RESIDENCY AND FELLOWSHIP TRAINING PROGRAMS

DEPARTMENT OF RADIOLOGY

THOMAS JEFFERSON UNIVERSITY HOSPITALS

PHILADELPHIA, PA

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DEPARTMENT OF RADIOLOGY

THOMAS JEFFERSON UNIVERSITY HOSPITAL

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INTRODUCTION

One of the major strengths of the Department of Radiology of Thomas Jefferson University Hospital is its strong and balanced underpinning in all three of the traditional missions of academic medicine – clinical practice, education, and research. Because of the solid expertise and national reputation of many of its faculty members, the department has been able to build a huge practice, encompassing over 500,000 studies per year. Our residency program is recognized nationally as one of the best, and our fellowship programs are also highly desirable. We regularly compete successfully with other top academic departments in the country for the best applicants at both the residency and fellowship levels. Extensive research programs, as summarized later in this booklet, cover virtually all aspects of radiology and lead every year to a large number of publications and presentations at major national radiology meetings.
DEPARTMENT OF RADIOLOGY OVERVIEW

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<td>Nuclear Medicine</td>
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<td>Laurence Needleman, MD</td>
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The faculty consists of 59 attending staff radiologists and 6 basic scientists in full-time research – 4 with expertise in medical physics, 1 in radiopharmaceutical drug development, and 1 in health services and economics.

The Department performs over ~500,000 examinations per year. Nearly ~200,000 general diagnostic studies are performed, including plain film examinations of the gastrointestinal and genitourinary tracts. In the subspecialties, roughly ~15,000 pediatric examinations, ~80,000
ultrasound examinations, ~50,000 magnetic resonance imaging (MRI) examinations, ~15,000 nuclear medicine scans, ~1,000 in vitro isotope studies, ~50,000 mammograms, ~75,000 CT scans, and ~8000 arteriograms and interventional procedures are performed yearly.

At present, the Department’s equipment consists of 11 multi slice CT scanners, 5 all-digital angiographic suites, 2 remote control fluoroscopic units, 46 ultrasound scanners, 12 nuclear medicine cameras, 15 general radiographic rooms, 15 portable x-ray units, 10 dedicated mammography units, and a stereotactic core breast biopsy device. In MRI, we interpret for 20 MRI’s. Most of this equipment is housed on the Jefferson campus, but some is located at 9 outpatient imaging centers, which are operated by the Department. The Department has several of its own specialty designed conference rooms with facilities for videotape recording, radiographic and slide projection and video projection.

The Department is very active in research with many projects in progress. During the last academic year, these resulted in 124 publications in medical journals and textbooks, 93 published abstracts, and 268 presentations at scientific meetings. Also during the last academic year, the department had 22 separate grants in force – 14 from the NIH or other federal agencies, 1 from a nonprofit medical organization, and 7 industry-supported clinical trials. The total level of grant support during the course of the year was over $1.6 million. Thus, Jefferson trainees in radiology can be assured that the department is staying at the very forefront of new developments in the field.
RESIDENCY TRAINING PROGRAM

The Radiology Residency Program at Jefferson has an outstanding national reputation. The principal objective of our program is to produce well-trained, competent radiologists who will find themselves highly competitive for successful careers in both academic and private practice sectors. This objective is achieved by promoting a friendly and stimulating environment conducive to learning. The educational curriculum is continually updated in order to keep pace with the rapid advances in radiology. The design of the resident rotation schedule prioritizes the educational needs of the residents over the service needs of the department.

The American Board of Radiology requires four years of training in Diagnostic Radiology and a one-year clinical internship prior to radiology training. We receive over 700 applicants each year, from which approximately 10% are selected for interviews. Our program is fully accredited for ten residents per year.

As per new ABR guidelines, the core curriculum consists of 36 months divided among musculoskeletal radiology, gastrointestinal radiology, pulmonary radiology, pediatric radiology, cardiovascular/interventional radiology, ultrasound, body CT and MRI, breast imaging, genitourinary radiology, emergency radiology; neuroradiology/head and neck, and nuclear medicine. During the third year, residents spend four weeks at the Radiologic Pathology course given by the American Institute for Radiologic Pathology (AIRP) in Silver Spring, MD. In addition, there are six months of elective time in the senior year.

In the first two months of the academic year, an introductory course is given in general diagnosis. This program includes formal lectures in normal radiographic anatomy, basic
diagnostic principles, and radiographic technique. For the remainder of the year, two hours of teaching conferences in diagnostic interpretation are given daily, Monday through Friday, by the attending staff. These conferences are in each of the major radiology subspecialties, and include a mixture of didactic lectures and case presentations. During case presentation, the residents have the opportunity to discuss the radiographic findings and differential diagnoses. Quality assurance conferences are held monthly and our chairman leads a conference series regarding non-clinical radiology that focuses on the business of radiology, professionalism, quality and safety, among other topics. An intensive course in radiologic physics will be given to prepare residents for the new ABR exam. The Departmental Radiology Conference is held the 3rd and 4th Wednesday of every month. This consists of: 1) Grand Rounds covering topics of interest in all radiology subspecialties. These are presented either by the departmental faculty or by invited outside speakers. 2) Radiology research conferences presented in a unique Journal Club type format. This allows everyone in the department the opportunity to present the results of their research activities to the Radiology Department. Residents are required to complete and present at several stages at least one research project at this conference and to submit their work to a national meeting.

During each workday, all studies are reviewed by the resident and staff together prior to dictation. Thus, each case becomes a teaching exercise. This type of review demands extra effort from the radiology staff, but is worthwhile in its end result of training and patient care.

Night call responsibilities begin in the second year of Radiology residency. Two residents (1 Junior and 1 Senior) are on call every evening using a night float system from 9PM to 9AM on Weekdays, and 8PM to 8AM on Weekends and Holidays. On-call residents are responsible for all general radiology, neuroradiology, body CT and US, and Nuclear Medicine.
There are three full time, academic, fellowship-trained, radiology faculty members dedicated to the interpretation of overnight Emergency Department imaging. The Emergency Radiology attending and on-call residents read studies independently but side by side. This team approach was designed to maintain independent resident study interpretation while allowing for more immediate attending feedback and back-up. Back-up is also available by both on call subspecialty fellows and attending staff.

The vast majority of our residents easily pass the American Board of Radiology Examination. September 2013 was the first administration of the computer based American Board of Radiology (ABR) Diagnostic Radiology Core Exam (for residents who began their training in 2010 or later) which took the place of the traditional written physics and general radiology portions of the Radiology Board examination. All of our residents to date have passed the Core examination. The Core Exam is a computer-based, image-rich exam taken 36 months after the beginning of radiology residency. Timing and content of the radiology curriculum has been modified in preparation for the Core Exam. Our department funds 3\textsuperscript{rd} year radiology resident use of “RADPrimer”, an expert-guided comprehensive curriculum including assessment questions covering a range of topics including radiologic differential diagnosis, anatomy, procedures, physics, safety, and appropriateness criteria. In addition, our department funds each senior resident to attend a physics review course prior to the Core examination. The ABR Certifying Exam replaces the traditional radiology oral examination and is taken 15 months after completion of diagnostic radiology residency.
Following residency, most residents elect to take fellowships either at Thomas Jefferson University or some other outstanding academic institution before going on to academic or private practice careers. The Department faculty is active in counseling residents about their career choices and helping residents and fellows secure the best possible positions upon completion of their training.
FELLOWSHIP TRAINING PROGRAMS

For residents completing their training program, the Department of Radiology offers one- or two-year fellowships in each of the following areas: Abdominal Imaging, Body MRI, Combined MRI (Musculoskeletal/Neuro), Neuroradiology, Breast Imaging, Musculoskeletal Radiology, and Vascular/Interventional Radiology. Candidates must be board eligible or board certified in Diagnostic Radiology.

The Abdominal Imaging Fellowship, which is accredited by the Accreditation Council for Graduate Medical Education (ACGME), consists of comprehensive training in MR, CT and Ultrasound. There is also elective time in which fellows may choose clinical rotations to supplement their fellowship experience or to work on a research project, which is required. The projected number of weeks in each rotation are:

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<td>Body MR</td>
<td>16 weeks</td>
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<td>Body CT</td>
<td>8 weeks</td>
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<tr>
<td>PET CT</td>
<td>4 weeks</td>
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<tr>
<td>Ultrasound</td>
<td>16 weeks (includes 4-8 weeks of interventional US)</td>
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<tr>
<td>Subspecialty</td>
<td>6 weeks (flexible schedule for subspecialty training)</td>
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<td>Elective</td>
<td>4 weeks (flexible clinical schedule and/or research)</td>
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<td>Vacation</td>
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Weeks on Body MRI and Elective may be exchanged depending on each fellow’s individual interests. Therefore, for example, up to 26 weeks may be spent on Body MRI.

MRI includes state of the art studies of the abdomen and pelvis. CT includes multidetector imaging and volumetric reconstructions for chest, abdominal and pelvic scanning as well as advanced vascular applications. Ultrasound includes general inpatient and outpatient diagnostic studies as well as dedicated vascular, musculoskeletal, obstetric and gynecology, and prostate training. State of the art GI/GU imaging is incorporated into US, CT and MRI rotations, including: virtual colonoscopy, angiography, urography, enterography, MRCP, prostate ultrasound and sonohysterography. The didactic curriculum includes daily lectures from July through September on all basic aspects of abdominal imaging. During the remainder of the year, there are one or two morning fellow-oriented conferences per week, distributed among ultrasound, body CT, body MR and GI/GU. Fellows also attend the weekly radiology grand rounds, and several weekly and monthly multidisciplinary conferences. Some conferences are semi-didactic conferences presented by faculty, while others are case conferences led by abdominal fellows and augmented by attending-led discussion.

The **Body MRI Fellowship** is a dedicated one-year program for one fellow, providing clinical and leadership training designed to enable this physician to run a body MRI service upon completion of the fellowship. It incorporates all aspects of Body MRI (both clinical and research), including basic and advanced principles of MRI, as well as integral participation in leadership and continuous improvement of the body MRI service. All aspects of clinical body MR imaging will be covered, including the chest, heart, breast, abdomen, male and female pelvis, and body and extremity vascular applications, including MR angiography (MRA), MR cholangiopancreatography, MR enterography and use of new contrast agents. In- and out-
patient services are active and the fellow will help plan protocols, monitor studies and provide appropriate diagnoses and consultations to the referring clinical services. The fellowship provides ample time and opportunity for active ongoing research related to magnetic resonance imaging, leading educational and multidisciplinary conferences, and attendance at monthly body MRI divisional staff meetings. Jefferson operates 15 MRI units—including two at 3T, 11 at 1.5T, and others from 0.3T to 1.0T—all of which send images to our PACS system for filmless interpretation.

The **Breast Imaging Fellowship** is a one-year program that includes intensive experience in interpretation of problem solving mammography, screening mammography, breast ultrasound and breast MRI as well as extensive training in the performance of image guided percutaneous breast biopsy using stereotactic, ultrasound, and MRI guidance, as well as pre-surgical needle localizations using mammographic, sonographic, and MRI guidance. The fellow will participate in teaching of residents and medical students, and will be responsible for coordinating the weekly mammographic-pathologic conference and presenting cases at the weekly multidisciplinary breast tumor board. The Division of Breast Imaging has seven faculty members. Research opportunities are available in mammography, breast ultrasound, MRI, and molecular imaging.

The **Interventional Radiology (IR) Fellowship** offers an ACGME accredited one-year fellowship program. Up to four positions are available each year through the NRMP match program. Completion of one year of post-graduate clinical training and an ACGME accredited radiology residency program are prerequisites. Training includes all aspects of interventional
radiology, including arterial, venous and nonvascular diagnostic and interventional procedures. Clinical patient management is emphasized, and includes daily patient rounds and morning review conference. Other conferences related to patient care are given each year by faculty from clinical departments. The division has its own admitting service and dedicated clinic.

The division performs over 13,000 procedures each year. These include procedures such as chemoembolization of liver tumors, radiofrequency and cryoablation of hepatic and non-hepatic tumors, vertebroplasty, endovenous laser of varicose veins, ambulatory phlebectomy, vein sclerotherapy, uterine artery embolization for fibroids, balloon angioplasty, vascular stent placement, TIPS (transjugular intrahepatic portosystemic shunt), and IVC filters/retrievals. Nonvascular procedures account for approximately 25 percent of cases, and include a wide range of biliary and urologic interventions.

A busy conference schedule includes didactic lectures on interventional topics, case presentations, a monthly journal club, and combined conferences with hepatology, nephrology, oncology and other clinical specialties. A new division conference room with amphitheater style seating for 28, and advanced audiovisual capabilities is utilized for educational conferences. Other educational or research activities are facilitated by Division and Department libraries, as well as a University library with electronic journal subscriptions.

The **Combined MRI (Musculoskeletal/Neuro) Fellowship** is a dedicated one-year program for three or four fellows incorporating all aspects of clinical magnetic resonance imaging. This includes brain, ENT, spine, and extremity applications. There are separate rotations to the neuro. and musculoskeletal services. Opportunities are also available for clinical and basic research.
The **Musculoskeletal Radiology Fellowship** is a one-year ACGME-accredited clinical program. There are three funded positions available yearly, and externally-funded and research positions are also available. The curriculum includes intensive training in musculoskeletal imaging modalities with MRI being the primary focus, but also including CT, CR, arthrography, and MSK ultrasound. MRI volume is approximately 100 cases per day from numerous closed and open MR systems at field strengths of 3.0, 1.5, 1.0, 0.7 and 0.3 tesla, and all interesting cases are reviewed weekly. Approximately one fourth of the year is dedicated to procedures including image guided MSK biopsy, vertebroplasty/kyphoplasty, pain procedures including selective nerve blocks and facet injections, discography and radiofrequency ablation. A comprehensive conference schedule includes two dedicated MSK radiology conferences weekly, as well as correlation conferences with orthopaedics and sports medicine specialists including spine, shoulder, hand/wrist, foot/ankle, and MSK oncology. Fellows also participate in office hours with orthopaedics subspecialists at the Rothman Institute. Members of the musculoskeletal radiology section are active in clinical research in the fields of musculoskeletal MRI, radiology-oncology-orthopaedics correlation, bone and joint diseases, orthopaedic trauma and sports medicine, and fellow participation in research endeavors is strongly encouraged.

The **Neuroradiology/Head and Neck Imaging Fellowship** offers an ACGME accredited one-year program with up to four positions. One fellow can spend an additional year at The Children’s Hospital of Philadelphia in a combined adult-pediatric program. The Division has access to six multidetector CT scanners, thirteen MRI scanners (including two 3.0T units, two 1.5T open units, and one 0.3T open unit,), two dedicated bi-plane angiographic and interventional units, a linear accelerator, a Gamma Knife, and a PET-CT scanner.
Extensive training is given in interpretation of plain films, CT, CT angiography, CT perfusion, MRI, and advanced MR techniques, as well as in the technical aspects and interpretation of myelograms, neuroangiograms, and interventional neuroradiologic procedures. Case interpretation and reporting are conducted daily under the guidance of the neuroradiology staff. In addition, there is a rotation for each fellow at The Children’s Hospital of Philadelphia for concentrated, in-depth experience in pediatric neuroradiology. Consultation with referring physicians from Neurology, Neurosurgery, Orthopedic Surgery, Head and Neck Surgery, Rehabilitation Medicine, Medical Oncology, and Radiation Oncology is an ongoing responsibility and learning opportunity. There is weekly active participation in Neurosurgery Grand Rounds, Neurology Grand Rounds, Stroke Conference, Brain Tumor Conference, ENT Grand Rounds, Head and Neck Tumor Conference, as well as two weekly Neuroradiology Conferences for residents and fellows and a weekly conference with the clinical staff of the Regional Spinal Cord Trauma Center based at Thomas Jefferson University Hospital. An extensive on-line teaching file of proven examples of neurologic abnormalities is available. Ample opportunities exist for research at the clinical level.
DIVISIONS OF THE DEPARTMENT OF RADIOLOGY

The **Body CT Division** performs over 20,000 CT examinations per year, consisting of chest, abdomen, and pelvis studies. Included in these examinations are CT interventional procedures – aspirations, biopsies, and drainages performed under CT guidance – as well as CT angiography, CT colonography, CT urography, and CT enterography. Additionally, advanced 3D post processing is performed for many of these studies using independent workstations. All the studies are supervised and read by the CT division members. The examinations are performed on 2 helical 64-slice scanners, one 256-slice scanner, and a 16 wide bore interventional scanner located at the main hospital, as well as additional scanners located in various inpatient and outpatient sites. Didactic lectures, in conjunction with ultrasound and MRI, are given throughout the year. Close correlation is obtained between CT and the other imaging modalities. Research opportunities are available for the residents and fellows rotating through the division.

The **Body Magnetic Resonance Imaging Division** is responsible for all body MRI studies, including cardiovascular MRI. The volume of body studies interpreted daily by this service is among the highest in the country. It is staffed by four body MRI specialists. There are 4 abdominal imaging (MRI/CT/US) fellows, and one dedicated fellow for the body MRI division. There are a total of 15 clinical MRI units in operation, including 2 state-of-the-art 3T scanners and several 1.5T scanners from all 3 major MRI vendors. 1.5T and 3T inpatient units are present side-by-side in the Gibbon Building. Two updated 1.5T units are located in an MRI facility in the Clinical Office Building (COB) at 909 Walnut Street, a block from the hospital. Three 1.5T MRI units, one of which is a short/wide bore system and one an extremity MRI system, are
present in our Imaging Center (JCCI) located at 850 Walnut St. (Walnut Towers) on campus. Other on-campus facilities with MRI scanners include the Jefferson Hospital for Neuroscience (3T and open-bore 1.5T systems), Methodist Hospital and at the Rothman Institute (1.5T). Outpatient satellite MRI centers are located in Langhorne, Doylestown, Collegeville, East Norriton, Exton, Philadelphia Navy Yard and Virgin Islands (facilities at St. Croix and St. Thomas).

The **Division of Breast Imaging** performs approximately 40,000 procedures annually, making it one of the most active academic services in the country. Procedures include mammograms, breast ultrasound, needle guided biopsy, stereotactic and ultrasound guided core biopsy, and breast MRI. All diagnostic breast imaging studies are performed at the Breast Imaging Center (BIC), a state of the art facility with 4 digital mammographic units, 3 ultrasound units, and a prone stereotactic table. Screening mammography is performed at the Mammography Screening Center (MSC), with 2 digital mammographic units. Both the BIC and MSC are beautiful patient centered facilities located in the Comprehensive Breast Center of the Kimmel Cancer Center, in the Medical Office Building adjacent to the main hospital.

The **Division of Cardiothoracic Radiology** consists of 9 American Board of Radiology (ABR) certified radiologists. This division is the primary group responsible for the interpretation of cardiothoracic examinations performed at Thomas Jefferson University Hospital (TJUH) and affiliated hospitals. During the last year, approximately 95,000 CXRs, 15,000 thoracic CTs, 500 cardiac CTs, and 100 cardiac MRI exams were interpreted in our department. Cardiothoracic images are digitally acquired and transmitted for interpretation on PACS in the cardiothoracic imaging reading room. Cardiothoracic Imaging section has close clinical and research ties with multiple TJUH clinical specialties including pulmonary medicine, medical oncology, radiation
oncology, cardiology, cardiovascular and thoracic surgery divisions and Emergency Department. These medical specialties refer a wide variety of cases for cardiothoracic imaging that include the following:

- Acute and non-acute cardiothoracic Diseases
- Lung cancer (screening, cancer management and surveillance)
- Airway diseases
- Diffuse Interstitial lung diseases
- Pulmonary vascular diseases (acute and chronic pulmonary embolism and pulmonary hypertension)
- A wide variety of Cardiovascular Diseases (Coronary CT angiography, Triple rule-out CT, Trans-catheter Aortic Valve Insertion planning CT, Atrial septal defect closure planning CT, Cardiac MRI, Thoracic CT/MRI Aortic angiography)
- Pre and postoperative evaluation of cardiothoracic diseases

Image guided thoracic percutaneous procedures are primarily performed by interventional radiology section. In addition to their clinical and research work, members of the Cardiothoracic Radiology Division are actively involved in trainee education. Our trainee education is formed according to the society of thoracic radiology and American Board of Radiology (ABR) curriculum guidelines. Our trainee teaching includes everyday “bedside” clinical teaching, didactic and interactive lectures in cardiothoracic imaging, and hands-on training in post-processing of advanced cardiothoracic imaging. In addition to routine plain radiography and thoracic CT rotations, dedicated cardiac CT rotation (CT, MRI and Echocardiography) is also offered to our trainees. Residents may also elect additional cardiac/thoracic or a mixture of cardiothoracic imaging rotation after their ABR core examination. Multiple routine trainee interactive lectures in cardiothoracic imaging are given to radiology residents and fellows. We
also have extensive collection of teaching and interesting cardiothoracic cases digitally stored in our PACS. Our division faculty members participate in weekly multidisciplinary lung cancer management conferences that trainees are encouraged to attend.

The **Interventional Radiology Division** is located on the 5th floor of the Gibbon Building. The area is separated from the main radiology department, but is conveniently located adjacent to the cardiac catheterization laboratories and the cardiac/peripheral vascular operating rooms. The IR area has four procedure rooms. The procedure rooms are connected to two workstations that allow case review or image manipulations independent of ongoing cases in the procedure rooms. The IR division also has a dedicated interventional CT scanner and several ultrasound machines. Multiple PACS workstations within the Division allow easy access to relevant diagnostic imaging studies for review. The IR division also includes a ten-bed, fully monitored recovery area for patients who have been given conscious sedation.

The **Division of Musculoskeletal Radiology** is one of the largest in the country. Each year approximately 30,000 radiographic musculoskeletal exams are performed, in addition to 10,000 musculoskeletal MR exams; staff serve as consultants to the Eagles, Phillies and Flyers, as well as local college athletes and the Pennsylvania Ballet. The division is very active in procedures as well. Each year, approximately 300 arthrograms (mostly MR arthrograms) are performed in addition to over 300 bone biopsies. The division also performs interventional spinal procedures, including discography, facet injections, selective epidural injections, vertebroplasty, kyphoplasty and nucleoplasty. Radiofrequency ablation of osteoid osteomas and metastatic lesions is also provided. The staff is active in research, having published approximately 100 articles over the past five years, most with fellows, residents or other trainees as the primary author. Staff train three musculoskeletal fellows each year, in addition to residents, cross-sectional fellows and other MRI fellows. Education is a priority, and staff provide numerous
didactic and case conferences throughout the year, in addition to clinical conferences with the orthopedic surgeons, musculoskeletal journal club, and the regional Orthopedic-Radiology-Pathology conference.

The **Division of Neuroradiology/Head and Neck Radiology** performs radiological and imaging procedures related to the nervous system, head, neck and spine. It is staffed by nine neuroradiologists and up to four neuroradiology fellows. In addition, the department chair is a nationally recognized head and neck radiologist. State of the art equipment, including 13 MRI scanners, six multidetector CT scanners, and a PET scanner are housed either on campus or at our outpatient centers. The nearby Jefferson Hospital for the Neurosciences has two dedicated bi-plane angiographic and interventional units, a multidetector CT, a linear accelerator, a Gamma knife unit, a 1.5 Tesla MRI unit, and a 3.0 Tesla MRI unit. Jefferson neuroradiologists cover this facility.

The Neuroradiology/Head and Neck Radiology Division is highly active clinically and works in close collaboration with the departments of Neurosurgery, Neurology, Otolaryngology, Orthopedic Surgery, and Rehabilitation Medicine (which runs a widely recognized spinal cord injury service). Approximately 600 selective cerebral arteriograms, 100 myelograms, and 16,000 CTs of the head and spine are performed each year. In addition, approximately 28,000 MRI scans of the head and spine are performed yearly. The division has been very productive in research activities, partly as a result of joint efforts involving the clinical services mentioned above.
Head and neck radiology is part of the division. A large variety and volume of facial, sinus, orbit, temporomandibular joint and neck cases are referred for radiologic evaluation from the busy Department of Otolaryngology/Head and Neck Surgery and the Department of Oral and Maxillofacial Surgery. The residents learn to interpret plain films, CT and MRI studies, and receive extensive one-on-one teaching by a staff radiologist. During their rotation, the residents can attend weekly head and neck tumor conference, where correlation of the physical examination with the radiologic findings is performed.

The **Nuclear Medicine Division** is located on the 8th floor of the Thompson and Main Buildings. It provides nuclear medicine training for diagnostic radiology and nuclear medicine residents. The Division has its own 3-year ACGME approved residency training program. The teaching responsibilities are shared by two staff physicians, one adjunct physician, and a nuclear medicine basic science educator. The Division performs approximately 12,000 nuclear medicine procedures annually. There are seven 7 dual-headed SPECT scanners, one single-headed large-field-of-view gamma camera, one DEXA scanner and a 7-day per week operating PET/CT scanner housed in our outpatient imaging center.

The scope of the nuclear medicine services includes in vitro tests, in vivo imaging, and therapeutic uses of unsealed radioisotopes sources. There are active research activities within the Division, both basic and clinical in nature. The basic research is performed in the radiochemistry section and clinical research is conducted by the clinical staff. Current interests include non-FDG PET isotopes in gastrointestinal and breast malignancies, as well as outcome projects in radioiodine therapy of thyroid cancer.

The **Division of Diagnostic Ultrasound** has an ultrasound physicist, cross-sectional imaging fellows, and fifteen staff physicians, many of who are also active in body CT and MRI. The
division occupies over 30,000 square feet on the 7th and 8th floor of the Main and Thompson Buildings. There are 21 examination rooms and over 30 major pieces of ultrasound equipment, including cutting edge machines. In addition, multiple outpatient facilities on and off campus performs additional examinations which are interpreted on campus. The Division now performs over 40,000 examinations annually, covering all aspects of ultrasound, including obstetrics and gynecology, abdominal and superficial scanning, echocardiography, brain, breast, peripheral vascular, and musculoskeletal ultrasound. The fellowship emphasizes advanced training in ultrasound guided interventional techniques. The facility uses all types of ultrasound equipment, including the most modern high-resolution real-time duplex, color Doppler and 3D and 4D ultrasound machines.

In addition to the extensive clinical activities of the division, there is a large research program with both basic and clinical investigations. Major areas of research include ultrasound contrast agents, endoluminal, musculoskeletal, and 3D ultrasound. A comprehensive ultrasound educational program provides intensive training for fellows and residents in addition to physicians and technologists from this country and throughout the world. On average, over 1,500 physicians and technologists from over forty different countries attend our programs in all aspects of ultrasound each year.

**HOUSING**

Thomas Jefferson University Hospital and Jefferson Medical College are situated on a large upscale section of center city Philadelphia. The campus is surrounded by several of Philadelphia’s legitimate stage theaters and fine restaurants. The Kimmel Center for the Performing Arts and the Academy of Music (home of the world-renowned Philadelphia
Orchestra), the beautiful new Pennsylvania Convention Center, and historic Independence Hall are all within five blocks of Jefferson. The University owns two modern apartment buildings on its campus, for medical students, residents and fellows. In addition, many apartments are available at reasonable rentals in the surrounding area, known as Society Hill (one of the Philadelphia’s finest neighborhoods). Some residents and fellows prefer to commute from the Philadelphia suburbs, which are 30 minutes from the hospital by mass transit or car. The major suburban rail lines within a 5-minute walk of the campus.

**LIBRARY FACILITIES**

The Department of Radiology Library contains 300 radiology textbooks and issues of 15 medical journals. There is also computer access to all major Radiology and other medical journals, 24 hours a day, 7 days a week. There is an extensive teaching file of over 1,600 representative radiographs with a written description of their radiographic findings and clinical presentations, including the entire American College of Radiology Teaching File on CD ROM.

The Jefferson Medical College Library, known as Scott Memorial Library, is located across the street from the hospital (between 10th and 11th on Walnut). It maintains a comprehensive general medical library of all major journals and textbooks including those for radiology.
Dr. George McClellan, who believed that medical students should actively participate in the diagnosis and care of patients, founded Jefferson Medical College in 1824. The medical college has always been located in Philadelphia, first in Dr. McClellan’s office, then in the former Tivoli Theater, at 418-20 Prune Street (now Locust) near Washington Square, and finally since 1828 at its present site.

Jefferson Medical College was renamed Sidney Kimmel Medical College (SKMC) on June 17, 2014. It has awarded more than 31,000 medical degrees and has more living graduates than any other private medical school in the nation. It offers both undergrad medical education programs and innovative joint degree programs to more than 1,000 students each year.

The Sidney Kimmel Medical College is recognized for its balanced approach to medical education, and approximately one out of four to one out of five applicants throughout the U.S. apply to Jefferson.

From its inception, Sidney Kimmel Medical College’s faculty and alumni have made significant contributions to medical science. A few highlights of these contributions are as follows:

**Samuel David Gross, M.D.** (JMC Class of 1828) is recognized as the outstanding surgeon of the 19th century and is immortalized in the famous painting “The Gross Clinic” painted by his anatomy student and devoted friend, Thomas Eakins.

**Marion Simms, M.D.** (JMC Class of 1835) is known as the Father of Modern Gynecology.
Silas Weir Mitchell, M.D. (JMC Class of 1850) and William W. Perry Keen, M.D. (JMC Class of 1862) combined their specialties to form the modern study of neurology and neurosurgery.

Carlos Finley, M.D. (JMC Class of 1855) discovered the carrier of yellow fever.

John H. Gibbon, Jr., M.D. (JMC Class of 1927) used the first heart-lung machine successfully on a patient during open-heart surgery in 1953.

James M. Hunter, M.D. (JMC Class of 1953), Director of Jefferson’s Hand Rehabilitation Center since 1973, developed the first artificial tendon.

Allen J. Erslev, M.D., Director of the Division of Hematology since 1963, was the first to demonstrate the existence of the hormone erythropoetin which controls red blood cell production.

In 1969, Jefferson Medical College became Thomas Jefferson University, a modern academic health sciences university comprised of four divisions: Jefferson Medical College (now renamed Sidney Kimmel Medical College), Thomas Jefferson University Hospital, the College of Graduate Studies and the College of Health Professions. In 1978, Jefferson opened its new hospital facility, the Gibbon Building, and implemented a number of innovative health care concepts and programs that have helped to keep it at the forefront of modern care nationally. Jefferson’s 650-bed hospital is one of the largest on the East Coast of the United States. It has a number of referral centers, attracting patients from a wide geographic area.