis
- Neurodegenerative Diseases
- New imaging biomarkers for neurodegenerative diseases using
- 7T MRI
- 7T imaging of patients with intractable epilepsy
- Characterization of multimodal diffusion data using high-angular, resolution-diffusion imaging

#### NUCLEAR MEDICINE

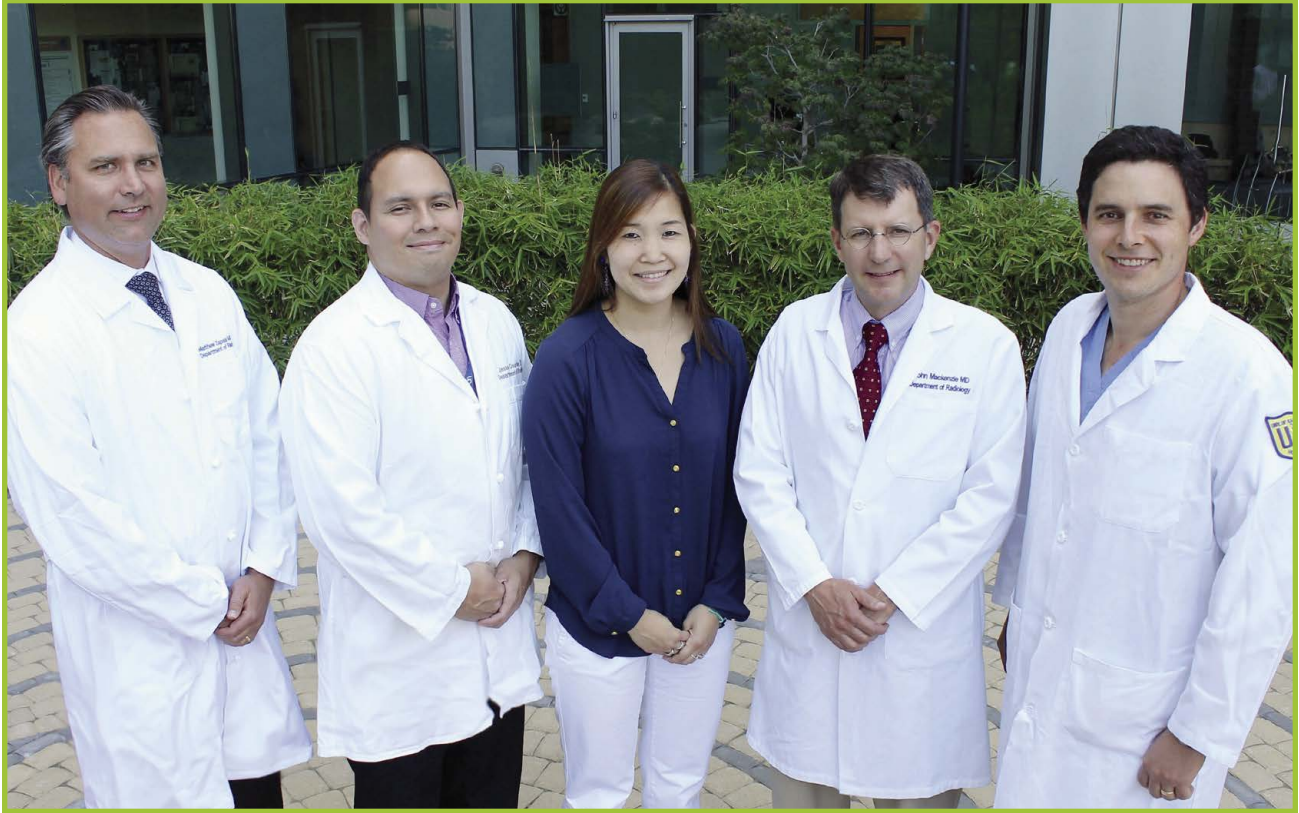
Miguel Hernandez Pampaloni, MD, PhD, Chief

#### Research Directions:

Cardiac and vascular applications of clinical SPECT-CT, PET and PET-CT

- Applications of SPECT-CT for cardiac synchrony
- Dementia imaging with SPECT-CT
- Clinical PET and PET-CT studies of cancer, cardiovascular, and neurological diseases
- Feasibility of PET and MRI to characterize myocardial metabolism and flow
- Use of PET to monitor therapy for breast and ovarian cancers
- Conformal radiation treatment planning with PET-CT
- Imaging structure and function in small animals with CT/SPECT
- Molecular probe development for SPECT and PET





#### **PEDIATRIC/FETAL RESEARCH INTEREST GROUP**

A. James Barkovich, MD, Director

##### **Research Directions:**

- Developing new imaging techniques to assess normal and abnormal development, including MRSI and DTI
- Developing new technology for imaging fetuses and neonates and adapting state-of-the-art techniques for application in the developing fetus and infant
- Using imaging techniques to diagnose and study malformations of the brain
- Using imaging to assess injury in premature and term neonates
- Using imaging to assess new therapies for injured fetuses and neonates
- Using imaging to assess brain injury in neonates and infants with severe congenital heart disease

#### **PEDIATRIC RADIOLOGY**

John Mackenzie, MD, Chief

##### **Research Directions:**

The mission of the Pediatric Radiology section is to improve the health of children through advanced clinical imaging and research.

The section studies pediatric disease through the lens of imaging and is focused on the development of new imaging technologies.

Several ongoing basic science and clinical studies are underway with collaborations with MRI physics, pediatric oncology, pediatric gastroenterology and pediatric surgery. Examples of research in the Pediatric Radiology section include:

- Study of novel diffusion weighted imaging (DWI) techniques to better identify inflammation and monitor treatment changes in children with inflammatory bowel disease (ulcerative colitis and Crohn disease).
- Testing and improving motion-resistant MRI with pulse sequences such as PROPELLER for use in infants and nonsedated children.
- Examining the strengths and limitations of high-resolution, 3D MRI sequences such as CUBE and SPACE for complex pediatric diseases in the chest, abdomen, and pelvis, including diseases of the liver, bile ducts, kidneys, and pelvic organs.
- Studying bowel motion (peristalsis) of bowel and the changes in motion that occur in disease using MRI pulse sequences such as real-time CINE FIESTA.



## **RADIOLOGY OUTCOMES RESEARCH LABORATORY**

Rebecca Smith-Bindman, Director

### **Research Directions:**

The main objective of Radiology Outcomes Research Laboratory (RORL) is to rigorously evaluate the benefits and the harms of medical imaging that uses ionizing radiation in order to identify ways to improve patient safety.

- Demonstrate, through high-quality clinical and observational research, the impact of medical imaging on patient health, both beneficial and harmful.
- Improve the performance of diagnostic imaging tests by conducting clinical trials that provide the evidence for appropriate and safe use.
- Identify problematic trends in imaging, their potential impacts on patient safety and the healthcare system, and propose solutions.
- Educate healthcare professionals on the current evidence-based techniques for maximizing image quality while simultaneously improving patient safety.
- Engage healthcare providers in purposeful quality initiatives that have an immediate positive impact on the healthcare system and patient safety.

The RORL is dedicated to providing rigorous evidence on the value of medical imaging that uses ionizing radiation to allow patients and their providers to engage in meaningful shared decision making around medical imaging. Our goal is to understand the impacts of diagnostic medical imaging and lessen the impacts of imaging when the costs outweigh the benefits.

## **ZUCKERBERG SAN FRANCISCO GENERAL HOSPITAL AND TRAUMA CENTER**

Mark W. Wilson, MD, Chief

In addition to being the city's main public hospital and Level 1 Trauma center, Zuckerberg San Francisco General Hospital and Trauma Center is an active teaching hospital, closely allied with UCSF. Faculty and residents from the Department of Radiology & Biomedical Imaging pursue a broad range of clinical and basic science research, including: outcomes of blunt and penetrating injuries treated by embolization; outcomes analysis of tomosynthesis-guided breast biopsy; evaluating the incidence of breast cancer in transgender patients; application of quantitative atlas-based MR imaging techniques in assessing spinal cord injury; virtual classroom for global radiology education; multimodality imaging of traumatic brain injury; molecular MR imaging of liver injury; molecular imaging of infection; evaluation of endothelial abnormalities in brain and pulmonary aneurysms and AVMs; improving the efficiency of stroke diagnosis and triage to therapy; and MR-guided focused ultrasound treatment of musculoskeletal tumors and facet joints





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## ULTRASOUND

Ruth B. Goldstein, MD, Chief

### Research Directions:

- Prenatal diagnosis of CNS anomalies with ultrasound and MRI
- Further investigation of clinical manifestations and treatment of twin transfusion syndrome
- Prospective, randomized trial of repair of fetal myelomeningocele
- Prospective, randomized trial for selective ablation of connecting vessels in twin transfusion syndrome

## VETERANS AFFAIRS MEDICAL CENTER: DIAGNOSTIC RADIOLOGY

Judy Yee, MD, Chief

### Research Directions:

- Dose reduction for screening and diagnostic CT colonography
- Stereoscopic 3D imaging- clinical applications
- Spectral imaging, dual energy, and low kVp CT imaging
- CT and MR contrast timing and delivery in the abdomen and pelvis
- Eovist MR for the detection of hepatocellular carcinoma
- High-field MR imaging of the prostate
- Stroke prediction using intimal thickness on carotid ultrasound



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### **VETERANS AFFAIRS MEDICAL CENTER: CENTER FOR IMAGING OF NEURODEGENERATIVE DISEASES**

Pratik Mukherjee, MD, Director

#### **Research Directions:**

The Center for Imaging of Neurodegenerative Diseases (CIND) is a Research Center dedicated to studying the causes and effects of neurodegenerative and psychiatric disorders, using imaging such as MRI and PET. We currently have eight full-time faculty performing studies in various fields, including imaging of Alzheimer's disease, Parkinson's disease, Depression, Post-traumatic Stress-Disorder, Gulf War Illness, and substance abuse. We also work on the development of novel powerful methods for brain MR, including spiral imaging and new approaches for processing and multivariate statistical analysis of brain imaging. CIND is located at the San Francisco VA Medical center and has a Bruker 4T MRI scanner, a Siemens 3T Skyra that was recently placed into operation and a 7T scanner.

Aside from studies at the CIND, faculty are also involved in large international imaging trials, such as the Alzheimer's Disease Neuroimaging Initiative (ADNI) and the Parkinson's Progression Marker Initiative (PPMI). CIND has also been involved in the development of new strategies for the prevention of neurodegenerative diseases. In addition, we have started an initiative, directed by Dr. Michael Weiner, The Brain Health Registry. The purpose of the BHR is to promote healthy brain function through the prevention of brain diseases, disorders and injuries that affect brain function in adults. This is the first neuroscience project to leverage online possibilities in this way and on this large scale.

In the area of MRI and image processing, we work with different techniques including the following:

- Ultra-high resolution structural MRI
- Diffusion spectrum imaging

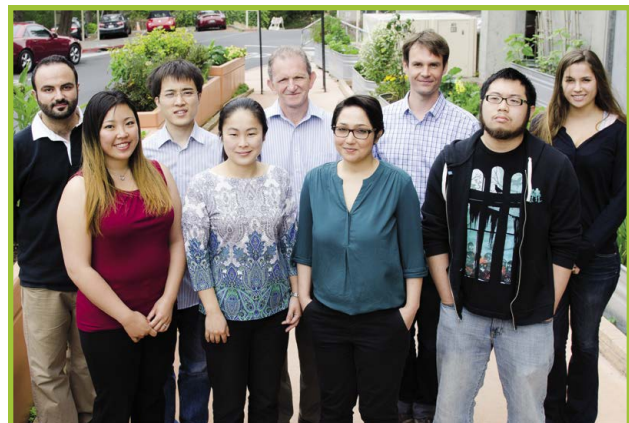
- Dynamic, arterial-spin-labeling imaging
- Resting-state functional MRI
- Susceptibility-weighted imaging
- Spectroscopic imaging and j-modulated spectroscopy
- Bayesian image reconstruction
- Multivariate image analysis methods

### **VETERANS AFFAIRS MEDICAL CENTER: VASCULAR IMAGING RESEARCH CENTER**

David Saloner, PhD, Director

#### **Research Directions:**

- Development of methods for visualization of complex flow in intracranial aneurysms
- Assessment of novel contrast agents in MR angiography
- Development of patient-specific models for review of endovascular therapies
- Analysis of plaque vulnerability using patient-specific image based computational methods
- Development of 4-D MR velocimetry methods for determination in analyzing the impact of hemodynamics on vascular disease progression



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## Grants and Fellowships

### Grants

#### Andrew J. Burghardt, Specialist

- Ultragenyx Pharmaceutical Inc; Analysis of HR-pQCT images from the UX023-CL201 and UX023T-CL201 Trials, 1/1/16–12/31/16, \$36,616
- Stanford University; Patient Oriented Research in Vitamin D Deficiency in CKD, 9/1/15–7/31/16, \$18,903

#### Julio Carballido-Gamio, PhD

- NIH National Institute on Aging; Papers Related to Shape and Density Modeling of Pixels in Hip Femur Data, 9/30/15–9/29/16, \$18,900
- NIH National Institutes of Arthritis, Musculoskeletal and Skin Disease; Multi-Parametric Spatial Assessment of Bone with HR-pQ, 6/1/16–3/31/21, \$1,376,905

#### Linda Chao, PhD

- UCSF; Exercise Program for Individuals with Dementia, 7/1/15–6/30/16, \$30,000
- Veterans Affairs; Pilot Test of Telephone-Delivered Cognitive Behavioral Therapy for Insomnia for Veterans with Gulf War Illness, 7/1/16–6/30/19, \$974,635

#### Daniel L. Cooke, MD

- American Heart Association; Bevacizumab Therapy for Brain Arteriovenous Malformation, 7/1/16–6/30/18, \$154,000

#### Rahul Desikan, MD, PhD

- American Society of Neuroradiology; Multi-dimensional Prediction of Alzheimer's Disease Risk, 1/1/17–12/31/18, \$230,865

#### Rebecca A. Dumont Walter, MD

- Society of Nuclear Medicine; Exploiting Bacterial Iron Metabolism for Spinal Infection Imaging with Positron Emission Tomography, 7/1/16–6/30/17, \$25,000

#### Michael J. Evans, PhD

- DOD, US Army Medical Research Acquisition Activity; Development of a Radioligand to Detect Glucocorticoid Receptor Expression in Enzalutamide Resistant Prostate Cancer with Positron Emission Tomography, 9/30/15–9/29/17, \$280,019

#### Nicholas Fidelman, MD

- Sirtex Medical Inc.; Radiation-Emitting SIR-Spheres in Non-resectable (RESIN) Liver Tumor Patient Registry, 8/1/16–7/31/21, \$177,555

#### Robert R. Flavell, MD, PhD

- DOD, US Army Medical Research Acquisition Activity; Detection of Aggressive Prostate Tumors using novel PET and Hyperpolarized <sup>13</sup>C Probes Targeting Interstitial Acidity, 9/1/16–8/31/20, \$823,901

#### Steven W. Hetts, MD

- Siemens Medical Solutions USA, Inc.; Siemens-AX-CBF Prototype Software Project, 2/2/16–2/2/18, \$124,798

#### Nola M. Hylton, PhD

- University of Pennsylvania; Multi-parametric 4-D Imaging Biomarkers for Neoadjuvant Treatment Response, 4/19/16–3/31/17, \$47,573

#### Priyanka Jha, MD

- RSNA Research & Education Foundation; Noninvasive *In Vivo* Hyperpolarized 1-<sup>13</sup>C Pyruvate Magnet Resonance Imaging to Detect Alterations in Placental Metabolism in Gestational Hypertensive Disorders in a Small Animal Model, 7/1/16–6/30/17, \$38,187

#### Kanti P. Kolli, MD

- New England Research Institute, Inc.; Predicting the Safety and Effectiveness of Inferior Vena Cava Filters (PRESERVE), 10/1/15–9/30/20, \$203,212

#### John Kurhanewicz, PhD

- DOD, US Army Medical Research Acquisition Activity; Metabolic reprogramming of cancer and Anti-Tumor Immunity by Targeting LDH-A, 9/30/15–9/29/18, \$365,871

#### Peder E. Larson, PhD

- NIH National Institute of Neurological Disorders and Stroke; Novel Ultrashort Echo Time Sequences for Brain MRI, 4/1/16–3/31/18, \$198,125

#### Sergey G. Magnitsky, PhD

- NIH National Institutes of Arthritis, Musculoskeletal and Skin Disease; Development of *in vivo* MR Imaging Technique for Monitoring Mesenchymal Stem Cell Therapy for Bone Pathologies, 4/1/16–1/31/18, \$320,795

**Sharmila Majumdar, PhD**

- GE Healthcare; PET/MR, C13, Cyclotron Showsite Agreement, 12/1/15–12/31/17, \$120,000
- GE Healthcare; Development of PET MR Imaging and Processing, 6/1/16–6/30/19, \$509,575
- GE Healthcare; Quantitative and Fast MR Imaging and MR Image Processing, 6/1/16–5/31/19, \$506,061
- NIH National Institutes of Arthritis, Musculoskeletal and Skin Disease; Evaluating Disease Progression in Hip Osteoarthritis, 7/14/16–4/30/21, \$3,458,324

**Dieter Meyerhoff, PhD**

- NIH; Neuropsychobiology in Polysubstance Abusers during Abstinence, 4/1/16–1/31/21, \$2,781,141

**Donna Murray, PhD**

- NIH, Self-Regulation and Neural Networks in Alcohol Use Disorders, 9/3/15–9/2/17, \$115,636

**David Newitt, PhD**

- Regents of the University of Michigan; Elimination of Instrumental Bias for Quantitative Diffusion Imaging in Clinical Oncology Trials, 8/10/15–7/31/20, \$748,895

**Susan Noworolski, PhD**

- Verily Life Sciences, LLC; Retrospective Study of Prostate MR Imaging, 1/26/16–1/26/21, \$68,387

**Viola R. Tognina Reike, PhD**

- InSightec Ltd.; Research Projects in the Area of MR-Guided High Intensity Focused Ultrasound (MRgFUS) is a Promising Non-Invasive Technique, 6/21/16–6/20/17, \$75,000

**Sabrina M. Ronen, PhD**

- NIH National Cancer Institute; Hyperpolarized Arginine Imaging of Inflammatory Cells and their Inhibition in GBM, 12/1/15–11/30/17, \$379,212
- NIH National Cancer Institute–Metabolic Imaging of Brain Tumor Response to Therapy, 4/1/16–3/31/21, \$3,233,781

**David A. Saloner, PhD**

- NIH Office of the Director; Combined X-ray Angiography and MRI Suite, 6/1/16–5/31/17, \$1,541,250
- Medical College of Wisconsin; Image-Based Numerical Predictions of Hemodynamics following Vascular Intervention; 7/17/15–5/31/17, \$125,018

**Youngho Seo, PhD**

- NIH Office of the Director; Combined Dual-Modality SPECT/CT for Small Animal Imaging Research at UCSF, 9/23/15–9/22/17, \$1,185,177

**John A. Shepherd, PhD**

- California Breast Cancer Research Program; Localized Probability of Mammographic Masking, 9/1/15–2/28/17, \$124,112
- Hologic, Inc.; Hologic Grant Request: Ultra-DXA, 3/11/16–3/10/17, \$2,000
- NIH National Institute of Diabetes and Digestive and Kidney; Optical Body Composition and Health Assessment; 5/15/16–4/30/21, \$3,154,298
- Massachusetts General Hospital; MGH Cross Cal, 4/1/15–3/31/17, \$19,349
- Brigham and Women's Hospital; Environmental Chemicals and Postpubertal Breast Composition in a Latino Cohort, 9/1/15–6/30/16, \$15,593

**Rebecca Smith-Bindman, MD**

- Kaiser Foundation Research Institute; Pragmatic Trial of More Versus Less Intensive Strategies for Active Surveillance of Patients with Small Pulmonary Nodules, 8/1/15–7/31/20, \$601,663

**Charles J. Truillet, PhD**

- DOD, US Army Medical Research Acquisition Activity; Detection and Treatment of Advanced Prostate Cancer with Radiolabeled Transferrin Molecules, 8/1/16–7/31/18, \$125,000

**Olga Tymofiyeva, PhD**

- NIH National Center for Complementary and Integrative Health; A Network Approach to Study Brain Plasticity in Children with Cognitive Training, 12/7/15–11/30/17, \$435,875

**Henry F. VanBrocklin, PhD**

- BioLaurus Inc; Radiolabelling and Small Animal Testing of (TBA), 11/5/15–11/5/16, \$28,990
- Iowa State University; *In vivo* Reporters of Gene Expression, 7/1/15–6/30/17, \$71,330
- Trace-Ability, Inc.; Mitigation of Quality and Compliance Risks in Radio-Pharmaceutical Production by Implementation of an Automated Release Testing Technology, 9/15/15–8/31/19, \$186,083
- University of Montana; Molecular Imaging of Chemical Threats and Countermeasure, 8/1/15–7/31/20, \$583,049
- Cancer Targeted Technology, LLC; NIH Phase 2 SBIR Initial Clinical Evaluation of Prostate Cancer PET Diagnostic, 3/1/15–2/28/17, \$333,497



**Michael Weiner, MD**

- Global Alzheimers Platform, Inc.; UCSF–GAP Collaboration: Leveraging the Brain Health Registry for GAP Clinical Trial Recruitment, 10/9/15–10/8/17, \$322,474
- Monell Chemical Senses Center; Olfaction as a Biomarker for Health and Cognitive Decline, 2/12/16–2/11/17, \$32,776
- California Department of Public Health; Elucidating Effects of Alzheimer's Caregiving Using The Brain Health Registry, 7/1/16–6/30/19, \$240,000
- Alzheimer's Drug Discovery Foundation; Brain Health Registry Trial-Ready Cohort, 7/1/15–6/30/17, \$100,000
- Larry L. Hillblom Foundation; Hillblom California Brain Health Registry Network, 1/1/16–12/31/19, \$1,200,000
- Mayo Foundation, Mayo Clinic; Weiner Sub Mayo Alzheimer's Disease Patient and Caregiver Powered Network, 10/1/15–9/30/16, \$178,317
- Alzheimer's Association; Using the Brain Health Registry to Facilitate the Imaging Dementia-Evidence for Amyloid Scanning (IDEAS) Study, 5/1/16–4/30/19, \$700,243
- NIH and Foundation for the NIH; Alzheimer's Disease Neuroimaging Initiative, 9/15/16–7/31/21, \$60,000,000

**Xiaoliang Zhang, PhD**

- NIH, National Institute of Biomedical Imaging & Bioengineering, Improved Sensitivity and Safety for Endovascular MR Imaging at 3T, 2/1/16–1/31/18, \$428,855

**Fellowships**

**Rahul Desikan, MD, PhD**

- Radiological Society of North America; An Automated Atlas of the Human Brainstem and Cerebellum, 7/1/16–6/30/17, \$50,000

**Rebecca A. Dumont Walter, MD**

- RSNA Research & Education Foundation; Exploiting Bacterial Iron Metabolism for Spinal Infection Imaging with Positron Emission Tomography, 7/1/16–6/30/17, \$50,000

**Michael A. Samaan, PhD**

- NIH National Institutes of Arthritis, Musculoskeletal and Skin Disease; Longitudinal Assessment of the Effects of Hip Arthroscopy on Articular Cartilage Biochemistry through a Novel Quantitative MRI-Based Approach, 9/1/16–8/31/18, \$126,972

**Leo P. Sugrue, MD, PhD**

- American Roentgen Ray Society; Imaging Biomarkers of Obsessive Compulsive Disorder, 7/1/16–6/30/18, \$150,000

**The Department of Radiology and Biomedical Imaging  
is grateful to the many alumni  
who give back with a gift to the department.**



"Alumni support of the Margulis Society is ever more important now that our residency has been recognized as the highest-ranked clinical training program among diagnostic radiology residency programs nationwide. Having benefited firsthand from the Margulis Society, I now happily support the organization's continued efforts in promoting UCSF Radiology resident research, career outreach and educational endeavors. Without alumni support I never would have benefited from many educational experiences, including the Armed Institute of Radiologic Pathology (AIRP) in Washington, D.C. prior to taking the ABR Core Examination.

It is truly an honor to be counted a graduate of the UCSF Radiology Residency and Neuroradiology Fellowship. My time in San Francisco was truly an amazing life experience. At UCSF I was afforded every opportunity to pursue my career, learn from world-class mentors, and make lifelong friendships. In retrospect, I will forever be grateful to Hideyo Minagi for his 7 AM radiography classes. Thanks Hideyo!"

—*Ramon Barajas, Jr., MD*  
*Residency '14, Fellowship '15*  
*Assistant Professor*  
*Oregon Health & Science University, Portland, OR*



"I donate to the Margulis Society because I believe in its mission to support travel, education and research for the radiology residents, and of course to sponsor the trainee career night and wonderful gala. I can still remember the first Margulis Gala that I attended as a resident. It was such an honor and thrill to feel apart of something with such a long tradition of excellence in radiology training. The Margulis Society makes UCSF feel even more like a family, a home away from home for residents to be mentored and supported by alumni!"

—*Ashley Aiken, MD*  
*Residency '06, Fellowship, '07*  
*Associate Professor of Radiology and Imaging Sciences*  
*Program Director, Neuroradiology Fellowship*  
*Emory University, Atlanta, GA*



"UCSF is an unparalleled institution of higher education, scientific discoveries, and patient care. As a native San Franciscan reflecting back on the past decades, I am most grateful and keenly aware of the impact that UCSF has had on my professional life and my community."

—*Jessica Leung, MD*  
*Residency '98, Fellowship '99*  
*Professor, Department of Diagnostic Radiology*  
*Section Chief, Breast Imaging*  
*Department of Diagnostic Radiology, Division of Diagnostic Imaging*  
*The University of Texas*  
*MD Anderson Cancer Center, Houston, TX*



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