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# RT Image

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## Building a Better Beam

The X-ray revolution

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# Building a Better Beam

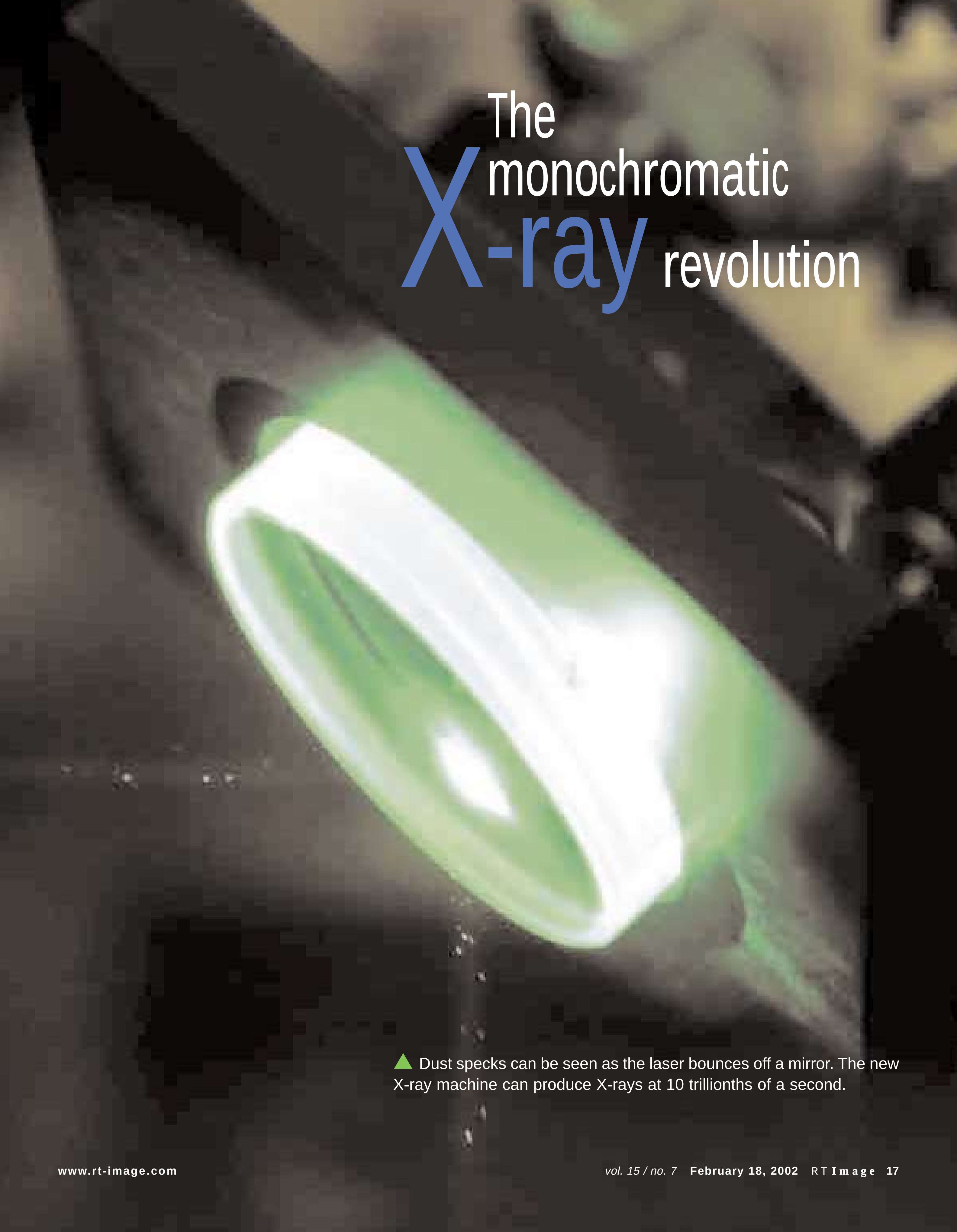
By Jeremy Kuhar

While the current debate over screening mammography's ability to detect breast cancer rages on, one thing remains certain: Image quality must improve. It's been a source of frustration for Frank Carroll, MD, a breast-imaging specialist at Vanderbilt University, Nashville. After more than 20 years in radiology, he still feels helpless reading mammograms.

"I feel like I'm standing in quicksand," he says. "It's just too difficult to know what you're looking at. We call a lot of things cancer when they're really not. There are a lot of unnecessary biopsies because we see things and we're not sure what they are. It's just frustrating because we could be doing a better job if we had the right tools."

*All photos courtesy of Frank Carroll, MD*

# The monochromatic X-ray revolution



▲ Dust specks can be seen as the laser bounces off a mirror. The new X-ray machine can produce X-rays at 10 trillionths of a second.

Searching for the right tools, Carroll and several colleagues at Vanderbilt began analyzing mammography to determine why image quality hasn't improved. It didn't take them long to identify the X-ray beam as the primary problem.

"Existing X-ray machines don't do a good job in mammography," he explains. "Radiation dose is too high and the accuracy is poor. It's mostly because the beam we use is simply not well suited to what we are doing."

According to Carroll, the problem with standard X-ray tubes is that they produce a beam that contains a broad spectrum of frequencies. They generate "soft" X-rays that barely penetrate the skin at the low end of the spectrum. At the high end, they generate "hard" X-rays that ricochet off bone and tissue. The result is a fog that obscures subtle features.

Carroll compares standard X-ray tubes to a light bulb. "When you turn on the light, you see white light with your eye. But the light is actually a mix of colors. It actually consists of red photons, green photons, blue photons. There's a broad spectrum coming out of the light. The same thing happens with an X-ray tube," he explains. "When you put an electrical voltage across an X-ray tube, you get a very wide range of X-ray photons."

Frank Carroll, MD, stands by the tabletop terawatt laser with a test paper. He believes the new monochromatic X-ray machine will revolutionize diagnostic imaging.

## Single Beam Solution

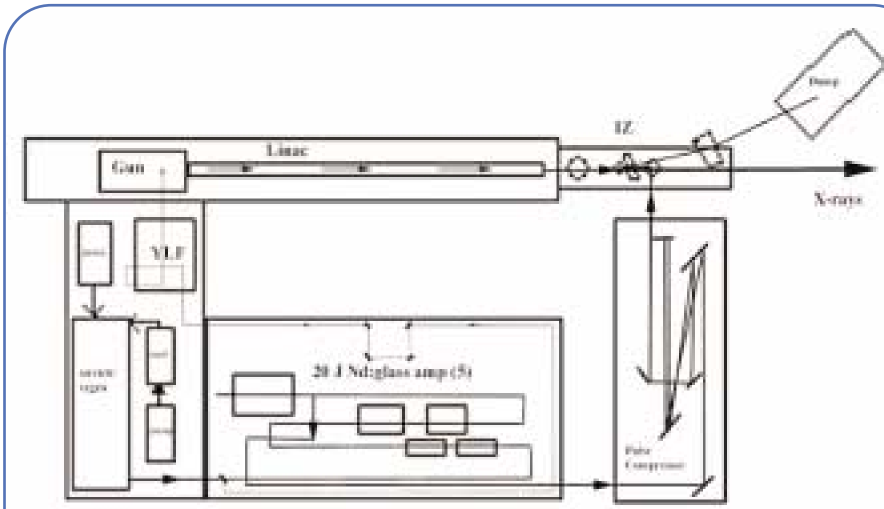
Carroll and his colleagues believe that using X-rays at a single wavelength will significantly improve image quality. Using technology previously found only in multibillion dollar laboratories, the research team built the first monochromatic X-ray machine specifically designed for medical imaging. The new machine produces a tunable monochromatic beam, allowing RTs to "fine tune" their X-rays to specific frequencies.

Using a monochromatic beam could make breast tumors more visible, says Carroll. He estimates that tumor tissue would be 11 percent lighter than normal tissue using monochromatic X-rays, a drastic improvement compared to the half-percent difference produced by conventional X-rays. Not only will the new machine improve image quality, but it will also use 50 times less dose. Yet its greatest benefit is its unmatched precision.

"We've created a beam that is more like an X-ray laser, so when you turn it on, you can decide what frequency you want and that's what you've got," says Carroll. "Monochromatic X-rays give the technologist total control, and that's the beauty of this machine. You can pick the X-rays that are best suited for the task at hand."

## How It Works

Building the monochromatic machine turned out to be harder than anticipated. The Vanderbilt research team, which includes Marcus Mendenhall, PhD, Robert Traeger, BS, James Waters, PhD, Charles Brau, PhD, and Wei Wei Clark, PhD, knew that they needed a better beam; however, they still had to figure out how they were




Monochromatic X-rays are created by accelerating electrons to the speed of light and colliding them with an infrared laser. The collision creates enough energy to change electrons into monochromatic X-rays.

going to create it. After testing several different theories, they finally found one that looked as if it would work. The basic idea is simple: Generate a beam of electrons and accelerate them to nearly the speed of light. At the same time, create a high-powered beam of infrared laser light. Direct the two beams so they collide head-on, and the infrared photons should bounce off the electrons and gain the energy required to become X-rays.

Scientists have been creating monochromatic X-rays using this approach for years. However, the X-rays they produced were not in the diagnostic imaging range. Diagnostic X-rays need to be between 15keV and 50keV (20kVp to 150kVp).

Before the research team could build their X-ray machine, they needed to find the money to finance their project. When a group of Vanderbilt scientists banded together to submit a proposal to the Department of Defense to create a free-electron laser (FEL) center on campus, Carroll joined in because he thought he might be able to use the unusual laser to produce better X-rays. The Strategic Defense Initiative Organization approved funding for the Vanderbilt center, but did not support Carroll's proposal because they thought it was too impractical.

"Of the six original components of the federal research grant for FEL, I was the only one that they didn't fund," recalls

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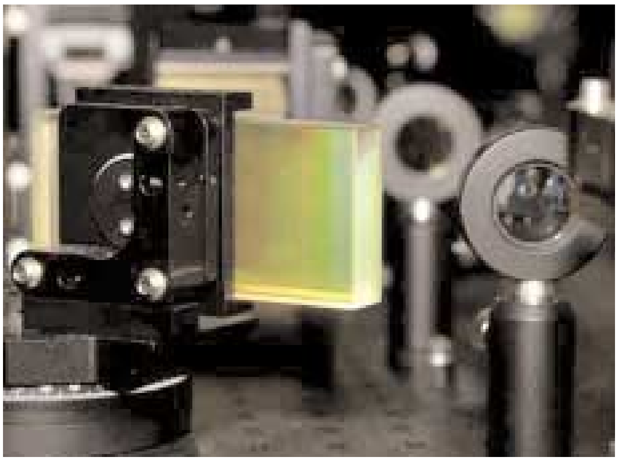
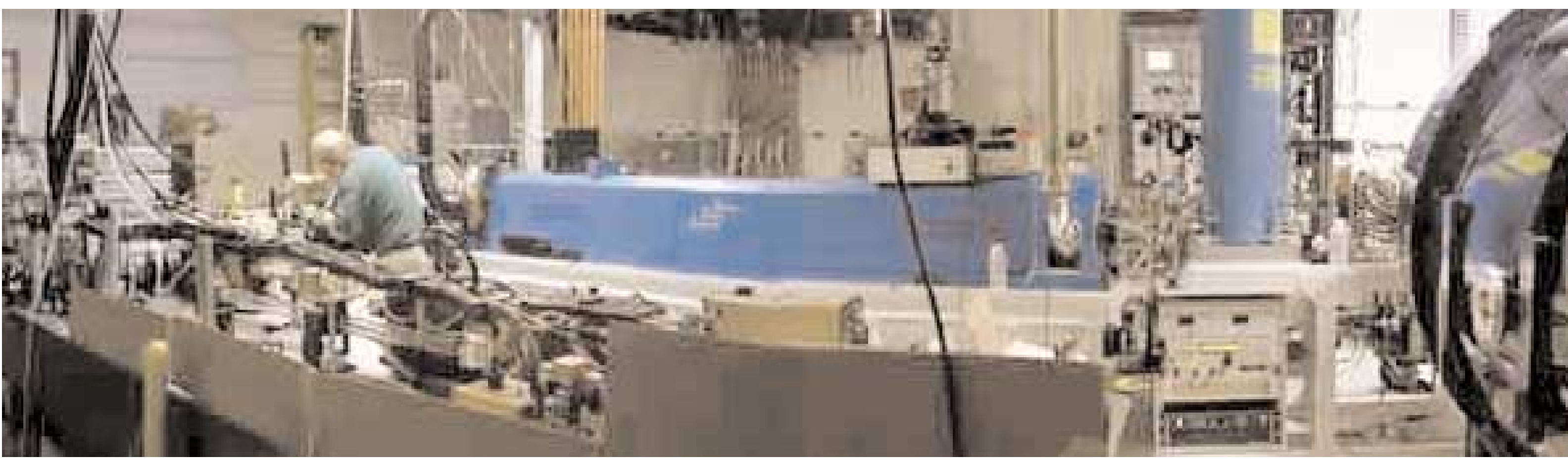
>
> *— Frank Carroll, MD*



▶Pictured to the right is a portion of the laser called a YLF, which illuminates the cathode. To create monochromatic X-rays, researchers collide an infrared laser with electrons accelerated to the speed of light.

▲The tabletop terawatt (T3) laser as seen through one of the large optics at the end of the table. The new X-ray machine will allow RTs to fine tune their beam, providing unmatched control of image quality.

▼This wide angle view shows the size of the machine, which will be housed in a room separate from the diagnostic exam area. The accelerator is the long blue structure in the background. The tall blue tank (right of center) is the superconducting magnet that focuses the electron beam. The large blue tank on the right is the pulse compressor, a part the research team has discovered to be unnecessary.



Carroll. "They told us that the project was too risky. But, by the same token, we would be their biggest payoff if we were successful."

Fortunately, Carroll was able to convince Eastman Kodak, Rochester, N.Y., that his ideas had merit. Kodak funded his efforts for the first three years, which allowed Carroll and his colleagues to create a preliminary design for the monochromatic X-ray beam line that they wanted to add to the Vanderbilt FEL.

## Early Obstacles

With the money in hand, Carroll began designing and building a prototype. He soon found that funding wasn't the only obstacle his team would have to overcome. Early prototypes of the X-ray machine proved to be cumbersome, not to mention deadly.

"The linear accelerator that we used had to be shielded in a vault surrounded by concrete seven feet thick. You couldn't stand next to it for 15 minutes or else you would be dead. This was just not practical if we were going to be using this for mammography," says Carroll.

Going back to the drawing board, the team made a few adjustments to their machine. The most significant change was switching from the massive 100-foot laser to a smaller, safer terawatt laser, which could be fired once every 100 seconds and using a new accelerator which could be fired as fast as 20 times a second. The new laser is smaller in size, but still able to produce lightning-fast imaging speeds and more than enough electrons to create the X-rays needed.

"Using the terawatt laser, we could produce $10^{10}$ X-ray photons in each 10 picosecond pulse. The fastest anybody can get an X-ray using current systems is about a thousandth of a second, and most are shot at about 1/30 of a second," he says. "Our machine is capable of taking X-rays at 10 trillionths of a second. You could fire a person from a cannon, and it's still going to look like they're frozen with our machine."

## Applications Abound

Improved image quality and reduced patient dose are only the beginning. According to Carroll, monochromatic X-rays will give clinicians access to more information not used by traditional X-ray systems. Conventional X-ray imaging actually delivers very little information. Photons that pass through the body strike the X-ray plate, while those that are absorbed don't. Physicists know that photons contain hundreds to thousands of times more information. As the X-ray photons travel through tissue, they undergo subtle changes in phase. With a monochromatic source, scientists can tap into this information through a process called phase contrast imaging.

**Tumor tissue would be 11 percent lighter than normal tissue using monochromatic X-rays, a drastic improvement compared to the half percent difference produced by conventional X-rays.**

Research done in synchrotron laboratories has shown that this approach can provide valuable information about changes in tissue density and edges between different organs and body parts. For example, phase contrast images can show individual muscles, which are completely invisible to conventional X-rays.

Carroll and his team are also working on three-dimensional imaging applications for their new X-ray machine. The 3D technique would image a woman's breast without compression by taking eight images as the woman rotates on an axis. A computer would then generate a 3D image for the radiologist to view. Carroll hopes that 3D mammography will eliminate the need for compression, one of the reasons women avoid mammography. "Breast compression is done with good intentions," says Carroll. "It's done to try to get the tissue to be the same thickness, but it just doesn't work too well. When you look at mammograms year to year, it's difficult to figure out if what you're seeing is just because the breast is compressed differently. By using 3D imaging without compression, the image is going to be consistent year to year."

Another approach the team is working on is time-of-flight imaging, which capitalizes on the imaging speed of the new system. Normally, all the photons that make it through the body contribute to the final image. This includes photons that have bounced around the body before emerging. With the extremely short pulses of the new X-ray source, Carroll can install digital detectors that will only measure photons passing through the body directly.

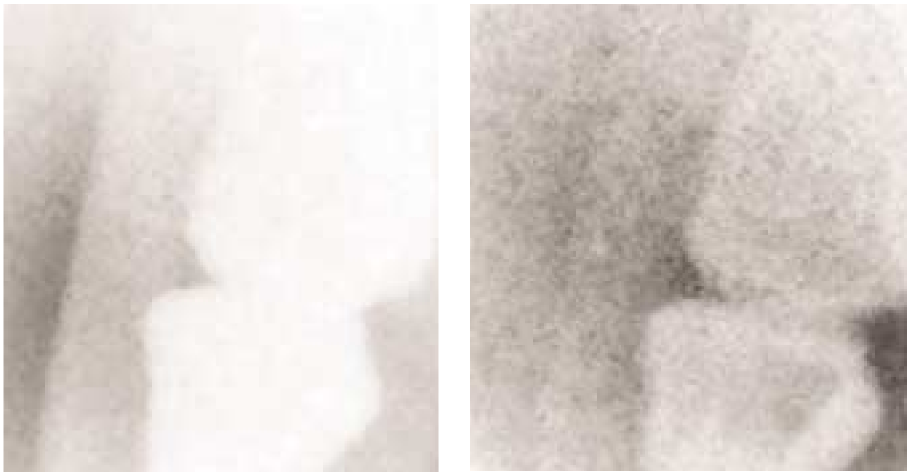
Perhaps the most promising application is K-edge imaging, a new technique that Carroll predicts will become a "whole new field of radiology."

A great deal of anatomical imaging is obtained using contrast agents. One commonly used contrast agent is iodine, which has a greater degree of toxicity than radiologists would like. K-edge imaging would provide a way to reduce both contrast agent toxicity and beam dose.

K-edge imaging works by using the energy that keeps electrons in orbit around the nucleus of an atom. Tuning the X-ray beam to a value equal to the binding energy of the electrons in the inner (K) shell of a contrast agent greatly increases the effectiveness of the agent. As a result, contrast can be used at much lower doses. The ability to tune the X-ray beam also allows researchers to choose among more compounds.

Carroll points to iodine as an example. "The K-edge of iodine is 33.2keV. If you hit iodine with an X-ray at 33.2keV, it will knock the K-shell electron out of its orbit," he explains. "When that happens, the X-ray photon is extinguished. All of sudden the X-ray is stopped."

Because the beam is tunable, researchers will be able to find less toxic contrast agents. "We can tune the beam to the K-edge of iodine, gadolinium or silver, whatever you want to put into the patient," says Carroll. "Or if you just want to dilute



▲ Because the new machine can create lightning-fast imaging speeds — speeds too fast for film screen — Vanderbilt researchers were forced to use glass detectors. As a result, the first images created show a lot of little specks, but researchers are encouraged, knowing that they are on the right track. **(L)** When tuning the X-ray machine to 16keV, the soft tissues are visible, but the bone is opaque. **(R)** When tuning to 25keV, the cortex and meduallary cavity are visible, and the soft tissue is less evident.

the iodine, you can dilute it. You can reduce either the iodine dose to the patient or you can reduce the radiation dose from the X-rays."

At higher X-ray energy levels, the body becomes increasingly transparent. That means a higher percentage of the X-ray photons pass through the body without doing any damage. By identifying contrast agents of lower toxicity that work at higher energy levels, the adverse side effects of contrast may be substantially reduced, Carroll says.

At the same time, it should be possible to use K-edge imaging to view a new level of detail within the body. An experiment performed by two of Carroll's graduate students has shown that this approach can image microcirculation channels in blood vessels that are invisible in conventional angiography, while reducing both the radiation dose and the concentration of the contrast materials given to the patient.

In addition to its radiological applications, the monochromatic X-ray may have an important role in the basic research efforts made possible by the mapping of the human genome. Many of the scientists involved say that the next step is "proteomics," which is the mapping and determining the functions of the millions of proteins that act as the basic molecular machinery of living organisms.

One of the key techniques for determining the structure of complex molecules like proteins is X-ray crystallography. These characterization efforts are currently done primarily at the big synchrotron laboratories because monochromatic X-ray beams are superior to polychromatic beams for this purpose. However, the demand for time on these beam lines is far greater than the time available. As a result researchers must prepare lengthy proposals and wait long periods of time before they can analyze their samples.

"There are drug companies that are begging to use synchrotrons," says Carroll. "With this machine, we will be able to replace the multibillion-dollar synchrotron labs, which take up several city blocks. Our machine is only about 20 feet long and 12 feet wide and only costs about $2.5 million to make."

With its lower cost and smaller footprint, each university could house a monochromatic X-ray machine, says FEL Center Director David Piston. "Just imagine, with this technology we will be able to put 100,000 monochromatic X-ray [machines] in 100,000 universities around the world for the cost of building just one centralized synchrotron lab."

## Future Changes

According to Carroll, there are still some minor changes that need to be made before they reach the final version. "The machine is becoming smaller and less expensive. It's becoming much more practical. It can be used for everything. We didn't just design it to be used in just one X-ray room. We designed a whole facility around it. We designed it to be used at an entire facility simultaneously."

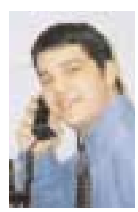
The research team is currently working on building a detector capable of handling the fast speeds of the beam. "We took two images so far. One was at 16keV. You can't see through the bone, but you can see the soft tissues. And then we tuned up to 25keV and you can see through the bone. You can see the cortex and the medullary cavity and the soft tissues are less evident. But there are a lot of little specks," says Carroll. "The specks are from the detector. We found that the beam is so fast that we can't use film screen."

Unable to use film screen, Carroll improvised and used glass as a detector. "I remembered that I had done a little bit of research on glass detectors a number of years ago," he says. "If you hit glass with X-rays it glows, so we tried it and it worked. The first images are actually glowing glass."

Although the first images don't show the machine's true potential, Carroll and his team are satisfied with knowing they are on the right track. Clinical trials start this fall.

"We are really excited about the changes this will make in diagnostic imaging," says Carroll. "Will it happen in the next few years? No. It's going to take a lot of people thinking about this and deciding how this could be used. With this technology there are many possibilities. Everyone always said you can't produce an image at 10 trillionths of a second. Well, we have two posted on our Web site."

***— Jeremy Kuhar** is an assistant editor at* RT **Image** *magazine. Questions and comments are encouraged and can be directed to jkuhar@valleyforgepress.com.*



# Functional MRI Used to Find Critical Learning Period

Your teachers were right! You should have paid more attention in class. According to a recent study published in January's issue of *Nature Neuroscience*, there is a critical learning period for acquiring non-verbal language.

Using functional magnetic resonance imaging (fMRI), neuroscientists discovered that patterns of brain activity in bilingual people who learned American Sign Language (ASL) before puberty differed from those who learned it after puberty.

The findings indicate that regions in the brain's right hemisphere are activated when children, who learned ASL before puberty, read sign language. The brains of children who learned ASL after puberty show significantly less right-hemisphere activity when signing.

The fMRI-based research has implications for the early education of all children because it stresses the need for early language exposure at critical development times.

## LANGUAGE ACQUISITION

Neuroscientists generally agree that there is a critical period for first language acquisition, and that children who are not exposed to language before puberty are unable to fully acquire and use the principles of verbal and non-verbal language. There also is evidence of similar critical periods for acquiring a second language.

"We know that late learners of ASL, while they are very fluent, never will be fully fluent like native or early learners of ASL," says study co-author David Corina, PhD, associate professor of psychology at the University of Washington, Seattle. "One aspect of ASL that is difficult for late learners is verb signs of motion," he explains. "You see some subtle errors in their use of these verbs, just as you might detect subtle grammatical differences when listening to bilingual users of a spoken language when they are not using their native tongue."

## NUTS AND BOLTS

The study involved 27 bilingual subjects. Sixteen were hearing persons born to deaf parents, who learned ASL and English from birth as native languages. The remaining 11 subjects were late learners who spoke English as their native language and learned ASL after puberty.

All subjects watched a screen while their brains were imaged using fMRI. Subjects were then asked to read written English sentences and meaningless strings of consonants. They also were asked to read ASL sentences and meaningless gestures that were similar to real ASL signs.

"This work is important because we want to understand the neural systems underlying language," says Corina. "We want to know if they are malleable or fixed and the degree to which they may vary in different languages. We now know there is activation in the right hemisphere when native signers view ASL, and to see that this is dependent on early exposure suggests there are specific times when neural systems for language may be particularly sensitive to change."

For more information, visit www.washington.edu.

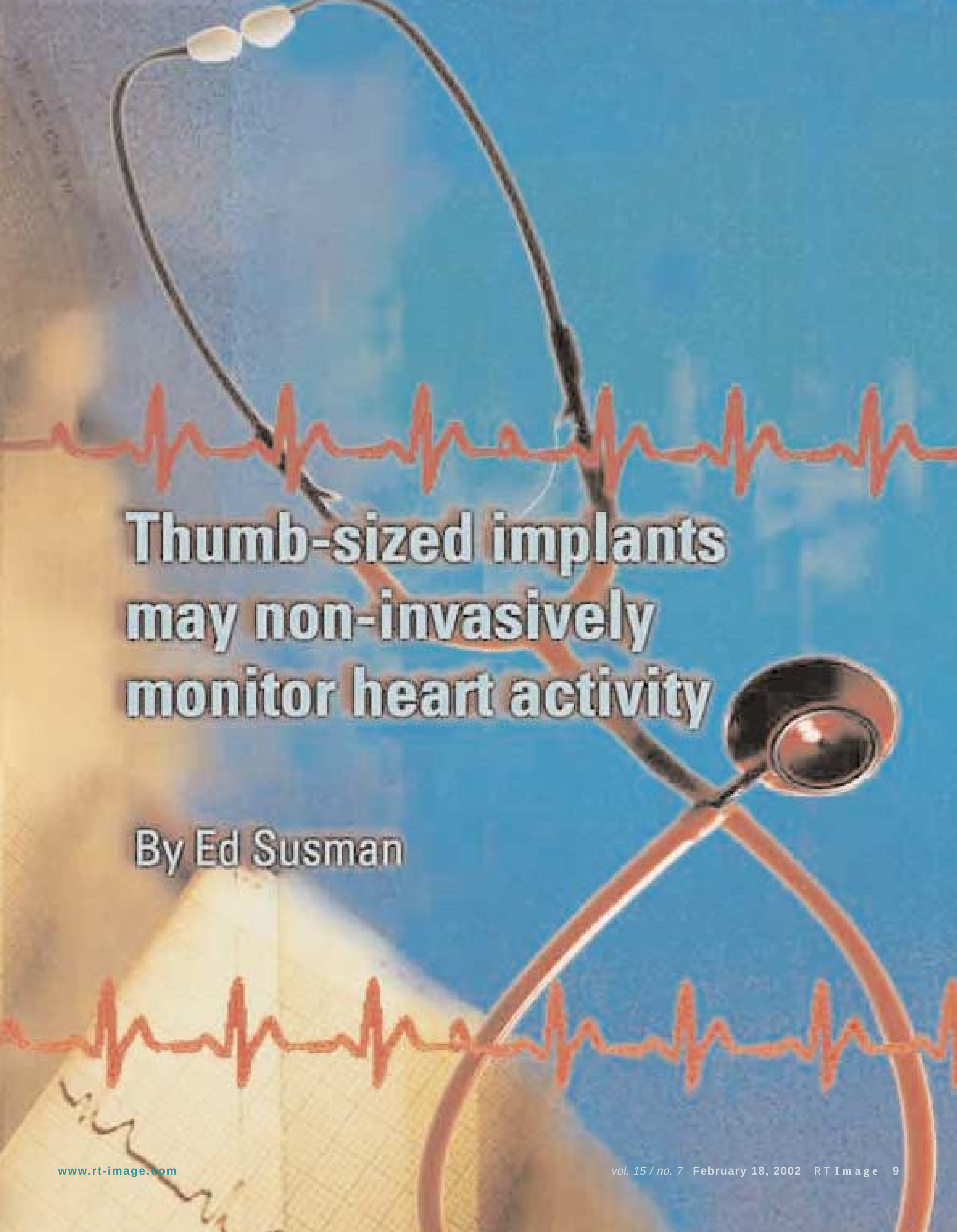
***— Source: University of Washington***

# MEMS the Word

Tiny microchips implanted in the heart may be used to monitor heart physiology in cardiac patients. The devices, known as micro-electrical-mechanical systems (MEMS) were introduced at the 14th Annual International Symposium on Endovascular Therapy (ISET) in Miami Beach, Fla. Jan 22 – 24. In the future, cardiologists may use the implanted sensors to continuously and non-invasively monitor heart activity, replacing procedures like surgery or CT scans.

# Thumb-sized implants may non-invasively monitor heart activity

By Ed Susman



## Medical MEMS

"This device would fit on a thumbnail and is about as thick as a sheet of paper," says Jay Yadav, MD, director of vascular intervention at the Cleveland Clinic Foundation in Ohio, in his ISET presentation on MEMS. Yadav helped design the CardioMEMS device used in his clinical trials.

MEMS do not require wires or batteries, and are made of materials that will not interact with tissues in the heart. The CardioMEMS will be able to monitor blood pressure in the right ventricles of patients with congestive heart failure or in the isolated aneurysm sac created through endovascular graft repair of an abdominal aortic aneurysm.

Folded like a closed flower, the microchip is placed in the heart and deployed by a catheter advanced into the heart from an incision made in the jugular vein. A screw at the base of the microchip anchors the chip in place against the heart wall. "An interventional radiologist should be able to implant the device in less than 30 minutes," Yadav says.

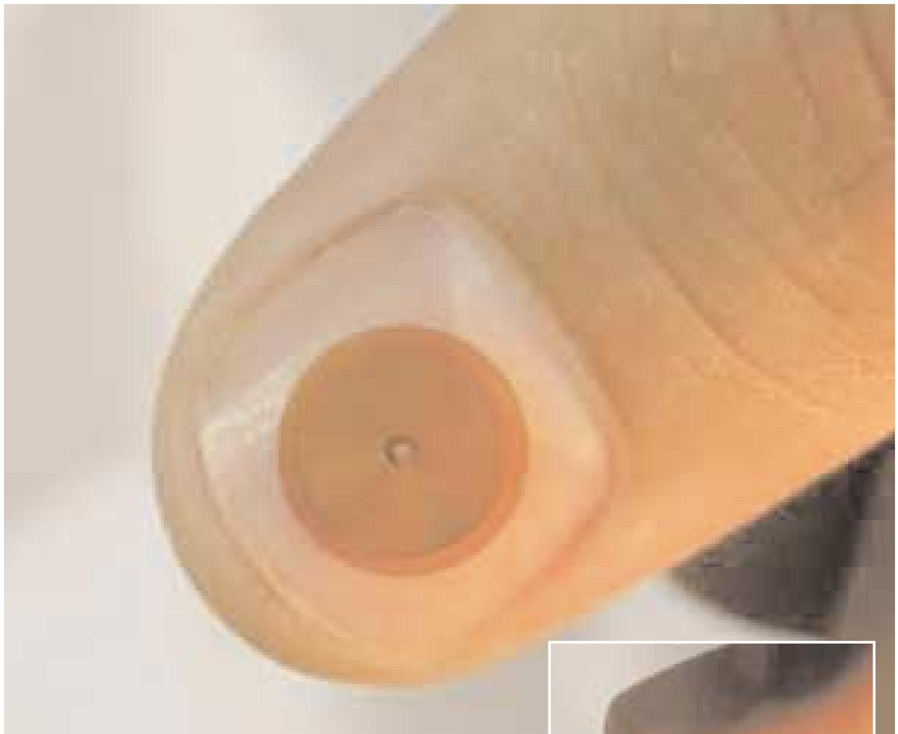
## The Wireless Evolution?

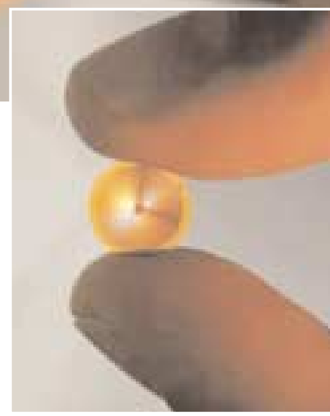
"The ability to accurately measure physiologic parameters such as pressure, flow and temperature from within the human body using wireless communication methods has long been an unfulfilled goal of the medical community," says Yadav.

That goal may be achieved with the combination of MEMS, medical telemetry and digital signal processing, he says. According to Yadav, interdisciplinary works between scientists and clinicians have created "devices sufficiently durable enough to permit minimally invasive delivery and long-term implantation." For example, the devices could be implanted in an aneurysm sac for real-time surveillance against intra-sac pressure increase, or on the chambers of the heart to continuously monitor cardiac function.

The ability to non-invasively monitor heart activity could reduce the need for surgery and periodic CT scans, the only current methods of detecting signs of heart failure. As safeguards, these methods are inefficient, costly and risky. MEMS have the advantage of constantly monitoring heart condition and pressure in an aneurysm without exposing the patient to ionizing radiation.

*Photos courtesy of CardioMEMS Inc.*





**The CardioMEMS non-invasively monitors heart activity.**

David Stern, vice president of Atlanta, Ga.-based CardioMEMS Inc., the company developing the microchip, expects that the devices will cost "several hundred dollars, but probably less than $1,000." He says that in the case of abdominal aorta aneurysms where the graft that creates the new aorta channel can cost $10,000 or more, the addition of the microchip would not add substantially to the cost of the procedure, especially when its ability to alert physicians to problems and avoid complications is factored into the cost. Similarly, the ability to prevent just one hospitalization of a heart failure patient could offset the cost of the device and the procedure to implant it, Stern suggests.

## Developing a Prototype

Yadav says MEMS devices must meet certain specifications before they become a medical reality. Some considerations include:

- The device's size and shape should permit introduction into the body using standard interventional techniques. Yadav says the device being considered for human trials can be folded up to be delivered with an 8 French to 12 French diameter catheter.
- The sensor should be powered externally or its power consumption would be so small that it could operate long-term without adding battery life. In the case of the CardioMEMS device, outside stimulation of the sensor by radio frequency waves elicits a signal that is received by a hand-held device about the size of a tape recorder, equipped with about a six-inch loop antenna. The sensor itself has no battery.
- The materials used to create the sensor should be biocompatible and durable.
- A simple device is needed to communicate with the MEMS. The handheld equipment would communicate through a palm-sized computer. Special software could record and interpret the signal, and upload the data to the patient's digital record.

The first implantation of the device will be performed in Argentina under the guidance of Juan Parodi, MD, chief of the department of cardiovascular surgery at the Cardiovascular Institute of Buenos Aires. Parodi was the original developer of the catheter procedure to repair abdominal aortic aneurysms, and performed the first human operations in the early 1990s.

## Early Warning

The endovascular procedure, while less invasive than open surgery, leaves a permanent sac containing blood outside the new aorta channel. "In about 10 percent of the cases, blood from the aorta will leak into the sac," Yadav says. Because the sac is a closed area, even a little blood can dramatically increase the pressure in the sac and may cause a rupture. The placement of the sensor into the sac could give medical professionals early warning so corrective endovascular-placed graft extensions or open surgery could be performed before a crisis situation develops, says Yadav.

Presently, there is no sensitive way of measuring pressures in the sac, and there are no very good ways of predicting which sac may leak, he adds.

A second series of studies will attempt to implant the tiny microchip directly into the hearts of patients suffering from congestive heart failure, Yadav says. He noted that Medtronic's Chronicle Hemodynamic Monitoring System, currently undergoing clinical investigation, records intercardiac pressure, heart rate, core temperature and other clinical parameters. "At the same time," he says, "MEMS technology is being used to create miniature sensors that promise to provide the cardiologist with the same type of information, but would be capable of operating without the need for an internal power supply or requiring complex surgical implantation techniques."

Patients with congestive heart failure often develop increased pressure in the right chamber of the heart, Yadav explains. The increased pressure causes a chain reaction that leads to pain and shortness of breath, frequently sending patients to the hospital for treatment.

If physicians could easily determine the pressures in the right chamber of the heart, they could treat heart failure patients before the crisis, preventing costly hospitalizations that severely degrade a patient's quality of life, he says. That's where the microchip plays a role, allowing physicians or even patients themselves to take daily pressure reports that would reveal early warning signs of danger.

"Most of the time heart failure patients are unaware they are having a problem until they suffer bouts of shortness of breath that result in emergency treatment," Yadav says. The initial trial of the device will be to see if it can reduce hospitalizations.

## Other Applications

The microchip technology has numerous applications, Yadav says. An alternative version of the chip may be used to report on chemical imbalances. Implanted in a blood vessel, the sensor could detect and report data like glucose levels, eliminating the need for diabetics to use fingersticks to measure their blood glucose levels.

Barry Katzen, MD, medical director of the Miami Cardiac and Vascular Institute in Fla., which sponsors the ISET meeting, says that the microchip would be a boon to patients with heart failure. "We really don't have a practical way of measuring [heart failure]. We can't listen to it, we can't see it on an X-ray, we really have no simple way to detect it," he says.

> **"We really don't have a practical way of measuring [heart failure]. We can't listen to it, we can't see it on an X-ray, we really have no simple way to detect it."**
>
> ***— Barry Katzen, MD***

"These sensor devices are the next generation of medicine," Katzen predicts. "We think these devices will greatly impact the future. It is very exciting."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***— Ed Susman is a free-lance medical journalist based in West Palm Beach, Fla. He travels around the world attending major medical conferences and reporting the latest information from various specialties.***

# What's Up, Dock?

## Ultrasound docking system for OR may save time, money


*Photo courtesy of Analogic Corporation*

**The surgical hawk mobile ultrasound scanner**

The first mobile ultrasound scanner with built-in multiple operating room (OR) docking capabilities allows surgical and ultrasound images to be viewed together.

The Surgical Hawk 2102 XDI from Denmark-based B-K Medical provides the first multiple OR connection facility for easily linking OR surgical towers with a mobile ultrasound scanner. Using a snap-on connector, the rack docking system on the scanner connects easily with any surgical tower.

The docking system also provides an instant connection between the scanner and the surgical tower, which allows surgeons to view surgical and ultrasound images simultaneously on the surgical tower's monitor.

### PICTURE PERFECT

This instant connection generates a picture-in-picture (PiP) effect viewing window on the surgical tower's monitor. Surgeons can swap views between surgical and ultrasound pictures in the main viewing window and the PiP window on the tower's monitor. The PiP window can also be positioned in any corner of the monitor's screen and the size modified for optimal viewing.

"This new surgical solution demonstrates B-K Medical's unparalleled commitment to meeting the specialized ultrasound needs of surgeons, hospitals and their patients," says René Barington, B-K Medical's managing director.

### PALM READING

In addition to the Rack Docking System, the Surgical Hawk 2102 XDI is equipped with a palm control unit that allows surgeons to adjust and control the scanner in the sterile field. The palm control unit allows surgeons to access and operate all the scanner functions they require during surgery, reducing the need for extra OR personnel.

**"This new surgical solution demonstrates B-K Medical's unparalleled commitment to meeting the specialized ultrasound needs of surgeons, hospitals and their patients."**

*— René Barington*

Once the ultrasound portion of the surgical procedure is complete, the rack docking system on the scanner enables the system to be quickly disengaged so the scanner can be moved to another OR or examination room. Hospitals and clinics can significantly reduce their operating costs by installing connection boxes on several surgical towers, rather than maintaining separate scanners in each OR.

For more information, visit www.analogic.com.

***— Source: Analogic Corporation***

# President's 2003 Women's Health Budget Increases Funding

President Bush's 2003 budget includes a $2.1 million increase for the Health and Human Services (HHS) Office on Women's Health, bringing the office's total budget request to $29.1 million, reports HHS Secretary Tommy G. Thompson. The increase comes above and beyond increases for women's health in other HHS agencies and programs, including $4 billion — a 21.5 percent increase — for National Institutes of Health (NIH) research on women's health.

The Office on Women's Health coordinates women's health activities, programs and outreach throughout the federal government and through public-private partnerships. Since taking office, President Bush has increased the Office on Women's Health's budget by 50 percent, and the President's 2003 proposed increase is in addition to the nearly $10 million increase the office received in 2002.

"Healthy women mean healthy families, and healthy families mean healthy communities. The President's 2003 budget will enable us to increase public awareness and appreciation that women have some fundamentally different health needs that need to be addressed in their own right," Thompson says.

The proposed increase will support a number of specific projects, including:

- $475,000 to support new and sustain current National Community Centers of Excellence in Women's Health. These model programs at community hospitals and health clinics provide clinical services, education, research and community outreach in underserved urban and rural communities,
- $426,000 to evaluate the 15 current National Centers of Excellence,
- $175,000 to improve education and services to women with HIV/AIDS,
- $180,000 to enhance support services for women with eating disorders,
- $175,000 to begin a partnership with the Department of Veterans Affairs to facilitate access to HHS programs for homeless women veterans,
- $70,000 to support and raise awareness of the Secretary's Organ and Tissue Donation Initiative and
- $543,000 to support current Office on Women's Health services.

In addition to the proposed increases for the Office on Women's Health and NIH research on women's health, the President's 2003 budget includes a total of $203 million — a $9 million increase — in funding for breast and cervical cancer screening and a $10 million increase for substance abuse prevention and treatment programs for women.

***— Source: Health and Human Services***

# Interdisciplinary Breast Conference

The National Consortium of Breast Centers Inc. will hold its 12th Annual Interdisciplinary Breast Conference, — Breast Care: A Passion for Excellence at the Flamingo Hilton Hotel in Las Vegas. Laszlo Tabar, MD, will be the keynote speaker. The three-day conference offers 24 hours of continuing education credits for physicians, nurses, administrators and RTs.

Participants may choose to attend the eight-hour session on BSE/CBE or participate in the concurrent session running throughout the first day. The plenary sessions on Tuesday and Wednesday will identify obstacles and opportunities of breast center operation and management. That second day, meetings will highlight the importance of the interdisciplinary team approach, including clinical components of operation, discussions of psychosocial techniques in patient management and then end with a two-hour discussion on the economics of breast center management. This session will include the identification of fiscal resources available to breast facilities regarding research, operation and special programs. Evening receptions allow attendees to become reacquainted and visit with representatives of companies that provide services/products to breast professionals.

For more information, visit www.breastcare.org.

***— Source: National Consortium of Breast Centers***

# Digital Radiology Industry Poised for Growth

Despite its higher throughput capacity and potential for tremendous cost savings, digital radiology (DR) has yet to find widespread acceptance. Radiology facilities view the high initial startup costs of DR skeptically in light of available alternative solutions with more favorable price-performance profiles, according to new analysis from San Antonio-based Frost & Sullivan (F&S). The analysis reveals the industry generated revenues of $95 million in 2000 and is projected to surge to $356 million by 2007.

"The high price of DR is likely to limit its market penetration significantly during the next several years. The large investments in development, coupled with the initially low production volumes, will keep prices out of reach for the majority of hospitals at first," says F&S Industry Analyst Antonio Garcia.

The biggest challenge to digital radiography is the initial price of the systems. However, price is expected to significantly decrease in the latter years of the forecast period. DR prices are largely expected to remain above $300,000 during the next several years.

"The large investments that manufacturers have made in research and development, coupled with low production volumes and costly manufacturing processes, should keep prices out of reach for the majority of hospitals during the initial stages of commercialization," states Garcia.

Most market participants agree that an economy of scale will be achieved for detector panel production, perhaps during the latter part of the forecast period, thereby driving prices down. Once this occurs, DR will be accessible to a much broader segment of the radiology market, giving a strong boost to the sales and revenues of DR equipment vendors.

In the meantime, hospitals and other potential consumers are opting to invest available funds in computed radiography (CR) rather than direct-digital units. Although CR is not necessarily more time-efficient and does not streamline workflow processes to the extent of DR, it does provide a digital image at a much cheaper cost than DR systems.

"Many facilities have been purchasing CR in the past and others will continue to do so into the foreseeable future. If the switch to a fully digital environment is to be made, departments will need a combination of CR and DR to reap the benefits from their rad rooms," says Garcia.

For information, visit www.healthcare.frost.com.

*— Source: Frost & Sullivan*

# Radiological Society of North America Names Visiting Professors for 2002

The Radiological Society of North America (RSNA) has announced the latest participants in its 2002 International Visiting Professor Program. Three teams of physicians have been chosen to travel to selected Pacific Rim countries to share their expertise in radiology.

The International Visiting Professor Program was created by the RSNA's Committee on International Relations and Education (CIRE) to foster international relations among radiological societies here and abroad, and to assist with medical education in emerging nations. As part of the program, teams of visiting professors travel to selected countries throughout the world at times that coincide with the annual meetings of the countries' radiological societies. The professors give presentations at the meetings, and the following week, they teach seminars covering the basics and state-of-the-art techniques in various imaging modalities.

"This modernized program gives first-rate radiology professors an opportunity to make a powerful impact in a short period of time," says Pablo R. Ros, MD, CIRE chairman. In return, the visiting radiologists gain an understanding of how radiology practices can vary in different socioeconomic and cultural settings.

The first team was scheduled to depart at the end of January. The team includes team captain Donald P. Frush, MD, of Duke University Medical Center, Durham, N.C., and Peter J. Strouse, MD, of the University of Michigan, Ann Arbor. This team will spend a week in Singapore and Thailand assisting with continuing medical education.

The second team will travel to New Zealand and the Pacific Islands in August and will consist of team captain George A. Taylor, MD, of The Children's Hospital at Harvard in Boston, Marie E. Schmidt, MD, of Mallinckrodt Institute of Radiology, St. Louis, Mo., and Richard I. Markowitz, MD, of Children's Hospital of Philadelphia.

The third team, scheduled to depart for Vietnam in late fall, is comprised of team captain Thomas L. Pope, Jr., MD, of Medical University of South Carolina, Charleston, Richard B. Towbin, MD, of Children's Hospital of Philadelphia, and James J. Abrahams, MD, of Yale University, New Haven, Conn.

For more information, visit www.RSNA.org.

***— Source: Radiological Society of North America***

**— If your organization or facility is conducting or participating in any newsworthy events, please send a press release and photographs, if available, to RT Image, In the News, P.O. Box 487, Phoenixville, PA 19460. You may also fax the information to 610-935-3584 or e-mail it to Editorial@valleyforgepress.com.**

# Mobile Endoscopy System

Cutting-edge imaging and display technology combine with portability in the first mobile integrated endoscopic visualization system.

The Dyonics Vision 111 Portable Endoscopy System from Smith & Nephew Inc., Andover, Mass., features a high-quality camera, high-efficiency light source and a liquid-crystal display flat-panel monitor. A portable design offers advantages over the size and cost of traditional visualization equipment. The system is available in both NTSC and PAL formats.

For more information, visit www.endoscopy1.com.

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# Illuminator Boxes

Illuminator boxes from Kiran X-ray Screens Ltd., Navi Mumbai, India, incorporate a sleek design with good quality intensity and uniform brightness.

A complete range includes single and multiple film panels suitable for general radiography, mammography and dental applications.

For more information, visit www.kiranxray.com.

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# Echo-Coat Needles

STS Biopolymers Inc., Henrietta, N.Y, have added echogenic ultrasound needles for use in breast localization to their echo-coat product line.

Echo-Coat® needles can be seen under ultrasound when positioned at virtually any angle. This helps clinicians find a more direct path to lesions and reduces procedure length and patient discomfort.

A special coating on the needles traps air bubbles in microcavities on the surface of a thin, biocompatible, adherent polymeric film. This surface provides substantially increased acoustical scattering and, when applied to the entire length of the needle shaft, can provide a significantly brighter ultrasound image of the device at virtually any angle.

For more information, visit www.stsbiopolymers.com.

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## Scout View

# PET Scans Key for Lung Cancer Patients

Before undergoing radiation therapy for the treatment of non-small-cell lung cancer (NSCLC), patients should first undergo positron emission tomography (PET) to see if radiation is more effective in curing the disease, according to a study published in the February 2002 *International Journal of Radiation Oncology Biology and Physics*.

In the study, conducted at the Peter MacCallum Cancer Institute in Melbourne, Australia, researchers found that NSCLC patients selected to receive radical radiation therapy (RRT) after PET staging had lower early death rates from cancer than patients selected to undergo RRT using conventional imaging.

Using platinum-based chemotherapy in combination with RRT has significantly improved survival for inoperable NSCLC patients. Staging with PET may be a major advance in the management of inoperable NSCLC through better patient selection.

Researchers analyzed patients' survival from two cohorts — one that underwent PET staging and another that did not. Eighty and 77 eligible patients comprised the PET and non-PET groups, respectively. The median survival was 31 months for PET patients and 16 months for non-PET patients. Mortality from NSCLC and other causes in the first year was 17 percent and 8 percent for PET patients and 32 percent and 4 percent for non-PET patients, respectively.

"Patients selected for radiation therapy after a PET scan have a lower early cancer death rate than those selected using conventional imaging," says Michael Mac Manus, MD, lead researcher from the Cancer Institute. "This study adds further weight to the case for routine PET scanning before aggressive therapies with curative intent for non-small-cell lung cancer. Failure to use PET will lead to patients with an incurable disease receiving futile, toxic and expensive therapies."

For more information, visit www.astro.org.

***— Source: American Society for Therapeutic Radiology and Oncology***



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