



## New Magnets Expand CAMRI's Scope

The Center for Advance Magnetic Resonance Imaging (CAMRI) continues to grow by leaps and bounds. In 2010 two new magnets—a 7T animal magnet and a 3T Tim TRIO (twin of the existing 3T)—arrived at CAMRI, helping to expand the center's state-of-the-art imaging capabilities and double its 3T resources. This summer, CAMRI expects delivery of a Siemen's 3T whole body Skyra MR scanner, a brand new platform acquired through a \$2.5 million NIH grant. The Skyra will be dedicated to cardiovascular MR research, a program within the center directed by James Carr, MD and a new recruit from the University of Freiburg in Germany, world renowned cardiovascular MR scientist Michael Markl, PhD. This addition will boost the center's 3T magnet count to an impressive three and allow for more research projects.

Thanks to a National Institutes of Health high-end instrumentation grant, CAMRI acquired a 7T Bruker Clin-Scan—the first small animal magnet for Northwestern's Chicago campus. Dedicated for use in animal studies and *ex vivo* studies, the small bore (6-inch diameter) magnet provides superior signal-to-noise with improved spatial and temporal resolution as well as a unique imaging platform. The scanner has been operational since August, under the direction of Daniel Procissi, PhD.

“The interface on this scanner operates just like our clinical magnets, so all sequences we write are transferable between all the magnets,” says Todd Parrish, PhD, director of CAMRI and MR neuroimaging research. “We can translate data from our lower field scanners up to the 7T and/or develop sequences that work on the 7T that can then be transferred to the 1.5T and 3T systems. This permits us to more easily translate between different human and animal disease models.”

The center's new 3T whole-body TRIO system with Tim (total imaging matrix) technology became operational in October. John Csernansky, MD, chair of psychiatry and behavioral sciences and Dr. Parrish partnered to complete the purchase of the magnet through the NMH Warren Wright donor fund, which is dedicated to advancing adolescent psychiatric research, thereby doubling the square footage of CAMRI. Projects that incorporate adolescent subjects will have priority on this magnet. Complementing CAMRI's existing 3T whole-body TRIO system, the new 3T Tim TRIO magnet will also be used to support neuroimaging research and other projects. Says Dr. Parrish, associate professor of radiology, “It's helping to expand our usable hours, especially during daytime hours and allowing us to accommodate additional studies.”

Since the acquisition of the first 3T

## INSIDE

|                          |   |
|--------------------------|---|
| From the Chairman        | 2 |
| Northwestern at RSNA     | 3 |
| Faculty/Staff News       | 5 |
| 2010 Residents and Grads | 6 |
| Research Spotlight       | 7 |
| Science and Art          | 8 |



## A Few Words from Eric J. Russell, The Invisible Specialty?

**D**iagnostic radiologists must come to grips with the fact that our patients greatly benefit from our expertise but often attribute the critically important contributions we make to their care to other providers. The American College of Radiology has done an excellent job of pointing out the gap in understanding that the majority of our patients have regarding who we are and what we do (see [www.acr.com](http://www.acr.com)—*Face of Radiology*). In the current era of consumer-driven health care and outsourcing of imaging services, the solution must involve radiologists actively changing that perception.

Our practices must become more patient-centered, and we must re-examine our clinical interactions from the patient's point of view and act as we ourselves would expect a doctor contributing significantly to our medical decision making to act. Direct contact with the patient is the key. While many diagnostic radiologists perform interventional procedures and have the opportunity to develop a doctor-patient relationship during that time, few either care to or have found a way to do so as part of a diagnostic imaging procedure.

Given the threat that interpretation of radiologic images could become a commodity, our services need to take on a much more personal quality for our patients. Within our current practice model, we need take an active role in service delivery. We must do everything we can to make the imaging experience comfortable, effective, relevant, timely, fast, and efficient. We also need to step up to the challenges of health care reform and act in a responsible way to provide consultative services directed at reducing inappropriate utilization of imag-

ing procedures. We should help choose the best examination for the patient's clinical problem and then tailor the protocol to minimize expense and exposure to radiation and contrast media.

Our culture of providing consultative services to other physicians is a strong one and will always remain a cornerstone of our profession. However, in certain circumstances, this may be less efficient and less satisfactory to patients than directly communicating our findings. A perfect example is the role that breast imagers play by directly communicating the results of mammographic examinations to patients so that there is no risk of that information getting lost or delayed.

It is also good practice to bring urgent or unexpected results of a diagnostic study to the attention of the referring physician by phone; however, we have all faced circumstances when that physician cannot be reached. In such cases the patient should be contacted directly and asked to contact their physician without delay. In daily practice, I personally relish the opportunity to speak with a concerned patient and do so whenever the patient seeks this contact. Unfortunately, this is uncommon. The challenge is to alter our practice model to facilitate and encourage timely communication.

Options might include letting the patient know the report will be in the referring physician's hands within a few hours or that the patient can view the report online. Perhaps we could develop a mechanism and/or space in our practices that makes it easier for radiologists to meet with patients and talk with them about their studies. Providing such a consultative service directly to patients could help radiologists develop a new type of relationship with their pa-

tients as well as their referring physicians.

I believe that such patient-centered approaches are needed to secure our future as the physicians who are best trained and positioned to integrate clinical information and imaging information into a report (or personal consultation) that directly impacts the care of the patient in a personalized way.

### Leadership Changes

The Department of Radiology has undergone an "interim" change in leadership. Supporting the Feinberg School of Medicine's search for a new dean, Eric J. Russell, MD, FSIR, will be serving as acting president and CEO of Northwestern Medical Faculty Foundation (NMFF). Howard Chrisman, MD, MBA, FSIR, professor of radiology, will serve as acting chair of Northwestern Radiology until Dr. Russell returns as chair. These changes became effective in early January.

Dr. Russell's new role supports former NMFF leader, Jeff Glassroth, MD, and his transition to interim dean of the Feinberg School and executive vice president for medical affairs at Northwestern University. Said Dr. Glassroth, "We are fortunate to have such dedicated leaders at Northwestern Medicine." In addition to his leadership of Northwestern Radiology, Dr. Russell has been a leader at NMFF, serving on its board of directors and chairing the organization's finance committee.

For several years, Dr. Chrisman has served as vice chair for clinical operations in the department. He serves as an associate chief medical officer at Northwestern Memorial Hospital and served on the NMFF finance committee.

# Northwestern Radiology at RSNA 2010

The 96th scientific assembly and annual meeting of the Radiological Society of North America (RSNA) attracted some 60,000 international medical and scientific professionals to Chicago November 28 to December 3. The meeting featured 4,200 scientific papers, posters, and education exhibits; 700+ technical exhibitors; and 300+ refresher courses. Presentations from the department included:

## MULTISESSION COURSE

### James C. Carr, MD

- Vascular Imaging Series: MR Angiography—Strategies for Technique Optimization
- Postprocessing, Work Flow, and Interpretation

### Frank H. Miller, MD

Essentials of Gastrointestinal Imaging: Liver Imaging

### Albert A. Nemcek Jr, MD

- Interventional Radiology Series: Peripheral Vascular Disease Imaging and Interventions
- Peripheral Vascular Disease: Epidemiology and Work-up

## REFRESHER COURSE

### Timothy J. Carroll, PhD

Techniques: MR Angiographic Pulse Sequences

### Ramona Gupta, MD

Real-time Interventional US (Hands-on Workshop)

### Robert J. Lewandowski, MD

Real-time Interventional US (Hands-on Workshop)

### Albert A. Nemcek Jr, MD

- Real-time Interventional US (Hands-on Workshop)
- Interventional Radiology Series: Peripheral Vascular Disease Imaging and Interventions

## EDUCATION EXHIBITS

### Hamid Chalian, MD

Evaluation of Abdominal Malignancies Using the Revised RECIST Criteria (version 1.1): What the Oncologist Wants to Know, *Chalian H, Ghadjar, K, Rezai P, Tore HG, Galizia M, Yaghmai V.*

### Matthew Feurer, MS

Utilizing an Open Source IHE Patient Identity Cross (PIX) Reference Manager to Facilitate the Creation of Personal Health Records, *Feurer M, Channin D, Kleper V, Mongkolwat P.*

### Ian Finn, MD, PhD

An End-to-end Natural Language Processing (NLP) System for Capturing and Searching Unstructured Information in Radiology and Pathology Reports, *Finn I, Apostolova E, Mongkolwat P, Kleper V, Channin D.*

### Mauricio S. Galizia, MD

MDCT Evaluation of the Rarest Italian Violins from the 17th and 18th Century, *Galizia M, Ananthakrishnan L, Borman T, Yaghmai V.*

### Ryan Hickey, MD

- The Use of C-Arm CT in the Interventional Oncologic Treatment of Hepatocellular Carcinoma, *Hickey R, Gupta R, Ryu R, Lewandowski R.*
- The Role of Interventional Radiology in the Management of Complications

Following Renal Transplantation, *Hickey R, Gupta R, Ryu R, Lewandowski R.*

### Steven D. Huffman, MD

Optional Inferior Vena Cava (IVC) Filters: A Critical Review of Extended Clinical Indications and Currently Available Devices, *Huffman S, Minocha J, Gupta R, Ryu R, Karp, J, Lewandowski R.*

### Ibrahim A. Idakoji, MPH

Computed Tomography Imaging of the Ocular Globe in Selected Procedures, *Idakoji I, McComb E.*

### David Levi, MD

The ABCs of ACL Reconstruction, *Levi D, Omar I, DuBois D, Yap R.*

### Jeet Minocha, MD

Radiologic Response Following Locoregional Therapies in Hepatocellular Carcinoma: A Critical Review of the Commonly Used Methodologies, *Minocha J, Riaz A, Gupta R, Ryu R, Salem R, Lewandowski R.*

### Pattanasak Mongkolwat, PhD

A Web-based Open Source and Open Access Annotation and Image Markup (AIM) Template Builder, *Channin D, Rubin D, Kleper V, Dave V, Mongkolwat P.*

### Huseyin Gurkan Tore, MD

- Quantification of Hepatic Tumor Necrosis after Locoregional Therapy: Why, When, How? *Tore H, Chalian H, Galizia M, Rezai P, Yaghmai V.*
- Reducing Radiation Dose in CT: Dose Saving Strategies while Maintaining Diagnostic Quality, *Tore H, Chalian H, Galizia M, Rezai P, Hoff F, Yaghmai V.*

continued on page 4

# Northwestern Radiology at RSNA 2010

continued from page 3

## Vanessa V. Wear, MD

Unsuspected and Significant Extramammary Findings on Breast MR Imaging Examinations: A Pictorial Review of 3844 Cases, *Wear V, Figuerres E, Mendelson E.*

## SCIENTIFIC PAPERS

### Andy Chon, MD

Comparison of ECG-gated Noncontrast and Arterial-Phase CT in the Quantitative Assessment of Thoracic Aneurysm, *Chon A, Collins J, Carr J.*

### Jeremy D. Collins, MD

Left Ventricular Diastology by Phase Contrast Cardiac Magnetic Resonance Imaging: Preliminary Results, *Collins J, Weale P, Kino A, Scanlon T, Hodnett P, Davarpanah A, Carr J.*

### Amir Davarpanah, MD

Magnetic Resonance Analysis of Right Ventricular Volumetric Function for the Noninvasive Diagnosis of Pulmonary Hypertension, *Davarpanah A, Hodnett P, Collins J, Kino A, Carroll T, Carr J, Shah S, Biris O.*

### Brandie L. Fagin, MD

Retrospective Review of Axillary Ultrasound Reports with Histopathologic Correlation Illustrates the Need for a Common Lexicon in Ultrasound Reporting of Axillary Lymph Nodes, *Fagin B, Mendelson E, Sullivan M.*

### Amy N. Melsaether, MD

Characterizing the MRI Appearance of Breast Fibrosis: Knowing When Biopsy Results Are Concordant, *Melsaether A, Wear V, Mendelson E.*

### Ellen B. Mendelson, MD

- Breast Keynote Speaker: Automated Breast Ultrasound: Potential, Rationale, Workflow
- First Evaluation of the Diagnostic Accuracy of an Automated 3D Ultrasound System in a Breast Screening Setting, *Stöblen F, Stelkens-Gebhardt R, Rezai M, Kümmel S, Mendelson E.*
- Shear Wave Elastography Patterns of Common Benign and Malignant Breast Lesions with Histopathologic

Correlation, *Mendelson E, Wear V, Arnold L, Karst I.*

### Huseyin Gurkan Tore, MD

Colon Cancer Hepatic Metastases Response after 90-Yttrium (90Y) Radioembolization Treatment: Can Changes in Tumor Density and Size at 30 Days Predict Metabolic Activity on FDG-PET at 90 Days? *Yaghmai V, Tochetto S, Tore H, Chalian H, Rezai P, Galizia M, Salem R.*

### Vahid Yaghmai, MD

- Gastrointestinal Keynote Speaker: Problems in Liver Ablation Follow-up Imaging
- Gastrointestinal (Abdominal Tumor Perfusion and Enhancement), *Hosseinzadeh K, Yaghmai V.*

## HOT TOPICS

### Reed Omary, MD

Image-guided Drug Delivery: Transcatheter Intraarterial Perfusion MRI Monitoring.

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# New Generation Scanner Finds First Home at Northwestern

Serving as the first U.S. site for the installation of the Siemens 1.5 Aera magnet, Northwestern Radiology has had a unique firsthand look and gained hands-on experience with the innovative scanner. This is the first scanner of its kind to combine Tim 4G with Dot (day optimization throughput) engines to greatly enhance image quality and productivity.

“The Dot engines help to automate examinations,” explains Charles Fasanati, MRI technical coordinator at Northwestern Memorial. “This capability leads to consistent reproducibility from exam

to exam and the potential for improved efficiency as well as greater patient comfort.”

At 70 cm, the bore diameter of the 1.5 Aera is 10 cm greater than the Avanto scanner, providing a roomier patient examination experience. Dot engines exist for neuro, cardiac, and body applications, to name a few of the clinical areas covered by the new magnet and utilized by the specialists in the department.

The 1.5 Aera also features an innovative radiofrequency (RF) system as well as all-new ultra-high density coil archi-

tecture. This new coil system packs more coil elements into a smaller space (204 coil elements that utilize up to 48 channels). Additionally, the use of a 3-point Dixon technique permits more homogenous fat suppression, even when the anatomy is off isocenter—or in the presence of ferrous materials.

The 1.5 Aera arrived at Northwestern last year. Since obtaining FDA approval, Northwestern Radiology has been fine tuning its use of the new magnet and adding to the imaging power of the department.

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# Northwestern Radiology Faculty and Staff Notes

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## Honors, Awards, Accolades

**Gary Dillehay, MD**, received the Chicago Radiological Society's gold medal last April 15. The society honored Dr. Dillehay's many years of service to radiology and nuclear medicine as well as his leadership in organized medicine on both the state and national levels.

The Society of Interventional Radiology (SIR) recently announced that three trainees conducting research at Northwestern Radiology will receive major research awards at the upcoming SIR annual meeting to be held this March in Chicago. Northwestern medical students **Andrew Gordon** and **David Magill** will receive the Dr. Constantin Cope Award for best medical student research. **Sam Mouli, MD**, a first-year resident in diagnostic radiology, will be awarded the Resident/Fellow Research Award. Dr. Mouli's research is supported by the NIH R25 Cancer Nanotechnology in Imaging and Radiotherapy training program.

**Ellen Mendelson, MD**, became the inaugural holder of the Lee F. Rogers, MD, Professor of Medical Education in the Department of Radiology at an investiture ceremony held last May 11. The professorship recognizes the contributions of Dr. Rogers, who served as chair of radiology at Northwestern for 21 years and greatly believed in the importance of developing teachers and educating students. Among her many accomplishments, Dr. Mendelson has long been dedicated to excellence in resident and fellow education. At the special event,

she shared, "Teaching is pure pleasure to me."

**Frank Miller, MD**, recently was awarded American College of Radiology fellowship.

caBIG (Cancer Biomedical Informatics Grid) recognized the work of **Pat Mongkolwat, PhD**, and **Vladimir Kleper**, along with other members of the TCGA (The Cancer Genome Atlas) Radiology Project Team by awarding the group the 2010 caBIG Outstanding Achievement Award. The honor recognizes a person or organization that exemplifies the collaborative spirit and philosophy of caBIG and whose contributions go "above and beyond" the call of duty. Awardees were recognized at the 2010 caBIG annual meeting in September.

The National Institutes of Health (NIH) Medical Imaging Study Section invited **Reed Omary, MD, MS**, to serve as a full member as well as its only interventional radiologist. The study section reviews the majority of NIH applications submitted by radiologists.

Awarded a 2010 Young Investigator Award, **Dinxin Wang** was selected as a finalist for the International Society for Magnetic Resonance in Medicine's W.S. Moore Award in clinical science. As a finalist, he had the privilege of presenting his work, *Quantitative 4D Transcatheter Intraarterial Perfusion MRI for Monitoring Chemoembolization of Hepatocellular Carcinoma*, at the joint annual meeting of the ISMRM-ESMRMB in Stockholm, Sweden, last May.

## Welcome New Faculty!



**Sameer Ansari, MD, PhD**, endovascular surgical neuroradiology, joined Northwestern Radiology August 1. Dr. Ansari

received his MD and PhD degrees from the Jefferson Medical College in 2000. He served as an intern at the Lankenau Hospital from 2000-01 and as a diagnostic radiology resident at the University of Illinois at Chicago from 2001-05. He subsequently moved to the University of Michigan for fellowship training in diagnostic neuroradiology 2005-06 and interventional neuroradiology 2006-08. From October 2008 to July 2010, he served as assistant professor and director of the Neurointerventional Service at the University of Chicago.



**Arlene Sirajuddin, MD**, thoracic imaging, joined the department July 1. Dr. Sirajuddin received her MD

degree from the Michigan State University College of Human Medicine in 2004. She served as an intern at the Michigan State University Kalamazoo Center for Medical Studies from 2004-05 and as a diagnostic radiology resident at the Cleveland Clinic from 2005-09. She completed a fellowship in cardiothoracic imaging at the University of Maryland in June 2010.

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## New Trainees Kick Off Academic Year

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**E**ight new first-year radiology residents joined the department this summer and began learning the ins and outs of their chosen specialty. While Northwestern Radiology bid a fond farewell to its graduates, the good-byes were brief: 6 of 8 of them have remained at Northwestern Memorial for fellowship training!

### Introducing New Residents

**Sabeen Dhand**, Northwestern; **Patrick Dillon**, University of Chicago; **James Hamblin**, Indiana University; **Julia**

**Poccia**, Northwestern; **Noah Schwind**, Ohio State University; **Leroy Stromberg**, Washington University; **Christopher Therasse**, Indiana University; and **Joseph Young**, Northwestern.

### Future Plans for Our Graduates

**Jon Ellison**, body imaging fellowship, Northwestern Memorial; **Elias Hohlastos**, interventional radiology fellowship, Northwestern Memorial; **Matthew Howenstein**, interventional radiology fellowship, Northwestern Memorial; **Debra Kanter**, breast imaging fellowship, Northwestern Memori-

al; and **Mark Rapoport**, interventional radiology fellowship, Northwestern Memorial; **Thomas Rhee**, body imaging fellowship, Northwestern Memorial; **Saumil Shah**, interventional radiology fellowship, William Beaumont Hospital, Detroit; **Jimmy Wang**, musculoskeletal radiology fellowship, University of California at San Diego.

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## New Magnets Expand CAMRI's Scope

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research magnet in 2002 to complement the original 1.5T Siemens-owned magnet, CAMRI has become a key university-wide resource. Not only do principal investigators from a variety of disciplines throughout Northwestern avail themselves of the services provided by CAMRI but also researchers from other nearby academic institutions use the center.

When Northwestern Radiology started CAMRI, the center was staffed by Dr. Parrish, an MR technician, and one nurse. With the addition of new Northwestern Radiology faculty member Jennie Chen, PhD, this March, CAMRI's radiology faculty/staff now also includes Xue Wang,

PhD; three MR technologists; an administrative assistant; and two full-time nurses. Other radiology faculty members conducting studies at CAMRI include Andrew Larson, PhD; Timothy Carroll, PhD; and Reed Omary, MD.

CAMRI's capabilities have extended beyond MR imaging. Investigators have also been conducting studies involving transcranial magnetic stimulation (TMS). Dr. Parrish collaborates with Northwestern neurosurgeon Robert Levy, MD, PhD, on using TMS to provide more precise pre-surgical mapping of brain tumors. Additional projects will use TMS to map language areas, find targets for therapeutic

stimulation, and alter normal brains by creating temporary lesions. This spring, CAMRI plans to add a high-density electroencephalography (EEG) sensor to its growing arsenal of research tools.

"From the beginning, our plan was to develop an advanced imaging facility for the university," says Dr. Parrish. "We helped people get started with their studies, collect good data, obtain funding—and then just did that process over and over again. We're really pleased that the concept of CAMRI took off as quickly as it did."

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## Department Contributes to Landmark Study

The earth “shook” when the National Cancer Institute (NCI) announced initial results of its landmark National Lung Screening Trial (NLST) on November 4. Ground-breaking data from this clinical study—the largest of its kind—showed that CT screening can save lives. Comparing the effects of two lung cancer screening procedures, the trial revealed that 20 percent fewer deaths were seen among those who were screened with low-dose helical CT than with chest X-ray.

Partnering to conduct the NLST, the American College of Radiology Imaging Network (ACRIN) and the Lung Cancer Study group launched the trial in August 2002. More than 53,000 (53,476 to be exact) current and former heavy smokers, ages 55 to 74, participated in the study at 33 sites—including Northwestern. The only Chicago-area ACRIN NLST site for this nationwide study, Northwestern enrolled and screened some 425 participants under the direction of principal investigator Eric M. Hart, MD, associate professor of radiology.

“For people who remain addicted to tobacco this is the first potentially good news in 40 years,” says Dr. Hart, who personally read and reported data from the annual screenings that were conducted at enrollment and at the end of the participants’ first and second years on the trial. He then followed the progress of the Northwestern participants for another five years, getting to know many of them. “It offers a glimmer of hope that early detection could help prevent people, who are at high

risk for lung cancer due to smoking, from dying from the disease. However, prevention is the more important issue. Smoking cessation is essential to limiting risk.”

Adhering rigidly to the study’s protocol, Northwestern randomized participants into two screening arms: one CT and the other, chest X-ray. At the time of enrollment, all individuals were cancer-free but over the course of the study, participants with lung cancer were seen in both groups at Northwestern—and around the country. Data gathered as of October 2010 from all of the NLST sites revealed that 354 deaths from lung cancer had occurred among participants in the CT arm of the study, while a much larger 442 lung cancer deaths were counted among those in the X-ray group. At this point, the statistical significance of the reduction in lung cancer mortality led to the study’s early termination.

Now that the study has reached its primary scientific objective, the NLST’s initial mortality findings will require further analysis with the purpose of improving patient care. The trial’s preliminary results raise many questions for future study, ranging from coverage decisions and medical resource utilization to generalizing the screening procedures of the closely monitored study to a larger at-risk population.

For Dr. Hart, the NCI’s historic announcement caps off a journey that began with building a research infrastructure from scratch and maintaining Northwestern’s momentum as an NLST site over the long haul. “We’ve helped collect data that will be mined for at least a decade and developed expertise in lung cancer screening that no other radiology services in our area possess,” proudly says Dr. Hart, who anticipates that active Northwestern’s role in

the study will wind down by mid-year. “I believe lung cancer screening with CT will become the standard of care in the not too distant future. Once the initial kinks are worked out for a larger population, we can begin thinking about incorporating what we have learned about lung cancer screening into our practice here.”

### Making Possible the NLST

The success of Northwestern as an NLST site depended on the commitment of not only the participants themselves, who stayed active in the trial for its duration, but also the dedication of many who contributed to the nuts and bolts of actual data collection.

A number of Northwestern Memorial Hospital radiology technologists volunteered to screen research participants for this very important trial. After completing the trial’s certification process, these technologists screened participants with strict adherence to the study’s protocol. They also completed detailed paperwork at the conclusion of each exam to ensure the integrity of the study’s data. Remarks Erin Nekervis, NLST coordinator, “Their selfless contribution to this study lasted nearly four years.”

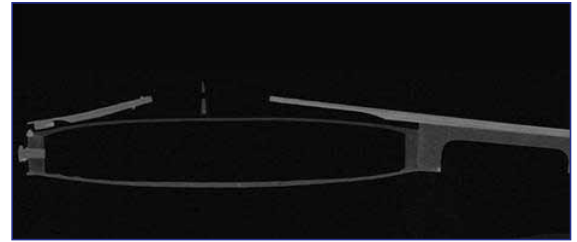
The technologists who helped make the study a reality included: Michelle T. Biringer, Angela Del Pino, Peter Dubbs, Glenna M. Fehrmann, Alan Lee Goodwin, Loretta Granger, Julie Haglage, Jenny Hirschy, Mollie King, Jodi Wietharn Kristopher, Nicole Mac, George Mahoney, Armen Markarian, Martha Ramirez, Michael Taylor, and Kelli M. West.

## MDCT Scanner Helps Unlock Secrets of Rare Violins

When science and art come together, the possibilities for creating “sweet music” are endless. So a year ago when noted American luthier, or violin maker, Terry Borman of Borman Violins inquired about using Northwestern’s MDCT scanner to help reveal what went into the design of some of the world’s rarest violins, Northwestern Radiology didn’t hesitate to offer the department’s technical expertise.

“It seemed like a great opportunity for radiology and radiologists to contribute to both the arts and sciences,” explains Dr. Yaghmai, medical director of CT. “While I personally don’t have any connections to violins, I do have an interest in art and exploring different applications of CT technology.” In fact, in the past the department has assisted with the scanning of ancient artifacts owned by Chicago’s Field Museum.

Northwestern Radiology’s participation in this project led to the first-time scanning of five rare Italian violins made in the 17th and 18th centuries. The goal: to gather data that might assist 21st-century violin makers in replicating the sound quality of these fine instruments. These multimillion-dollar violins made by revered master luthiers Antonio Stradivari and Andrea Guarneri—whose violins have stood the test of time and become the gold standard against which all modern violins are compared—came to Northwestern Memorial Hospital by way of the Stradivari Society of Chicago. The organization makes it possible for promising young musicians from around the globe to play these exceptional and priceless instruments, launch their professional careers, and achieve excellence in the field of classical music.



**Top:** This CT image shows a “sagittal” view of a rare violin. **Left:** This transparent view of a violin box came from adjusting volume rendering parameters, allowing for an “inside” look at the violin’s sound post and bass bar.

Dr. Yaghmai requested the participation of several department members he thought might be interested in assisting with this unusual application for CT scanning, including his then research fellow, Mauricio Galizia, MD. Indeed Dr. Galizia, now a cardiovascular imaging fellow at Northwestern, had a keen interest. A talented and skilled violinist, Dr. Galizia took up violin at age 12 and even performed professionally with several orchestras in his native Brazil.

“One day Dr. Yaghmai called me, saying there was something ‘different’ going on with the CT scanner. When I arrived at the scanner, I was surprised to find these magnificent violins being scanned!” recalls Dr. Galizia. “To be so close to these famous and ancient instruments was astonishing. What at first only seems to be a box of wood is, in fact, full of art and history. I could think only of all the famous musicians who had played them.”

Initially the project’s scope was simply to acquire data to help characterize the design and construction details of the violins. But the CT scanner’s ability to virtually “deconstruct” the components of the rare instruments without harming them prompted Drs. Yaghmai and Galizia to share results from the study. At the most recent RSNA meeting, they presented an educa-

tional exhibit that was written in collaboration with Borman as well as a former body imaging fellow, Lakshmi Ananthkrishnan, MD, also an accomplished violinist.

Northwestern’s MDCT scanner proved particularly useful in distinguishing design features such as the arch and thickness of various violin sections and the use of different types of materials that went into shaping the rare instruments, according to Dr. Yaghmai. Northwestern’s radiology experts also used the dual energy technology to further analyze the violins’ construction details—the first such application for the MDCT. From mapping wood density to violin design, the scanner provided data that Borman and his fellow luthiers can now take into account when creating today’s instruments. This collaboration also demonstrated that medical technology has many applications, including helping to bring the past and future closer together.

“There was nothing intrinsically peculiar from the 17th century that made these violins possible, apart from good skills and detailed work,” says Dr. Galizia, who served as first author on the exhibit. “It is completely possible to build a violin today that is as good as a classical one. In a certain way, I think radiology can help the modern makers to communicate with the past.”