



Virtual Colonoscopy Research News

by Jerome Z. Liang, Ph.D.

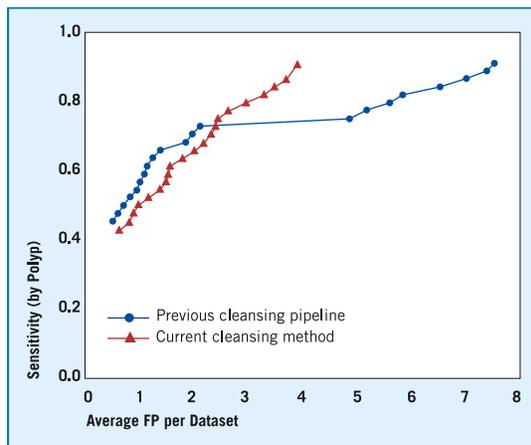
The Virtual Colonoscopy Research Project was recently renewed with over \$1M from the National Institutes of Health (NIH), entitled "Developing Virtual Colonoscopy for Cancer Screening". The Principal Investigators are Professors Jerome Z. Liang, Ph.D., of the Radiology Department and Arie E. Kaufman, Ph.D., of the Computer Science Department. This research first started with an anthropomorphic phantom experiment, which lead to the first patient trial in December of 1995; both at the Radiology Department of the University Hospital. A joint effort from the Departments of Radiology, Computer Science and Gastroenterology advanced this innovative technology to commercial stage at the Long Island High Tech Incubator at Stony Brook with FDA approval in November of 2000. An independent clinical trial on the FDA-approved commercial visualization system by 1,233 asymptomatic patients showed a comparable performance to the conventional fiber optic colonoscopy in detecting clinically significant polyps greater than 8mm diameter size, as reported in the December 2003 issue of the *New England Journal of Medicine*. This favorable performance is technically due to (1) the use of a less-stressful bowel preparation, followed by electronic colon cleansing (i.e., image processing technology) of the residual colonic materials from the virtual abdominal images, and (2) the high-quality visual navigation (i.e., image visualization technology) through the cleansed virtual colon, resembling the procedure of the clinical fiber optic colonoscopy. This NIH renewal will further develop into a computer model used to inspect the entire virtual colon, looking for polyps, named Computer-Aided Detection of polyps (CADpolyp). Our recent peer-journal paper (the December

2005 issue of *Medical Physics*) has shown an average of three to four false positives (without missing the true polyps) per patient study by the CADpolyp (see the table below).

In other words, a radiologist may only need to check the small number of suspects detected by the computer expert, instead of inspecting the entire colon mucosa, to find the true polyps. This can save a significant amount of time.

In addition to further development of CADpolyp, another task of this renewal is to improve our electronic colon cleansing technology. At the Radiological Society of North America (RSNA) annual meeting in December of 2005, we presented improved polyp detection results by our electronic colon cleansing technology over our previous one which was licensed to Viatronix Inc. in 2000 (see the figure). The results were obtained by applying our current and previous technologies to the NIH database, which consists of 52 patient studies with 44 polyps of size greater than 5 mm (including four flat polyps).

Size of polyps in (in diameter)	Lesion Located Fraction (by polyp)		
	100%	90%	80%
	Mean number of FP per dataset Mean number of FP per polyp ~ % of eliminated candidates		
All polyps (4 mm ~ 3 cm)	2.68/2.82 ~ 93.1%	1.21/1.61 ~ 96.9%	0.58/0.90 ~ 98.5%
Small/Median polyps (4 mm ~ 10 mm)	3.44/3.10 ~ 92.8%	1.56/2.00 ~ 97.1%	1.00/1.14 ~ 97.9%
Large polyps (> 10 mm)	2.00/2.43 ~ 93.5%	0.90/1.17 ~ 96.2%	0.20/0.50 ~ 99.2%



By the improvement of electronic colon cleansing and further development of CAD-polyp, this renewal shall advance virtual colonoscopy as a safe, cost-effective, minimal-invasive screening modality for prevention from the deadly colorectal cancer. For detailed information on this project and related researches, please visit: www.mil.sunysb.edu/iris

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Our CADpolyp results from 153 patient studies at Stony Brook. For 100% detection sensitivity, the number of false positives (FPs) was in the range of three to four per patient study. More than 90% suspects which mimic polyps on the colon wall were eliminated by our CADpolyp.

Chairman's Corner

by Donald P. Harrington, M.D., M.A., F.A.C.R.



As you read through this issue of the *Radiology Letter*, you will note that we are highlighting research and education. We are welcoming back two former faculty members, Barbara Wajsbro-Kandel, M.D. and Maryanna Mason, M.D. Dr. Kandel returns to breast imaging services and also abdominal imaging. Dr. Mason has joined the general radiology section as well as abdominal imaging. These

two radiologists will assist the department for a quicker turnaround time to your referrals and our commitment to having the best radiologists on our staff. Joining our faculty is Dvorah Balsam, M.D., a noted pediatric radiologist who will assume the role of Chief of Pediatric Radiology. She comes to Stony Brook with many years of pediatric radiology experience as a replacement for Thomas Smith, M.D. who retired as Chief of Pediatric Radiology in September 2005.

The Radiology Department has collaborated with the School of Health Technology and Management to establish baccalaureate training programs in Nuclear Medicine Technology and Radiology Technology. Our plan for 2007 is the commencement of a masters' level program in radiological science and radiology assistant. These programs support the educational mission of the department and our service to the community.

Our research endeavors are highlighting virtual colonoscopy. The early initial investigation and visualization software used by many has its roots at Stony Brook. The new NIH grant (highlighted in the *Letter*) is funding to further develop a computer generated artificial intelligence protocol for examining the colon. A summary of the varied research activities of the Department is highlighted which will contribute to the future of medical imaging.

This is an exciting time to be involved with medical imaging at Stony Brook. Imaging will be the leader in medical diagnosis in this century through the modalities of MRI, CT and PET scanning and newer methods on the horizon.

Our Department and faculty are committed not only to academic excellence in training new radiologists but to the ongoing medical education for all radiologists. Our research for new imaging techniques is a high priority as well. This commitment supports our primary mission of excellence in patient care utilizing the latest imaging equipment and the best faculty to provide superior medical care and tertiary medical imaging.

THE RADIOLOGY LETTER

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Managed Care Update

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Transit Workers

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Healthfirst
HMO
Healthfirst 1199
Medicaid
Child Health Plus
Family Health Plus
Health First N.Y. (COMM)
Health First (65) Plus

Healthnet (all plans)
Tricare Prime Remote and
Standard Program

HIP/HIP Access II
HMO
Healthcare Partners/IPA
HIP Select (EPO, PPO)
VIP (Medicare)
Prime
Medicaid
Child Health Plus
(G-A) CHP
Family Health Plus
DCN

Horizon
HMO
Vista
Vista Plus
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Standard Plus

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Freedom Plan Metro
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Sierra
Suffolk Health Plan
Champus
United Healthcare
Child Health Plus Plan
Medicaid
Family Health Plus

USI (Select Pro)
Vytra
HMO
Suffolk County Vytra/PPO
East End Health Plan
(Vytra PPO Plan)
Direct Access HMO
Central Suffolk Hospital
(Peconic Health Corporation)
Southampton Hospital
Southside Hospital
Smart Start
Neighborhood Network Plan (EPO)
Suffolk Employees
School Health Plan (SSEHP)
Vytra Medicaid
PPO Cost Sharing Plan

Health Worldwide/SUNY Students

New Faculty



Barbara Wajsbro-Kandel, M.D.

returns to the faculty staff as an Assistant Professor of Clinical Radiology in the Division of Breast Imaging

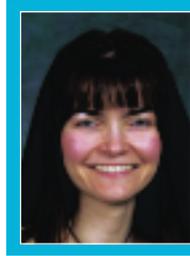
and Cross-sectional Imaging. Dr. Wajsbro-Kandel also worked at Stony Brook in the same capacity from July 1989 to July 2001. After leaving Stony Brook in 2001, she worked at the Bay Ridge Medical Imaging PC in Brooklyn, New York. She received her medical degree from the New York School of Medicine, followed by a Pediatrics internship at the Beth Israel Medical Center in New York, and a Diagnostic Radiology residency and Ultrasound/Body CT fellowship at the State University of New York at Brooklyn. Other appointments include the State University of New York at Brooklyn, Kings County Medical Center – Downstate, Brooklyn, New York and the Lutheran Medical Center in Brooklyn, New York. Dr. Kandel is Board Certified in Diagnostic Radiology and is a member of the American Institute of Ultrasound in Medicine, American Roentgen Ray Society and Society of Breast Imaging.



Dvorah Balsam, M.D.

joined the faculty staff as a Professor of Clinical Radiology in the Division of Diagnostic Radiology and

Section of Pediatric Radiology and as Chief of Pediatric Radiology. She received her medical degree from the Albert Einstein College of Medicine, Yeshiva University in the Bronx, New York, followed by a mixed Medicine/Pediatric internship at the Bronx-Lebanon Hospital Center in the Bronx, New York. She completed a Diagnostic Radiology residency at the Albert Einstein Jacobi Medical Center in the Bronx, New York and a Pediatric Radiology fellowship at the Columbia – Presbyterian Medical Center in New York, New York. Dr. Balsam's previous appointment was at the Nassau University Medical Center in East Meadow, New York where she was Chief of Pediatric Radiology and an Attending in Pediatrics. Dr. Balsam is Board Certified in Radiology and has a Certificate of Added Qualifications in Pediatric Radiology.



Maryanna Mason, M.D.

joined the faculty staff as an Assistant Professor of Clinical Radiology in the Division of Cross-sectional Imaging. Dr.

Mason also worked at Stony Brook in the same capacity from January 2002 to April 2003. She received her medical degree from the New York Medical College in Valhalla, New York, followed by a Pathology internship at North Shore University Hospital in Manhasset, New York. Dr. Mason completed a Diagnostic Radiology residency at the Long Island Jewish Medical Center in New Hyde Park, New York and a Cross-sectional Imaging fellowship at the State University of New York at Stony Brook, New York. Dr. Mason's previous appointment was at the St. Catherine of Siena Medical Center in Smithtown, New York and Good Samaritan Hospital Medical Center in West Islip, New York where she was Section Chief of Ultrasound. Dr. Mason is Board Certified in Radiology.

Lectures

Meng Law, M.D. presented a lecture on *"Ultra-High Field & Parallel Neuro-Imaging"* on September 13, 2005. Dr. Law is an Assistant Professor of Neurosurgery & Radiology at New York University School of Medicine at the New York University Medical Center in New York, New York.

Gary Israel, M.D. presented a lecture on *"MRI of the Female Urethra and Perineum"* on November 8, 2005. Dr. Israel is an Associate Professor of Radiology and Chief of CT at Yale-New Haven Hospital in New Haven, Connecticut.

Nathaniel Reichek, M.D., F.A.C.C., F.A.H.A. presented a lecture on *"Cardiac MRI and CTA in Patients with Coronary Artery Disease"* on November 10, 2005. Dr. Reichek a Professor of Medicine and Director of Research and Education at the St. Francis Hospital in Roslyn, New York.

Mark Murphey, M.D. presented a lecture on *"Imaging of Soft Tissue Tumors: How to Stay out of Trouble"* on December 13, 2005. Dr. Murphey is the Chief of Musculoskeletal Radiology at the Armed Forces Institute of Pathology/University of Maryland in Baltimore Maryland.

Mark Schweitzer, M.D. presented a lecture on *"Shoulder MRI Clinical Pearls"* on March 14, 2006. Dr. Schweitzer is the Director of Musculoskeletal Radiology at the Hospital for Joint Diseases/NYU Medical Center in New York, New York.

Larry Boxt, M.D. presented a lecture on *"CT Examination of the Heart"* on April 11, 2006. Dr. Larry Boxt is the Director of Cardiac MRI/CT at North Shore University Hospital in Manhasset, New York.

Elliot Fishman, M.D. presented a lecture on *"CT Angiography: Techniques & Clinical Applications"* on May 9, 2006. Dr. Elliot Fishman is Professor of Radiology and Oncology and Director of Diagnostic Imaging and Body CT at the Johns Hopkins Hospital in Baltimore, Maryland.

Departmental News

Dr. Zengmin Yan received a letter from a patient's family thanking him for finding a medical problem on an MRI exam that was previously missed on prior studies.

Congratulations to **Robert Matthews, M.D.** who passed the written Board examination in Nuclear Cardiology and is Board Certified in Nuclear Cardiology (CBNC).

The American College of Radiology (ACR) has just published the 50th textbook of its well known syllabus series used since the 1970's for radiology physician self education and resident board review. Ultrasound III which was published December 2005 was edited by Barbara Hertzberg, M.D. of Duke University Hospital, Michael Hill M.D. of George Washington University Hospital and **Harris L. Cohen, M.D.**, the Editor in Chief of the American College of Radiology's syllabus series. Dr. Cohen is on the faculty staff of the University Hospital and School of Medicine at Stony Brook, New York in the Department of Radiology.



Welcome to **RoseMary Citrola, Ph.D.** who joined the Department as Departmental Research Coordinator. RoseMary will be working closely with scientists, faculty, and research staff to streamline the grant and compliancy processes.

Mark Schachter, Patrick Connors and **Jason Mathew**, three of the graduates from the first graduating class of the Nuclear Medicine Program, presented a research project on the Benefits of SPECT and PET Fusion with Anatomical Imaging Modalities and won second place out of sixteen student presentations at the Annual Greater New York Chapter Meeting of the Society of Nuclear Medicine.



Congratulations to **Mohit Naik, M.D.** who was appointed Chief Resident.



Khaldoon Al-Dulaimy, M.D. (left) and Harris L. Cohen, M.D.

Khaldoon Al-Dulaimy, M.D., a Radiology resident at Stony Brook and **Harris L. Cohen, M.D.**, Professor of Radiology and Director of Body Imaging coordinated the Society of Radiologists in Ultrasound (SRU) Unknown Case of the Day Program for the 2005 Annual Meeting held in October 2005.

Harris L. Cohen, M.D. was chosen as one of three members of the Radiologic Society of North America's International Visiting Professor Program. **Dr. Harris L. Cohen** of Stony Brook, Dr. Alexander Norbash, Chairman of Boston University School of Medicine's Department of Radiology and Dr. King Li, Chief of Molecular Imaging at the National Institute of Health, lectured at several venues in Chennai and Bangalore, India during the first two weeks of January 2006.



Dr. King Li, Dr. Alexander Norbash and Dr. Harris Cohen (left to right)



Mohit Naik, M.D. (left), Amit Patel, M.D. (front) and Harris L. Cohen, M.D. (rear)

Mohit Naik, M.D. and **Amit Patel, M.D.**, radiology residents at Stony Brook and **Harris L. Cohen, M.D.**, Professor of Radiology, coordinated the RSNA's Unknown Ultrasound Case of the Day Program for the 2005 annual meeting held in December. The RSNA meeting is one of the world's largest health related meetings with an attendance of about 50,000 individuals. Drs. Naik and Patel were awarded Certificates of Appreciation for their work by the RSNA.

Medical Imaging Research News

Jerome Z. Liang, Ph.D., Professor of Radiology, Computer Science, and Physics & Astronomy, was invited to give a lecture tour in China this past summer on his research interests in 3D image-based diagnosis, treatment planning and follow-up evaluation. Dr. Liang has lectured several times on Medical Imaging Informatics – from image formation and processing to visualization. The photo shows his lecture at XinJiang University. Dr. Liang also lectured at Beijing University, ZheJiang University and Shanghai University for Science and Technology. For detailed information on his research activities, please visit the Laboratory for Imaging Research and Informatics (IRIS): website at www.mil.sunysb.edu/iris.



Benefits of Fusion Imaging

by Robert Matthews, M.D. and William Stanley, C.N.M.T.

Fusion imaging is the superimposing of anatomical and functional images in order to better define and localize lesions. Various combinations of fusion imaging are possible including PET/CT, PET/MRI, SPECT/CT, SPECT/MRI, SPECT/US, and others. Using fusion software allows for co-registration, in which images are combined from different systems acquired at different times. Areas such as the brain are easier to perform fusion since patient variation is less likely. More difficult areas include the thorax, which may have different arm position, respiratory cycles, and body rotation. Repetition of the same position is essential for adequate fusion co-registration. These topics were discussed in a paper entitled "Benefits of SPECT and PET Fusion with Anatomical Imaging Modalities" presented by Mark Schachter, Patrick Connors, and Jaison Mathew at the Greater New York Society of Nuclear Medicine Symposium.

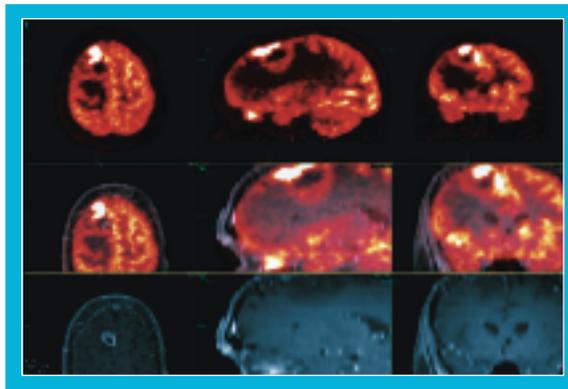


Figure 1. MRI demonstrated an enhancing lesion with associated edema in the medial right frontal lobe. PET/MRI fusion imaging showed that the area thought to represent edema was in fact new tumor growth, and the enhancing lesion was necrotic tissue.

In this investigation of fusion imaging, we sought to evaluate fusion imaging impact on the interpretation of nuclear medicine SPECT and PET studies. Eight studies were selected in which SPECT or PET fusion images were obtained within one month of anatomical imaging with either CT or MRI scan. Cases included 3 brain PET/MRI, 1 brain SPECT/MRI, 1 parathyroid SPECT/CT, 1 gallium SPECT/CT, 1 NeuroSpec SPECT/CT, and 1 denatured spleen SPECT/CT. Two radiologists were first asked to evaluate the CT or MRI images alone, then assess SPECT or PET images alone, followed by interpretation of combined fusion images.

For a majority of the cases, the radiologists demonstrated greater confidence of diagnosis with fusion imaging than with either study alone. In one case involving the evaluation of brain metastasis, PET/MRI fusion images changed

the location of recurrent tumor compared to either PET or MRI alone. Two studies where fusion did not show benefit were the gallium SPECT/CT and parathyroid SPECT/CT. In these two studies, variation of patient positioning made co-registration difficult and the quality of fusion images was compromised. Both brain PET/CT and SPECT/CT fusion imaging were rated the highest in diagnostic confidence and quality of fusion due to the fixed anatomical location within the cava.

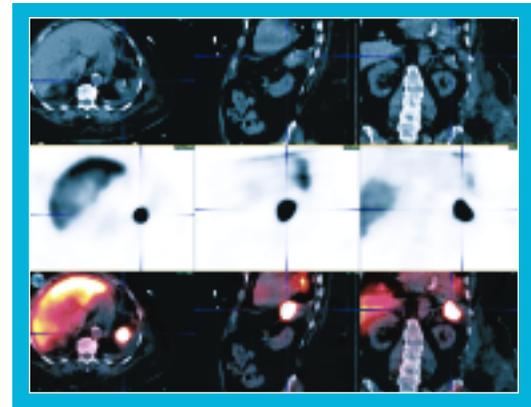


Figure 2. Following splenectomy for ITP, patient continued to have low platelet count. CT scan was performed and interpreted as post-surgical changes at the site of splenectomy. Denatured RBC SPECT/CT fusion imaging clearly showed rejuvenated splenic tissue within surgical bed. Fusion images allowed better pre-operative planning for the surgeon.

Current trends in radiology are to install fixed PET/CT and SPECT/CT cameras to take full advantage of combined physiological and anatomical imaging. Our research validates this trend, demonstrating that SPECT and PET fusion images with CT and MRI prove to be helpful when there is good quality of co-registration. The combination of two modalities clearly enhances the definition of lesions allowing for more accurate diagnosis. Both patients and referring physicians would benefit from the higher diagnostic certainty derived from fusion imaging.

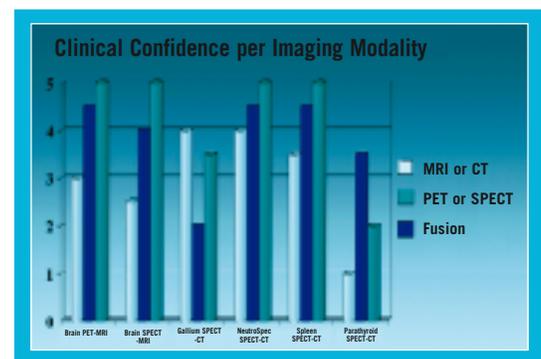


Figure 3. Radiologists indicated higher diagnostic confidence with fusion images compared to either modality alone when there is good quality of co-registration.

Patient
appointments
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Radiologic Technology and Nuclear Medicine Technology Programs

by Terry M. Button, Ph.D.

The Department of Radiology has joined with the Health Sciences Program in the School of Health Technology and Management to form new concentrations of study in Radiologic Technology and Nuclear Medicine Technology. These two new programs unite the resources of the Hospital and the University; uniquely modify the old "four plus one format" of education. Students are both liberally and clinically educated in the four years spent completing the Bachelor of Science in Health Science degree. The 12-month post-baccalaureate clinical training hosted by University Hospital's Department of Radiology concludes the student's education. It is upon successful completion of both educational components that students are then eligible to take the National Registry Examination.

We are proud to have both Mr. Joseph Whitton serve as the Radiologic Technology Program Director and Mr. William Stanley serve as the Nuclear Medicine Technology Program Director. Our inaugural class of students boasts 14 students in Radiologic Technology and 13 students in Nuclear Medicine Technology.

In addition, a one-year continuing education program has been formed in Magnetic Resonance Technology. This is very fitting given that University Hospital's Professor Lauterbur received the Nobel Prize in Medicine for discovery of this imaging technology at Stony Brook. This program is overseen by Dr. Terry Button.

Research

by RoseMary Citrola, Ph.D.

Research continues to be a priority in the Radiology Department. 2005 ended with over 60 active research projects approved by the Office of Research Compliance. 19 of the projects are interdisciplinary collaborations with members of the following divisions: Biomedical Imaging, Diagnostic Radiology, Breast Imaging, Nuclear Medicine, Body Imaging, Ultrasound, Interventional Radiology, Electrical Engineering, Computer Science, Neuroradiology, Thoracic Imaging, MRI Research, Computed Tomography, Cross-sectional Imaging and Medical Physics.

Multi-disciplinary collaborations with the following departments has developed to include 27 studies with members of Surgery, Pulmonary Diseases, Psychology, Pediatrics, Anesthesia, Biomedical Engineering, Clinical Neurology and Psychiatry. The Department of Radiology continues to lead the way with hospital collaborations.

Finally, work is underway to expand the Department of Radiology and the School of Health Technology and Management's successful collaborative relationship by developing a Master of Science in Radiological Science. Two specific tracks are planned with an anticipated start date of September 2007:

- *Imaging Track* – This program is designed for advanced clinical studies in Medical Imaging. Radiology Residents will be enrolled in this program with each earning a Masters of Science in addition to credentialing in Diagnostic Radiology
- *Radiology Assistant* – Legislation has recently been changed in New York State to allow the credentialing of the Radiology Assistant (RA). This program will enroll certified Radiologic Technologists that hold an appropriate Baccalaureate degree. The responsibilities of the RA are equivalent to that of a physician's assistant (PA) but as it relates to Radiology. Dr. Moore has agreed to oversee this program



Joseph Whitton
(left) and
William Stanley

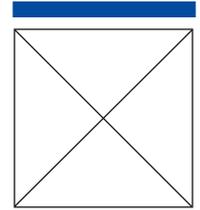
By working with such groups as SUNY Downstate, Winthrop Hospital, Columbia Presbyterian, Brookhaven National Labs and the United States Navy, United States Army, and Department of Defense, researchers can share, validate and build upon each members information instead of duplicating research.

In 2006, the science community can expect to see ground-breaking data from the Department of Radiology research in the following areas: Dynamic Infrared Imaging, Thyroid Tissue Imaging, SPECT Image Quality and Speed, Virtual Colonoscopy, Bladder, Tumor Imaging, Multi-Slice Coronary Angiography, Nano-bubble technology for Acute Ischemic Stroke, Lung Cancer Staging, Embolization Therapy for Brain Arteriovenous Malformation, High Resolution MRI for Epilepsy, Biomechanics of Dementia and Hydrocephalus, Fluid Interaction of Abdominal Aortic Aneurysms, 3D for Breast Abnormality Detection.

RADILOGY LETTER

A Radiologist's Approach to Imaging Vistas ■ State University of New York at Stony Brook

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