Department of Radiology - Annual Report July 1, 1987-June 30, 1988

David C. Levin

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DEPARTMENT OF RADIOLOGY

ANNUAL REPORT
JULY 1, 1987 - JUNE 30, 1988

DAVID C. LEVIN, M.D.
PROFESSOR AND CHAIRMAN
# TABLE OF CONTENTS

Name of Department and Chairman .................................................. 1  
Department Divisions and Directors ............................................. 1  
  Department Faculty ................................................................. 2  
  Radiology Residents and Fellows ............................................. 6  
  Departmental Committees and Memberships ................................ 7  
  Department Organization Charts .............................................. 9  

State of the Department ............................................................. 11  

Teaching Programs ........................................................................ 23  
  A. Teaching Programs for Medical Students and Non-Radiology House Staff .... 23  
  B. Residency Program for Residents in Radiology ........................... 25  
  C. Training Programs for Fellows .............................................. 27  

Continuing Medical Education (CME) Programs ............................. 28  
Radiology Grand Rounds .................................................................. 30  
Radiology Research Conferences .................................................. 32  

Research Programs and Grants: 1987-1988 ..................................... 34  

Publications .................................................................................... 44  

Scientific Presentations ................................................................. 60  

Honors, Editorial Activities, Service for National or Regional Radiological Organizations ..... 88  


We wish to gratefully acknowledge the contributions of Saundra Ehrlich, Linda Vitale, and Elizabeth Rehmann, who compiled material for, organized, and edited large portions of this report.
**DEPARTMENT DIVISIONS AND DIRECTORS**

<table>
<thead>
<tr>
<th>Division</th>
<th>Director(s)</th>
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<tbody>
<tr>
<td>General Diagnostic Radiology</td>
<td>Robert M. Steiner, M.D.</td>
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<td>Esmond M. Mapp, M.D.</td>
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<tr>
<td>Mammography/Ambulatory Radiology</td>
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<td>Magnetic Resonance Imaging</td>
<td>Matthew D. Rifkin, M.D.</td>
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<tr>
<td>Pediatric Radiology</td>
<td>George W. Gross, M.D.</td>
</tr>
<tr>
<td>Radiation Biology</td>
<td>Robert L. Brent, M.D., Ph.D.</td>
</tr>
<tr>
<td>Radiological Physics</td>
<td>Robert O. Gorson, M.S.</td>
</tr>
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<td>Office of Radiation Safety</td>
<td>Benjamin Galkin, M.S.</td>
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DEPARTMENT FACULTY

PROFESSORS

David C. Levin, M.D., Chairman
Stephen A. Feig, M.D.
Benjamin Galkin, M.S.
Barry B. Goldberg, M.D.
Carlos Gonzales, M.D.
Robert O. Gorson, M.S.
Alfred B. Kurtz, M.D.
Esmond M. Mapp, M.D.
Matthew Rifkin, M.D.
Robert M. Steiner, M.D.
Yen Wang, M.D., D.Sc. (Med.)

ASSOCIATE PROFESSORS

Peter Burns, Ph.D.
David Karasick, M.D.
Stephen Karasick, M.D.
Vijay M. Rao, M.D.
Richard J. Wechsler, M.D.

RESEARCH ASSOCIATE PROFESSORS

P. Macke Consigny, Ph.D.
Simon Vinitski, Ph.D.

CLINICAL PROFESSOR

Mark M. Mishkin, M.D.

ASSISTANT PROFESSORS

John M. Boone, Ph.D.
D. Lawrence Burk, Jr., M.D.
Wolfgang Dahnert, M.D.
Geoffrey A. Gardiner, Jr., M.D.
George W. Gross, M.D.
Pamela Hilpert, M.D.
Philip A. Katz, Ph.D.
David W. Levy, M.D.
Donald Mitchell, M.D.
Laurence A. Needleman, M.D.
Rebecca Pennell, M.D.
Marcelle J. Shapiro, M.D.
Paul W. Spirn, M.D.
Kevin L. Sullivan, M.D.

PROFESSORS EMERITI

Jack Edeiken, M.D.
Philip J. Hodes, M.D.

HONORARY PROFESSOR

A. Edward O'Hara, M.D.

CLINICAL ASSISTANT PROFESSOR

Joseph Bonn, M.D.

INSTRUCTORS

Ashokkumar Babaria, M.D.
Lorna Blum, M.D.
Huynh T. Doan, M.D.
Ricky Ian Feld, M.D.
Irene P. Raisis, M.D.
C. Amy Wilson, M.D.
Elaine Wolk, M.D.
FACULTY WITH SECONDARY APPOINTMENTS IN RADIOLOGY

Demetrius H. Bagley, M.D., Associate Professor of Urology [primary]
Associate Professor of Radiology [secondary]

Robert L. Brent, M.D., Ph.D., Professor of Pediatrics [primary]
Professor of Radiology (Radiation Biology) [secondary]
Professor of Anatomy [secondary]

Ralph A. Carabasi, M.D., Associate Professor of Surgery [primary]
Associate Professor of Radiology [secondary]

Ronald J. Jensh, Ph.D., Professor of Anatomy [primary]
Professor of Radiology [secondary]

Donald Myers, M.D., Clinical Assistant Professor of Neurosurgery [primary]
Instructor in Radiology [secondary]

Chan Hee Park, M.D., Professor of Radiation Therapy and Nuclear Medicine [primary]
Professor of Radiology [secondary]

Joel S. Raichlen, M.D., Clinical Assistant Professor of Medicine [primary]
Clinical Assistant Professor of Radiology [secondary]

Stanton N. Smullens, M.D., Associate Professor of Surgery [primary]
Associate Professor of Radiology [secondary]

Nagalingam Suntharalingam, Ph.D., Professor of Radiation Therapy and Nuclear Medicine (Medical Physics) [primary]
Professor of Radiology (Medical Physics) [secondary]

Jerome J. Vernick, M.D., Clinical Professor of Surgery [primary]
Clinical Associate Professor of Radiology [secondary]

Paul Walinsky, M.D., Professor of Medicine [primary]
Professor of Radiology [secondary]

Ronald J. Wapner, M.D., Associate Professor of Obstetrics and Gynecology [primary]
Associate Professor of Radiology [secondary]
VOLUNTEER AND AFFILIATED FACULTY

CLINICAL PROFESSORS

Morton G. Murdock, M. D. (Graduate Hospital)
David J. Ritchie, M. D. (Mercy Catholic Medical Center)

HONORARY CLINICAL PROFESSOR

Mortimer B. Hermel, M. D.

ADJUNCT PROFESSORS

Dov Jaron Ph.D. (Drexel University)
Vernon L. Newhouse, Ph.D. (Drexel University)
John Mitchell Reid, Ph.D. (Drexel University)
Joseph L. Rose, Ph.D. (Drexel University)

ASSOCIATE PROFESSORS

Richard P. Cancelmo, M.D. (Bryn Mawr Hospital)
Matthew E. Pasto, M.D. (Mercy Catholic Medical Center)
John Wills, M.D. (Wilmington Medical Center)

CLINICAL ASSOCIATE PROFESSORS

Albert Arouh, M.D. (Lankenau Hospital)
William J. Elwell, M.D. (Mercy Catholic Medical Center)
Geraldine E. Hamilton, M.D. (Mercy Catholic Medical Center)
Chul Kyun Kwak, M.D. (Our Lady of Lourdes Hospital)
Milton Margulies, M.D. (Lankenau Hospital)
James E. McGrath, M.D. (Our Lady of Lourdes Hospital)
Herbert C. Perlman, M.D. (Carlisle Hospital)
Gordon S. Perlmutter, M.D. (Reading Hospital and Medical Center)
Stephen Pripstein, M.D. (Abington Hospital)
Hugo R. Rodriguez, M.D. (Lankenau Hospital)
Daniel M. Scotti, M.D. (Methodist Hospital)
Gustav Seliger, M.D. (Mercy Catholic Medical Center)
Noble L. Thompson, Jr., M.D. (Bryn Mawr Hospital)
Alan H. Wolson, M.D. (Lehigh Valley Hospital Center)

VISITING CLINICAL ASSOCIATE PROFESSORS

Donald D. Cameron, M.D.
Christopher W. Canino, M.D.

HONORARY CLINICAL ASSOCIATE PROFESSORS

Leonard S. Ellenbogen, M.D.
John L. McClenahan, M.D.
ADJUNCT ASSOCIATE PROFESSOR

Henrietta Kotlus Rosenberg, M.D. (Childrens Hospital of Pennsylvania)

ASSISTANT PROFESSOR

Carl S. Rubin, D.O. (Frankford Hospital)

CLINICAL ASSISTANT PROFESSORS

Olin S. Allen, II, M.D. (Medical Center of Delaware)
Wahib Bichara, M.D. (Mercy Catholic Medical Center)
Virginia D. Balmarcich, M.D. (Mercy Catholic Medical Center)
John Breckenridge, M.D. (Abington Hospital)
Raphael Caccese, M.D. (Our Lady of Lourdes Hospital)
Joel I. Cossrow, M.D. (Pittsburgh)
David M. Danoff, M.D. (Bryn Mawr Hospital)
Simplicio E. Evangelista, M.D. (Bryn Mawr Hospital)
Arnold H. Levine, M.D. (private practice)
Cynthia L. Miller, M.D. (Methodist Hospital)
Harry E. Morgan, M.D. (private practice)
Joseph T. Murphy, M.D. (Bryn Mawr Hospital)
Hayler H. Osborn, M.D. (Bryn Mawr Hospital)
Arthur J. Press, M.D. (Lankenau Hospital)
Donald E. Red, M.D. (Lankenau Hospital)

ADJUNCT ASSISTANT PROFESSORS

Stephanie B. Flicker, M.D. (Deborah Heart Hospital)
Peder C. Pedersen, Ph.D. (Drexel University)
Armand Saragovi, M.D. (Rolling Hill Hospital)
Harry Zegel, M.D. (St. Agnes Hospital)

INSTRUCTORS

Joseph H. Becker, M.D. (Methodist Hospital)
John H. Garafola, M.D. (Lancaster)
Arthur S. Haber, M.D. (Mercy Catholic Medical Center)
Helen Leibowitz, M.D. (Mercy Catholic Medical Center)
Anthony J. Limberakis, M.D. (private practice)
Gerald A. Nissenbaum, M.D. (Our Lady of Lourdes Hospital)
Edward M. Podgorski, Jr., M.D. (private practice)
Emanuel M. Renzi, M.D. (Wilmington Medical Center)
David Weiss, M.D. (Chestnut Hill Hospital)

CLINICAL INSTRUCTORS

Mark Cooper, M.D. (Methodist Hospital)
Yen-Zen Kuo, M.D. (Veterans Administration Medical Center, Wilmington)
Lillian H. Stern, M.D. (Methodist Hospital)
RADIOLOGY RESIDENTS
Flavius Guglielmo, M.D., Chief Resident
Michael Harned, M.D., Chief Resident

FIRST YEAR RESIDENTS
Steven F. Domiano, M.D.
Andrew S. Gallant, M.D.
Kenneth Kaplan, M.D.
Jonathan Shapiro, M.D.

SECOND YEAR RESIDENTS
Mark O. Cosentino, M.D.
Valerie T. Greco-Hunt, M.D.
Deborah Rubin, M.D.

THIRD YEAR RESIDENTS
Thomas S. Chang, M.D.
Mark DeLaurentis, M.D.
Flavius Guglielmo, M.D.
Michael E. Harned, M.D.

FOURTH YEAR RESIDENTS
Paul Davis, M.D.
Pamela Hendricks, M.D.
Ilan Kinori, M.D.
David March, M.D.
Richard Shlansky-Goldberg, M.D.
Robert Traflet, M.D.

RADIOLOGY FELLOWS

Cardiovascular/Interventional Radiology
Bennett Kashdan, M.D.
Stephen Klein, M.D.
Edgar S. Moser, Jr., M.D.

Neuroradiology/ENT Radiology
Adam E. Flanders, M.D.
Gerald L. Helinek M.D.
Harry E. Pinkus, M.D.

Ultrasound/CT/MRI
Steve M. Cohen, M.D.
Alan U. Glazer, M.D.
Keith R. Haidet, M.D.
Ellen O'Mara, D.O.
Catherine W. Piccoli, M.D.
Ruth Zodkevitch, M.D.

* * * * * * * * * * * * * * * * * * * *
DEPARTMENTAL COMMITTEES AND MEMBERSHIPS

Advisory Committee
Chairman: Alfred Kurtz, M.D.
Members: Barry B. Goldberg, M.D.
         Esmond Mapp, M.D.
         Mark Mishkin, M.D.
         Vijay Rao, M.D.
         Matthew Rifkin, M.D.

Education Committee
Chairman: Vijay Rao, M.D.
Members: D. Lawrence Burk, M.D.
         Stephen Feig, M.D.
         Ricky Ian Feld, M.D.
         Geoffrey Gardiner, Jr., M.D.
         Barry Goldberg, M.D.
         David Karasick, M.D.
         Esmond Mapp, M.D.
         Donald Mitchell, M.D.
         Robert Steiner, M.D.
         Richard Wechsler, M.D.

Research Committee
Chairman: Matthew Rifkin, M.D.
Members: Joseph Bonn, M.D.
         John M. Boone, Ph.D.
         Peter Burns, Ph.D.
         P. Macke Consigny, Ph.D.
         Saundra Ehrlich
         Benjamin Galkin, M.S.
         Barry Goldberg, M.D.
         Mark Mishkin, M.D.
         Donald Mitchell, M.D.
         Gary Shaber, M.D.
         Marcelle Shapiro, M.D.
         Kevin Sullivan, M.D.
         Simon Vinitzki, Ph.D.
         Richard Wechsler, M.D.
Residency Selection Committee
Chairman: Alfred Kurtz, M.D.
Members: Joseph Bonn, M.D.
          George Gross, M.D.
          David Karasick, M.D.
          Stephen Karasick, M.D.
          David Levy, M.D.
          Esmond Mapp, M.D.
          Mark Mishkin, M.D.
          Vijay Rao, M.D.
          Matthew Rifkin, M.D.

Support Services Committee
Chairman: Yen Wang, M.D.
Members: Carlos Gonzalez, M.D.
          David Karasick, M.D.
          Esmond Mapp, M.D.
          George McArdle
          Gary Shaber, M.D.
          Paul W. Spirn, M.D.
          Robert Steiner, M.D.

Computer Committee
Chairman: Gary Shaber, M.D.
Members: John M. Boone, Ph.D.
          Geoffrey Gardiner, Jr., M.D.
          Robert Gorson, M.S.
          Charles Lockard
          George McArdle
          Laurence Needleman, M.D.
          Robert M. Steiner, M.D.
          Larry Waldroup
          Yen Wang, M.D.
CHAIRMAN'S REPORT ON THE STATE OF THE DEPARTMENT

INTRODUCTION AND DEPARTMENT ORGANIZATION

Our department has had a very good year. In all three of our major mandates - clinical care, research, and teaching - our programs have moved ahead successfully and we have been able to expand our activities. As Chairman, I am very proud of the accomplishments of our faculty, who have worked diligently and efficiently as a team despite the fact that we are a large department which is dispersed throughout a number of different areas of the campus. Our eight clinical divisions functioned cohesively, which was a challenging task because it was necessary to mesh together the activities of many physicians who work in several different divisions of the department. Our divisional structure is as follows:

1. **General Diagnostic Radiology** - Co-directed by Drs. Robert Steiner and Esmond Mapp. This division has sections of Pulmonary Radiology, Gastrointestinal Radiology, Genitourinary Radiology, and Musculoskeletal Radiology.

2. **Pediatric Radiology** - Directed by Dr. George Gross.

3. **Breast Imaging** - Directed by Dr. Stephen Feig.

4. **Cardiovascular/Interventional Radiology** - Directed by Dr. Geoffrey A. Gardiner, Jr.


6. **Ultrasound** - Directed by Dr. Barry Goldberg.

7. **Body CT** - Directed by Dr. Richard Wechsler.

8. **MRI** - Directed by Dr. Matthew Rifkin.

In addition, there are two other divisions which do not have clinical responsibilities. These are the divisions of Radiological Physics, headed by Mr. Robert Gorson, and Radiation Biology, headed by Dr. Robert Brent.

Aside from the clinical divisions, there are six standing departmental committees, set up to take care of specific functions. The departmental **Advisory Committee** is charged with evaluating promotions and appointments and discussing major departmental issues and policies with the Chairman. The Advisory Committee for the past two years has been headed by Dr. Stephen Feig and also included Drs. Alfred Kurtz, Matthew Rifkin, Gary Shaber, Esmond Mapp, and Mark Mishkin. A new Advisory Committee was selected after the June 1988 staff meeting; the new members are Drs. Alfred Kurtz, Mark Mishkin, Esmond Mapp, Vijay Rao, Matthew Rifkin and Barry Goldberg. Dr. Kurtz has been named Chairman of this new Advisory Committee. The **Computer Committee** is headed by Dr. Gary Shaber and is charged with overseeing all computer operations within the department and bringing new computerized functions on-line. The **Education Committee** is headed by Dr. Vijay Rao and is charged with overseeing the educational programs we provide for medical students, residents and fellows as well as post-graduate continuing education programs. Dr. Rao has written a separate report on departmental educational activities over the past year; her report will immediately follow this one. The **Residency Selection Committee** is headed by Dr. Alfred Kurtz and is charged with reviewing all applications for our residency program, setting up interviews after screening the original applications, conducting the
interviews, and finally, ranking the candidates. The Research Committee is headed by Dr. Matthew Rifkin and is charged with overall monitoring of the numerous research activities of the department. They organize the bi-weekly departmental research conferences and review requests for seed-money support of specific projects by the departmental research fund. The Support Services Committee is headed by Dr. Yen Wang and is responsible for some of the logistics of department operations and overseeing our quality assurance program.

The administrative organization of the department is under the overall supervision of Mr. George McArdle, our departmental administrator. Mr. McArdle is one of the best administrators in the entire field of radiology and has continued to do a superb job of helping to run a very complex organization. The supervisory personnel working under Mr. McArdle are all performing at a very high level, and this is certainly one of the major reasons why we have been so successful this past year. The administrative organization of the department is shown on the charts on pages 9 and 10.

Aside from the performance of our faculty and that of Mr. McArdle's administrative team, there is another major reason for our success of the past year. This is the strength of the leadership of the institution as a whole. In my opinion, President Lewis W. Bluemle, Jr., Dean Joseph Gonnella, Senior Associate Dean Robert Blacklow, Executive Director Michael J. Bradley, and Associate Executive Director Thomas J. Lewis are providing outstanding leadership for the University, the Medical College, and the Hospital. Despite the numerous and well-known problems currently confronting major health care institutions, Jefferson remains in solid financial shape, with almost full occupancy of the hospital, with active and growing teaching programs and research support, and with plans to expand. Much of the credit for this excellent state of affairs goes to the aforementioned individuals, and all of us in the Department of Radiology express our appreciation to them.

The remainder of this report will deal with nine specific areas: I. New faculty recruitments. II. Overview of clinical activities. III. Developments in clinical services, new clinical programs, and new facilities. IV. Planned new facilities for the future. V. Research accomplishments. VI. Future research plans. VII. Long range goals of the department. VIII. Problems and future challenges. IX. Issues for the University.

I. NEW FACULTY RECRUITMENTS

Turnover is inevitable on academic faculties. During the past year, Drs. Rebecca Pennell, Harry Cooperman, Cynthia Miller, David Levy, and Oksana Baltarowich (part-time) submitted their resignations and will be entering private practice. Dr. Maria Vilaro also left, having completed the 2 year commitment she originally made to the department. Aside from replacing these physicians, we have also added a new staff position to provide increased support at the Breast Imaging Center, and another new position for a Director of Physiological Research. Recruitment efforts consumed a good bit of time this past year but this has proven to be time well spent, as we have been able to attract an outstanding group of new faculty members for these positions. In alphabetical order, they are:

- **Lorna Blum, M.D.** - Dr. Blum graduated from the Medical College of Pennsylvania, then did her residency at Pennsylvania Hospital, followed by a fellowship in CT/US/MRI at the Hospital of the University of Pennsylvania. She will be working primarily in our Ultrasound and Breast Imaging Divisions and will also have some responsibilities in Body CT.

- **Paul Macke Consigny Ph.D.** - Dr. Consigny received his Ph.D. in physiology from Southern Illinois University. He did a post-doctoral fellowship at the world-renowned Cardiovascular Research Institute of the University of California, San Francisco. He then held faculty appointments at the University of Nebraska and Medical College of Pennsylvania. He is our new Director of Physiological Research, and I anticipate that his joining the department will provide a major impetus for basic research activities.
• **Rick Feld, M.D.** - Dr. Feld graduated from Mt. Sinai School of Medicine in New York City. He is board-certified in Internal Medicine, and did his radiology residency at Mt. Sinai Hospital. This was followed by an US/CT/MRI fellowship in our department. He will be working primarily in our Ultrasound Division and will also have some Body CT responsibilities.

• **Pamela Hilpert, M.D., Ph.D.** - Dr. Hilpert is a graduate of the Albert Einstein College of Medicine. She has a Ph.D. in developmental neurophysiology from the University of Rochester. She did her radiology residency at Temple University Hospital, followed by an imaging fellowship at the University of California, San Diego. She will work primarily in our Ultrasound Division and will also have some Body CT responsibilities.

• **Irene Raisis, M.D.** - Dr. Raisis is a graduate of Jefferson Medical College and the radiology residency program in our department. She was one of our chief residents during her third year. Dr. Raisis will be working primarily at the Breast Imaging Center, and will also have some responsibilities in General Diagnostic Radiology.

• **Sharon Segal, D.O.** - Dr. Segal is a graduate of the Philadelphia College of Osteopathic Medicine. She did her radiology residency at the same institution, and then came to Jefferson for a fellowship in US/CT/MRI. She is working half-time and will be a member of the Ultrasound Division.

• **Paul Spirn, M.D.** - Dr. Spirn received his M.D. from the University of Pennsylvania and did his radiology residency at the Massachusetts General Hospital. He was a colleague of mine on the radiology faculty at Harvard Medical School and the Brigham and Women's Hospital, and has more recently been a member of the faculty at Hahnemann University Hospital. He is an outstanding thoracic radiologist and will be working exclusively in this area.

• **C. Amy Wilson, M.D.** - Dr. Wilson graduated from the Medical College of Pennsylvania. She did her radiology residency at Pennsylvania Hospital, followed by a year in a junior staff position there. She will divide her time between breast imaging, general diagnostic radiology, and ultrasound.

I think these 8 new faculty members are an outstanding group who will add great strength to our department. In addition to these newly recruited people, 7 other faculty radiologists are completing their first full year at Jefferson. Drs. Joseph Bonn, Marcelle Shapiro, and Kevin Sullivan joined the Division of Cardiovascular/Interventional Radiology (CVIR). All three have done outstanding jobs. Under the leadership of Dr. Geoffrey Gardiner, Jr., that division has now completely turned itself around. They have worked very well together and have rapidly upgraded our clinical capabilities and research activities in Interventional Radiology. Drs. Wolfgang Dahnert and David Levy were added to the Division of Diagnostic Ultrasound, and Dr. Levy also became part of our MRI division. The two of them have also done outstanding work and have added great strength to our ultrasound and MRI activities. Unfortunately, Dr. Levy has elected to enter private practice, and we certainly regret his departure. Dr. D. Lawrence Burk has been another superb addition to the department. He is a highly qualified musculoskeletal radiologist with great expertise in MRI. The latter is of course an extremely complex technology and his in-depth knowledge and understanding of it is of great value. Finally, Dr. Elaine Wolk has joined the Breast Imaging Center on a half-time basis. Dr. Wolk trained thoroughly with Dr. Feig before assuming this faculty position. Two Ph.D. physicists also joined us during 1987-88. Dr. John Boone came from the University of Missouri as our new head of image processing physics, and Dr. Peter Burns came from Yale as head of ultrasound physics. Both have outstanding qualifications and will provide research strength in these two important areas of radiology.
II. OVERVIEW OF CLINICAL ACTIVITIES

One year ago in this report, I pointed out that during the 1986-87 academic year, our department had enjoyed a healthy growth rate in procedure volume of 5%. For 1987-88, our growth has been nothing short of spectacular - approximately a 17% increase in procedure volume over 1986-87. We made the provision of excellent patient care one of our primary goals, and I feel this rapid rise in referrals demonstrates success in accomplishing that goal. Our services have improved in a number of ways. Our reception areas have become more efficient. Studies are obtained and processed more rapidly. Radiologists are reading them more rapidly. Better consultative services are being provided. Transcription and editing of reports is being speeded up. Our system of hand delivery of reports to offices around the Jefferson campus has proven effective. Numerous favorable comments have been received from patients, referring physicians, and hospital administration on the helpfulness, friendliness, and positive attitude of our non-physician staff - receptionists, technologists, nurses, secretaries, word processing personnel, etc. This is largely attributable to the spirit and dedication of Mr. McArdle and his senior supervisors.

In the area of computer support, Messrs. Charles Lockard and Bryan Budzynski completed the installation of our new PDP 11-84 computer. One very important new function this has allowed us to implement is a patient tracking system. This system, which uses bar coding technology, allows us to monitor the exact time patients spend at different stages as they go through the process of obtaining their imaging studies. The tracking begins when the patient comes in the front door and ends only when he/she leaves. By monitoring the various time intervals while the patient remains in the department, we can determine if bottlenecks or delays are occurring and where they are, so that prompt action can be taken to remedy the problem. It also allows us to know precisely where any patient is at any moment, should we receive an inquiry about his/her whereabouts. In addition, it helps us monitor utilization of rooms, equipment, and technologists.

We have continued to monitor report turnaround time. This is the time it takes, after the completion of a patient's study, to produce a completed report and send it out to the referring physician's office. Since April 1986, we have been able to reduce our mean turnaround time by more than one-third. Part of this improvement can be traced to an improved program of training of word processing and film library personnel. The leadership of Lisa Massanova (word processing) and Ellen Blank (film library) has been outstanding. In many other large departments of radiology around the country, the typing of reports and the filing of films are chronic problems, but here at Jefferson these two important functions are very effectively performed.

Finally, we have continued our active collaboration with the hospital's excellent Division of Planning and Marketing, headed by Mr. Trevor Fisk. Glossy brochures have been sent out to referring physicians throughout the Delaware Valley describing our Breast Imaging Center, Neurosciences Imaging Center, and new MRI unit. We are actively marketing some of our new services and techniques through articles in New Directions and Contemporary Medicine. Periodically we are sending marketing letters to everyone on the active medical staff, informing them of new programs in the department. We are continuing to survey patients at random as they come through the department to find out whether they are satisfied with our services. We are presently working with the Marketing group to develop a questionnaire which will be sent to referring physicians to ascertain their level of satisfaction with our services.

III. DEVELOPMENTS IN CLINICAL SERVICES, NEW PROGRAMS AND NEW FACILITIES

A. Division of General Diagnostic Radiology: Growth in procedure volume has not been confined only to some of the newer imaging modalities. Solid growth also occurred in some of the more traditional types of radiographic studies. For example, plain films of the abdomen increased by 24% this past year. Bone films increased by 12%, chest films by 10%, portable chest films by 17%, and upper GI series by 11%. We completed the installation of a badly needed new fluoroscopic unit in room D in Core 3. At the present time, room A in that same core is undergoing renovation with
installation of another new fluoroscopy unit. When that is completed, we will have completely upgraded our fluoroscopy capabilities. A new radiographic room was opened up in Jefferson's sports medicine complex in the Edison Building. We completely redecorated and reorganized the administrative and office area on NH-3. We also began sprucing up the appearance of the patient care areas by adding colorful framed prints. We will continue our efforts to improve the environment during this coming year.

B. Pediatric Radiology: Pediatric films were up by 10% during this past year. The new pediatric fluoroscopy unit has completed its first full year of operation in Core 1. Although our overall volume of pediatric examinations is not that large, Dr. George Gross has certainly maximized his use of those studies for teaching purposes. His "pediatric case of the week" is a very popular part of our teaching program, and he received the A. Edward O'Hara Award from the residents as outstanding teacher in the department. Dr. Gross has also managed to develop an excellent collaboration with clinicians at the Children's Rehabilitation Hospital, and this should expand as that facility becomes incorporated into Jefferson Park Hospital.

C. Breast Imaging: The Breast Imaging Center has continued to grow rapidly. During the past year, we have installed a fifth mammography unit and a breast ultrasound unit. We have recruited a sixth x-ray technologist. One year ago, we reported that the Breast Imaging Center was doing approximately 50 studies per day. In the past year, our mammography volume has increased by 44%. The numbers of needle localizations, consultations on outside films, breast ultrasound studies, and plain radiographic exams have increased as well, and the Center is now averaging about 75 total studies per day, with some days above 80. It became apparent last year that one of the limiting factors in our ability to provide services there was inadequate physician staffing. With the addition this year of Drs. Irene Raisis, Lorna Blum, and Amy Wilson, the understaffing problem should be alleviated. The services of the Breast Imaging Center have been very well received by the medical community throughout the Delaware Valley. This results from several factors - Dr. Feig's excellent reputation in the field, the beautifully designed facilities, the hospitable and sympathetic attitude of the technologists, and the fact that patient studies are tailored to resolve all diagnostic problems during a single visit without requiring the patient to make another appointment.

D. Cardiovascular/Interventional Radiology: The CVIR Division has been hampered in recent months by extensive construction in its area on NH-5. This is necessary because of the need to replace antiquated equipment and inefficient patient care and office areas. Despite the physical limitations presently being encountered, the CVIR group has rapidly expanded its capabilities. Procedure volume is up 33% over last year. The volume of diagnostic angiograms, biliary drainage procedures, percutaneous nephrostomies and stent placements, and intra-arterial thrombolysis procedures is expanding rapidly. We feel our capabilities in the area of balloon angioplasty are still not being fully utilized; hopefully an expansion of the vascular surgery service will occur in the future to allow this. Several important new "cutting edge" techniques have been employed during the past year. Laser thermal angioplasty continues to be applied to certain patients, particularly those with total obstruction of the superficial femoral arteries. The Division was the first in the Delaware Valley (and one of the first in the country) to percutaneously implant arterial stents. This technique is one which hopefully will reduce or eliminate restenosis following balloon angioplasty. Eleven of these stents have been placed at the present time, all successfully. The group has also begun percutaneously inserting inferior vena cava filters. The CVIR and Ultrasound Divisions have begun closely collaborating in percutaneous drainage of abscesses. Administratively, angiographic and interventional radiology billing codes have been revised and charges have been updated to better reflect the time and effort involved in such procedures.

E. Neuroradiology/ENT Radiology: This division has also had a busy year. The volume of head and spine CT exams increased by 10%. 2200 MRI examinations were performed, all of which of course represents new volume since this service was not offered in previous years. Although some have predicted that MRI would obviate the need for myelography, our volume of myelograms has shown a 17% increase during the past year. The operation of our two CT units on Main-10 for 15
hours per day on weekdays and 12 hours per day on Saturdays and Sundays has reduced the waiting
time for head and spine CT's to essentially zero. The installation of the new Philips angiographic
unit with an ADAC digital subtraction system completes the Neurosciences Imaging Center on
Main-10. We are working to develop good interventional neuroradiology capability - specifically
the treatment by catheter techniques of intracranial aneurysms and arteriovenous malformations,
and the treatment of impending or acute strokes by angioplasty or thrombolysis. Drs. Gonzalez and
Doan have recently spent time working with European neuroradiologists to increase their
experience in these areas. One new program that has recently gotten underway is the use of
Gadolinium-DTPA in MRI studies of the brain. This agent recently received FDA approval and
should enhance our capability to detect subtle abnormalities. Administratively, a central film
filing operation has been set up on Main-10 to better serve referring neurologists, neurosurgeons, and
orthopaedists. This file room is coordinating the handling of all studies on patients with head or
spine disease. Incorporation of Drs. Vijay Rao and Larry Burk into Neurosciences Imaging Center
operations on Main-10 has strengthened the division, and improved both patient care and teaching.

F. Division of Diagnostic Ultrasound: Two important new collaborative arrangements have
commenced during the past year. In conjunction with the Department of Obstetrics and Gynecology,
we have opened an Antenatal Evaluation Center, co-headed by Dr. Alfred Kurtz from our
department and Dr. Ronald Wapner of the Department of OB/GYN. This center focuses on the care
of women with high-risk pregnancies. With the Department of Surgery, we have begun operating a
conjoint Non-invasive Peripheral Vascular Laboratory, co-headed by Dr. Larry Needleman of our
department and Dr. Anthony Carabasi of the Department of Surgery. Both facilities represent
important clinical services and should grow considerably in the future. Other rapidly growing
areas in ultrasound are color Doppler, prostate imaging, and invasive ultrasound (percutaneous
biopsies and abscess drainages done under ultrasound guidance). Dr. Matthew Rifkin continues to
head our prostate imaging operation, while Dr. Wolfgang Dahnert has been newly appointed as
head of invasive ultrasound. One of the most exciting developments has been the introduction of
lithotripsy. The new Technomed kidney stone lithotriptor has been in operation for approximately
one year and the gallstone lithotriptor manufactured by the same firm has just recently commenced
operation. Both these units rely on ultrasound for localization of the stones and appropriate
focusing of the extracorporeal shockwave generators. They are presently located on Main-5 and
members of our Ultrasound Division are involved in every lithotripsy procedure. Overall,
ultrasound examination volume increased last year by approximately 17%.

G. Division of Body CT: Our new dedicated Body CT facility opened on NH-3 in the fall of 1987.
This has enabled us to achieve an 18% increase in Body CT volume during the past year. Backlogs
are still between 1-2 weeks and to try and shorten this, the Body CT group has taken over some
evening and weekend scanning slots on the CT units on Main-10 (these units remain open evenings
and weekends, whereas the one on NH-3 does not). The availability of the dedicated unit has
enabled Dr. Wechsler and his colleagues to make greater use of dynamic incremental scanning
techniques to better differentiate blood vessels from other structures. They have also produced
3-dimensional reconstruction of CT scans, which has been particularly useful for studies of facial
bone abnormalities, hip trauma, and several other musculoskeletal problems. Another new service
is the use of quantitative analysis of pulmonary nodule calcification using a standardized phantom.

H. Division of MRI: Our MRI unit on Main-10 opened in the spring of 1987 and performed over 2750
MRI examinations during 1987-88. 21% of these were body examinations; the remainder were
studies of the head, spine, and ENT structures. There is tremendous demand for MRI services at
Jefferson. On the one hand, this is gratifying, but it is also very frustrating, since we are not able to
meet the demand with only one unit. Many patients are being referred elsewhere. In January 1988,
we secured hospital approval for a second MRI and much time this spring has been devoted to space
planning for the second unit, working out administrative details as they pertain to the state
regulations on MRI, negotiating with commercial vendors, etc. I am very pleased with the way our
MRI and neuroradiology divisions have met the difficult challenge of mastering the complexities
of MRI technology and applying it to routine patient care. The contributions of Simon Vinitski,
Ph.D., head of MRI physics, have been extremely important in this regard. In addition to
physician and physicist expertise, we have also organized an outstanding group of MRI technologists, under the very capable leadership of Lucille Aquilone, R.T. Their spirit, knowledge, and dedication have resulted in outstanding support for our clinical unit.

IV. PLANNED NEW FACILITIES

Despite the fact that a number of major renovations and installations of new equipment have been accomplished during the past two years, more remains to be done. The following projects are either in the planning stages or under construction.

On NH-5, construction of the two new procedure rooms is just about complete. Installation of the new Philips angiographic systems with ADAC digital subtraction units will commence shortly. These should become operational by early fall. Thereafter, construction of the Sansom Street side of the 5th floor will begin. This will create new office space and a conference room for the CVIR Division.

We are now actively planning for the installation of our second MRI unit. This will be an ambulatory facility on Walnut Street between 9th and 10th Streets. The MRI unit will be ordered shortly, upon conclusion of final negotiations with GE. The building itself is currently being designed. The administrative details of complying with state regulations are being worked out. It is hoped this unit will be operational by early 1989.

Jefferson Orthopaedic Associates is building a large new office and examining area on NH-8. This will contain two new radiographic rooms which will be part of our department and will focus on musculoskeletal radiography.

As part of the PACE project, a temporary emergency room is being constructed on 1st floor Pavilion. A new radiographic room will be installed there. When the new emergency room is opened several years hence in Main and Thompson, we will have two radiographic rooms there.

A new chest radiographic unit will be installed on NH-3. Also on NH-3, a pneumatic tube station will soon be installed to allow immediate transport of films between our department and the emergency room.

Several renovations of ancillary space will also be carried out this year. The reception area in Ultrasound on Thompson-7 is neither attractive nor efficient, and is now being redesigned. In Core 4 on NH-3, the head unit and polytomographic unit will both be relocated. Core 4 will then be completely rebuilt, to create a much larger and more attractive library, storage space, and several additional offices. A major renovation of the Ballroom had been planned for this past spring, but the cost of this project proved to be much higher than anticipated. For this reason, we redesigned the area once again, but in such a way as to reduce construction costs. As part of this project, a large amount of additional storage space for teaching file films will be created in the consultation room. On Main-10, a new personnel lounge will be built, along with four small new offices and a secretarial area.

Finally, our new animal research laboratory on Curtis-12 is now under construction, and we anticipate that the lab will be functional by this fall. Dr. Consigny is also in the process of setting up a cell culture and in vitro vascular experimental laboratory in Jefferson Alumni Hall in space provided to him by the Department of Physiology.

V. RESEARCH ACCOMPLISHMENTS

Research productivity was again maintained at a high level this past year. This is quite apparent from looking at the long list of publications and scientific presentations in which our faculty members were involved and which is included in this report. At the annual meeting of the RSNA in December 1987, the largest radiology meeting in the world, Jefferson had no fewer than 24
presentations. This was one of the largest representations among all university radiology departments. At the AUR meeting this past April in New Orleans, our department had 14 presentations - again, an outstanding performance among academic departments, given the fact that the AUR meeting is considerably smaller than the RSNA.

In the area of grant funding, we had a very successful year. Dr. Matthew Rifkin's prostate imaging grant was approved and funded by NIH as part of the National Collaborative Diagnostic Imaging Project on prostate disease. Dr. Larry Needleman's large grant to study Doppler screening in pregnancy-induced hypertension was approved and funded by NIH. Dr. Barry Goldberg was successful in establishing a collaboration with the Biomedical Engineering and Science Institute of Drexel University to develop a "Center of Excellence in Biomedical Imaging". This project received funding by the Ben Franklin Partnership of Pennsylvania. It will bridge the biomedical engineering resources at Drexel with the medical and clinical resources of our department to carry out diagnostic imaging research. Dr. Goldberg's NIH grant to study the effects of prenatal ultrasound on postnatal development is continuing, as are subcontracts through Drexel University to study techniques for characterization of atherosclerotic plaques and ultrasonic tissue characterization. Dr. Peter Burns has been funded to study Doppler detection of breast cancer. Dr. Macke Consigny has several grants in the areas of angioplasty-induced release of arterial mitogens, factors responsible for restenosis after angioplasty, and the effects of both balloon and laser thermal angioplasty on atherosclerotic arteries.

At the present time, our department has total external grant funding commitments of $2,360,309 (direct plus indirect). This does not include various types of support we are also receiving from equipment manufacturers. Drs. Larry Needleman, Matthew Rifkin, and Barry Goldberg are certainly to be complimented for their successful efforts in securing federal and state funding for their grant proposals. It is a well known fact that radiologists, without an NIH-based imaging institute, are at a definite disadvantage in securing grant support. Most of the funding that does go to support imaging research goes to Ph.D. scientists, rather than physicians. I would especially like to congratulate Dr. Needleman on his accomplishment in getting his grant proposal on Doppler screening in pregnancy-induced hypertension funded by NIH. The total amount of support for this project is over $1,000,000, and it is almost unheard of for a junior faculty radiologist without a long history of grant funding to have this type of project federally supported. I look for further efforts at securing NIH and other agency funding in the future, particularly from our Ph.D. scientists.

Internal funding for research is also available through the departmental research fund. Within the past year, the Research Committee has approved seed money from the fund for start-up support and equipment for projects by Drs. Boone, Burns, Goldberg, Vinitski, Rao, Rifkin, Sullivan, and Gardiner. The fund also supports a relatively large number of departmental personnel whose primary responsibilities are in the research sphere. These include 2 research coordinators, 2 physicists, 2 photographers, MRI and ultrasound research technologists, a computer programmer, a film librarian, a research technician, and a research secretary. With the departure of Steve Mervis for a position with the Philadelphia office of the American College of Radiology, Hilary Stavetski was recruited as Assistant Administrator of the department. Working in close concert with George McArdle, Ms. Stavetski has an important role in departmental research. She will help in the preparation of future grants, particularly the budgeting and administrative aspects, and has already re-organized and computerized the bookkeeping of the various grant accounts. In addition to this role, Ms. Stavetski also has responsibility for overseeing some personnel working on Main-7 and Main-8.

A final accomplishment has been the organization of functioning research laboratories for 3 of our Ph.D. scientists. An MRI laboratory has been established on Main-10 by Dr. Vinitski. Dr. Boone is in the process of setting up an image processing laboratory on Main-8. Dr. Burns is setting up an ultrasound experimental laboratory, also on Main-8. As in the past, Professor Ben Galkin continues to operate a laboratory with a scanning electron microscope and an experimental breast imaging unit in the Curtis Building. These research laboratories contain, in their aggregate, a rather small
amount of floor space, but hopefully additional research space will be made available to the department when the new research building becomes a reality.

VI. FUTURE RESEARCH PLANS

The growth in imaging technology during the past 15 years has been one of medicine's most striking events. One of our overall research goals is to continue to contribute to these technological advances and to study their applications both in the experimental and clinical spheres. Technology assessment is another broad goal. We now have at hand a variety of imaging modalities with which to approach various clinical problems. It is of great importance to learn which techniques to apply for a given clinical problem, and in what sequence. For example, does a patient with suspected prostate disease need ultrasound, MRI, and CT? Does a patient with low back pain need myelography, CT, and MRI? A third broad area of research interest is in the development of interventional radiology. Almost every division of our department is applying interventional techniques either as an adjunct to surgery or a substitution for surgery. Not too long ago the sum total of interventional radiology was the treatment of gastrointestinal bleeding. Now we are opening obstructed arteries with angioplasty balloons, dissolving blood clots by the administration of thrombolytic drugs, draining abscesses, biopsying lesions in virtually every part of the body, decompressing obstructions of the bile ducts and urinary tracts, fragmenting kidney and gallstones, percutaneously inserting vena cava filters, and contemplating the use of new devices such as lasers, stents, and atherectomy catheters. Most of these techniques need to be studied critically in terms of indications, design of devices, treatment of complications, long-term results, etc.

Aside from these broad general goals, the various divisions of our department have more specific research plans for the near future. The General Diagnostic Division and the Pediatric Radiology Division will both focus on digital radiography and image processing in the study of pulmonary nodules, bronchopulmonary dysplasia, and necrotizing enterocolitis. Radiographic patterns of relapse in sarcoidosis will also be studied. The Breast Imaging Division will study various parameters of image quality in facilities accredited by the American College of Radiology. Dr. Feig and his colleagues will also compare benefits and risks of mammography screening using a relative risk model for radiation carcinogenesis, and will evaluate mammographic criteria for detecting tumor recurrence following radiotherapy. In the Division of Cardiovascular/Interventional Radiology, Drs. Gardiner, Bonn, Shapiro, and Sullivan will study techniques for percutaneous ablation of the gallbladder, the use of tissue plasminogen activator in treating deep vein thrombosis, and improved methods of angioplasty using lasers and intra-arterial stents. In conjunction with Dr. Consigny, they will develop and work with an animal model for studying restenosis after angioplasty and possible means of preventing it. Dr. Gardiner and I will pursue efforts to set up a regional registry of peripheral and renal angioplasty patients. This will be carried out in conjunction with the American College of Radiology and will hopefully lead to a broad database which will provide long-term information about patients undergoing these procedures. In the Division of Neuroradiology/ENT Radiology, Dr. Mishkin is organizing our department's collaboration with several other institutions in prospectively comparing the incidence of adverse reactions using non-ionic contrast agents and standard agents with steroid pre-treatment. The division will also attempt to evaluate the comparative roles of myelography, CT, and MRI in patients with low back pain. They are working with members of the Neurology Department to set up a clinical trial of thrombolytic therapy in acute stroke. They are also involved in MRI studies, such as the stereotactic localization of thalamic lesions, imaging in temporo-mandibular joint disease, and the effects of MRI on metallic otic prostheses. In conjunction with members of our MRI group, they will also attempt to study the application of MRI to altered cerebral blood flow states. The Division of Diagnostic Ultrasound will of course continue to pursue projects that have outside grant funding. These include Doppler evaluation of pregnancy-induced hypertension, bio-effects of ultrasound, characterization of atherosclerotic plaques, and prostate ultrasound. Dr. Barry Goldberg has submitted a grant proposal to evaluate ultrasonic contrast agents, and Dr. Matthew Rifkin has submitted 2 others - on the quantitative assessment of prostate carcinoma and staging of colorectal carcinoma. Dr. Peter Burns has submitted a proposal dealing with Doppler evaluation of splanchnic blood flow. Areas of unfunded research include color
Doppler studies of the newborn brain, studies of patients who have undergone ECMO, comparison of endovaginal and transabdominal ultrasound scanning in pregnancy, and standardization of measurements in obstetrical ultrasound. The Division of Body CT will study CT and ultrasound in the evaluation of Greenfield filters, CT findings in liver transplantation, and CT evaluation of axillary lymph nodes in stage II and III breast carcinoma. They will also study normal axillary anatomy using both CT and MRI. The Division of MRI has a number of projects planned. They will study the application of different MR pulse sequences to detect bone marrow changes in patients with sickle cell anemia, a comparison of MRI and ultrasound with arthrography in patients with shoulder joint derangement, fat and water suppression techniques in MRI, surface coil development (in conjunction with Medical Advances, Inc. of Milwaukee), improving contrast to noise ratio by changes in flip angle and bandwidth, and 3-dimensional MRI. They will also continue to evaluate the clinical potential of MRI in a variety of other organs. An important aspect of these studies will be a comparison of MRI with other imaging technologies. In the Division of Radiological Physics, Drs. Vinitski and Burns will participate in the MRI and ultrasound studies listed above. Dr. Boone will study various aspects of artificial intelligence, particularly the use of computers to combine clinical information and radiographic findings to aid in diagnosis. He will also study scatter effects in digital imaging, true color radiography using dual energy images, and motion compensation in digital subtraction angiography.

VII. LONG-RANGE GOALS

In the clinical sphere, many of our goals remain the same as they were last year. We must continue to provide high quality and rapid service to referring physicians. It is not clear whether we will be able to outdo the striking growth rate in procedure volume that we experienced this past year, but we must certainly make every effort to see that sustained and healthy growth occurs. To this end, we must also continue vigorous marketing efforts. We must make sure that our space and equipment are modern and efficient. As the PACE project unfolds over the next several years, we must work closely with the hospital administration and the Division of Emergency Medicine to ensure that we are providing them with the best possible radiological support. Our departmental computer system is an excellent one and many management functions have successfully been computerized; others should be in the future. An important, yet unfulfilled, goal is securing the radiology contract at the Wills Eye Hospital. This is proving to be a difficult issue, but I am confident that if it is given to us, we can provide Wills with the best possible imaging studies in patients with ophthalmologic diseases. Finally, we must not lose sight of the fact that people are our most important asset. There is a major shortage of radiologic technologists in this country. As a department and as a hospital, we must continue to ensure that the salaries, fringe benefits, and working environment we provide for our technologists are highly competitive. On the M.D. and Ph.D. level, we must continue vigorous recruiting efforts whenever they become necessary. I am very proud of the quality of our faculty at this time and we must do everything possible to keep it that way.

In the teaching sphere, we must continue to maintain the high standards already established in our training programs for medical students, residents, fellows, and practicing radiologists. We must try to expand our preceptorship program, wherein practicing radiologists who want to update their knowledge can spend 1-4 weeks in our department working with our clinical radiologists in particular areas of interest. Attractive preceptorship programs could probably be developed in breast imaging, MRI, neuroradiology, cardiovascular/interventional radiology, and ultrasound. We have recently set up an international visiting professorship program funded by the departmental research fund, and we must try to expand and publicize the existence of this program.

In the research sphere, we must continue our efforts to seek grant funding from NIH and other federal and state agencies. We must also continue our efforts to obtain equipment and personnel support from commercial manufacturers. With the addition to our faculty of Ph.D. basic scientists like Drs. Simon Vinitski, John Boone, Peter Burns, and Macke Consigny, we are well on our way to building an excellent basic research capability. We must do everything possible to foster their efforts by providing them with space, financial support, equipment, and personnel support. Much
of this will of course depend upon their own abilities to obtain grant funding; we must also help them in that endeavor as well. One of the remaining "frontiers" of imaging research is magnetic resonance spectroscopy. This fascinating and potentially valuable technique is still in its infancy. We must develop research capability in this area by seeking institutional support for an MR spectroscopist position and recruiting an outstanding individual to fill it. Finally, there are a number of new diagnostic imaging and interventional techniques with which various members of our department are now becoming familiar. They include xenon cerebral blood flow determination, CT analysis of vertebral mineral content, kidney stone and gallstone lithotripsy, fast imaging in MRI, MR spectroscopy, the use of lasers and stents in treating arterial obstructions, insertion of inferior vena caval filters, color Doppler, the spectrum of interventional neuroradiological technique, MRI of the heart and blood vessels, and digital radiography. These techniques have the potential to become useful tools, but need to be carefully evaluated through clinical research programs.

VIII. PROBLEMS

Like virtually every other department, we are faced with certain problems, not all of which can be easily solved. First of all, a service department like Radiology must be able to efficiently provide all services needed by referring clinicians. We are not able to do this at the present time with only a single MRI unit in operation. The pace at which planning for the second MRI unit is progressing is slower than I would like. Part of this is the inevitable result of requirements of the state bureaucracy. We in the department and hospital administration must make every possible effort to get our second MRI unit up and running as quickly as possible. We do not have an MR spectroscopy program here, in part due to lack of available magnet time. As a developing academic department, we must build such a program, although time constraints will continue to create difficulties.

Another problem is laboratory space. If we are to increase our basic research output, additional space will be needed. At the moment, it is unclear where this will come from.

As indicated earlier, there is a shortage of trained radiologic technologists throughout the country. Through close cooperation between Mr. McArdle and Jefferson's Department of Human Resources, we have been able to maintain a competitive position as a prospective employer for technologists seeking new jobs. Although this is not a serious problem at the moment, it could become one if economic conditions change.

Geographic dispersion of the department remains a problem. We are currently operating on NH-3, NH-5, Main-7 and Thompson-7, Main-8, Main-10, the Breast Imaging Center, the Emergency Room, and the Jefferson Sports Medicine Facility. Shortly, we will also begin operating in the orthopaedic area on NH-8, and the new ambulatory MRI building on Walnut Street. Obviously it is very difficult to maintain economies of scale or efficient use of personnel under these conditions.

Finally, our departmental library is in extremely poor shape. Not only is this area dingy and dark and overcrowded, but there are also many missing volumes and journals. This certainly hampers the development of a good teaching program, although we do have plans in the works for trying to rectify the situation.

IX. ISSUES FOR THE UNIVERSITY

In his instructions to chairmen on the preparation of this section of departmental reports, the Dean requested that we address the question of broad issues confronting the University. One of these, in my opinion, is controlled growth. Within the past year, the hospital has concluded negotiations creating alliances with both Jefferson Park and Methodist hospitals. It is not entirely clear to me what benefits these provide to the University. If these institutions made strong contributions to Jefferson's clinical, teaching, and research programs, the benefits would be self-evident. But do they? One possible negative effect is dilution of effort of our hospital administration. As I stated
earlier in this report, Jefferson is fortunate to have outstanding administrative leadership. However, there are only so many hours in the day, and only so many things that even the best administrator can focus upon. If our leadership is forced to spend too much time solving the problems of Jefferson Park and Methodist Hospitals, they may not be able to devote the proper amount of time to solving problems here on campus.

Another broad issue is the provision of the proper amount of research space to clinical departments. Plans are now underway for the development of a large new research building on Locust Street between 9th and 10th Streets. When the project was first proposed, the implication was that many or even all departments would have space in this building. Radiology and other departments were asked to submit requests for space. Now we've heard that only 2 or 3 of the basic science departments are to get space there. What happens to the rest of us? The clinical departments bring in the lion's share of revenues to support the university, and it seems to me that we certainly ought to share in the fruits of its expansion.

A final broad issue is the appropriate evaluation and introduction of expensive new technology. With a seemingly endless stream of new devices (mostly very expensive) constantly being developed, knowing what to invest in is often a difficult challenge and one which must be met in a thoughtful and careful manner if scarce resources are not to be squandered.

X. CONCLUSION

1987-88 has been an excellent year for the Department of Radiology. Our clinical referrals have risen dramatically. Our teaching programs remain strong. Grant funding and research productivity have increased. All of us on the faculty can collectively take great pride in these achievements. We also wish to express our gratitude to the many other people, both inside and outside the department, who have helped make this progress possible. These include our technical, clerical, and administrative personnel within the department, as well as Messrs. Bradley, Lewis, and Murtaugh in the hospital administration and Dean Gonnella and his associates at the Medical College. It is no secret that hospitals and physicians face cutbacks and other restraints in the funding of medical care, but the quality of people we have here at Jefferson makes for a unique set of circumstances which should allow us to prosper even in the face of these obstacles.

David C. Levin, M.D.
Professor and Chairman
TEACHING PROGRAMS

Vijay M. Rao, M.D.

Introduction

The Department of Radiology is highly active in the teaching of medical students, radiology residents, fellows, and the clinical house staff. Several continuing medical education (CME) courses traditionally offered by the Department of Radiology continued to be received with great enthusiasm. The new teaching programs introduced a year ago, namely the Radiology Grand Rounds, Research Conferences, Radiology-Pathology Correlation Conferences and a radiologic anatomy course for the freshman medical students were a great success and will be continued this year.

A. Teaching Programs for Medical Students and Non-Radiology House Staff

Freshmen Medical Students

Under the direction of Vijay M. Rao, M.D., a new course in Radiological Anatomy which was introduced a year ago for the first year students continued to be very popular. The course emphasizes cross-sectional anatomy as it relates to the newer imaging modalities, namely computed tomography and magnetic resonance imaging. Designed in conjunction with Dr. Edward Masters from the Department of Anatomy, the Anatomy course allows a departmental radiologist who may be either a faculty member, fellow or senior resident to be available as a consultant in the dissection laboratory for two hours per week throughout the length of the course.

Junior and Senior Medical Students

General Radiology Elective RAD 401-01: This elective is also under the direction of Vijay M. Rao, M.D. It is a structured course but has the flexibility of accommodating the special needs of any particular student. The objectives of this course are described below.

1. To teach the basic elements involved in the radiology of emergency care. This includes radiology of trauma, acute abdomen and common chest diseases such as pneumothorax, pleural effusions, pneumonia, etc.

2. To teach the principles of X-rays, fluoroscopy, computed tomography, ultrasound, nuclear medicine and magnetic resonance imaging. This enables the students to better understand the factors affecting patient preparation, patient cooperation, and the sequence in which diagnostic tests should be performed.

3. To teach the effective use of the Radiology Department. The appropriate use of new technologies is emphasized.

The maximum number of students accepted per block is 12. These students are divided into small groups of 3 to 4 students. At any given time, they are assigned to different areas such as general diagnostic radiology (which includes thoracic, skeletal, genitourinary, and gastrointestinal radiology), neuroradiology, body CT, ultrasound, nuclear medicine, and cardiovascular/interventional radiology. Students have the opportunity to interact on a one-to-one basis with faculty members, fellows and residents.
The radiology elective was taken by approximately 143 junior and senior class members of Jefferson Medical College. Of these, 101 completed the RAD 401-01 elective at Thomas Jefferson University Hospital and the remaining 42, at affiliated hospitals or outside institutions. Students enrolled in RAD 401-01 have rated this course as one of the most enjoyable learning experiences of their senior year, with many commenting that it should be a requirement for all medical students. The 26 House Staff officers from the Department of Medicine who have taken this elective have also found it a fruitful and worthwhile experience.

**Neuroradiology Elective RAD 403-01:** This elective is supervised by Carlos Gonzales, M.D. The students are exposed to the entire gamut of neuroradiological procedures including angiograms, myelograms, computed tomography, and magnetic resonance imaging. They also participate in the interpretation of extracranial head and neck imaging studies. The students are given the opportunity to attend and participate in all neuroradiological and otolaryngological radiology conferences. A teaching file of outstanding cases is available for their use.

**Pediatric Radiology Elective RAD 405-01:** This elective is supervised by George Gross, M.D. The students participate in plain film interpretation and observe special diagnostic procedures on pediatric patients. They attend all teaching conferences of the Department of Pediatrics where the pediatric radiologist is consultant. A pediatric radiology teaching file is available.

**New Teaching Programs**

The following new elective courses for medical students were approved by the JMC Curriculum Committee and are being offered effective July 1, 1988.

**Cross Sectional Imaging (Ultrasound, Computed Tomography, and Magnetic Resonance) Elective RAD 406-01:** This elective will be supervised by Barry Goldberg, M.D. and Rick Feld, M.D. Each medical student will rotate for an interval of two weeks in ultrasound, one week in CT, and one week in MR. The students will participate in the ongoing daily morning conferences and combined US/CT/MR conference from 8:30 a.m., which is held three times a week. Use will also be made of the extensive videotape library on cross sectional imaging.

In addition, the students will rotate within the various areas of CT and MR. During this time the students will observe many different procedures being performed by the technologist and review cases with the physicians. It is anticipated that medical students going through this rotation will come away with a basic understanding of the usefulness of ultrasound, CT and MR in the diagnosis, and a knowledge of how these procedures are performed.

**Cardiovascular/Interventional Radiology Elective RAD-407:** This elective will be supervised by Geoffrey A. Gardiner, M.D. During their month in Cardiovascular/Interventional Radiology, students will become familiar with the wide range of procedures performed by the radiologist by first-hand observation of cases. They will participate in case review sessions held every morning with the residents and fellows. The students will accompany the residents and fellows on morning rounds for follow-up evaluation of patients who have had both vascular and non-vascular procedures. Students will have an opportunity to review the wide collection of cases in the teaching files, and may assist with various research projects which are in progress during that time. By the end of the month, the students will have a much better understanding of both the diagnostic and interventional capabilities of this section of the Department of Radiology, and will be more familiar with the management of patients with vascular disease and biliary or renal obstruction.
Interdepartmental Radiology Conferences for Junior and Senior Medical Students and Non-Radiology House staff: During rotation on clinical services, the junior and senior medical students and house staff receive frequent exposure to radiology through a number of interdepartmental conferences:

i) Weekly combined neurology/neurosurgery/radiology conferences
ii) Weekly lectures in radiology for junior students in medicine
iii) Bi-weekly conferences in orthopedic radiology for students on orthopedics
iv) Bi-weekly radiology conferences for house staff and students on otolaryngology
v) Weekly combined radiotherapy/otolaryngology/radiology/oncology head and neck tumor conference
vi) Lectures to students on Emergency Room rotation
vii) Weekly combined pulmonary/radiology and pathology conferences
viii) Monthly conference for students and house staff in thoracic surgery
ix) Bi-weekly combined pulmonary/radiology/surgery/radiotherapy lung tumor conference
x) Bi-weekly pediatric radiology conference for students on pediatrics
xi) Monthly neonatal imaging conference for Intensive Care Nursery faculty, residents and medical students

Unknown Case of the Week for Medical Students and Non-Radiology House Staff

Radiology residents present imaging studies accompanied by clinical information for medical students and non-radiology house staff. The purpose of this weekly case conference is to introduce and teach interpretation of radiographic findings, given a minimal knowledge of a patient's history.

Unknown Pediatric Case of the Week for Pediatric House Staff

This was initiated by George W. Gross, M.D. Various image studies of children accompanied by clinical information and one or more questions are presented weekly. A diagnosis, explanation and discussion are then provided for teaching purposes.

B. Residency Program for Residents in Radiology

The American Board of Radiology requires four years of training in diagnostic radiology, regardless of prior post-graduate training. Because of the increasing demand for sub-specialization among radiology trainees, the residency training program recently underwent a major restructuring. One addition was the introduction of elective time in the fourth year. Under the restructured program, there is a core curriculum of 3 years. During that time, all residents are assigned 3 months in each of the following areas: thoracic radiology, skeletal radiology, genitourinary radiology, gastrointestinal radiology, body CT, cardiovascular/interventional radiology, neuroradiology/ENT, mammography, outpatient radiology and pediatric radiology. The residents spend 2 months in magnetic resonance imaging and 4 months in nuclear medicine. In the fourth year, they have the option of taking additional elective in one or several of these areas.

During the first year, residents learn the basic concepts and interpretation of diagnostic studies as applicable to each subspecialty. In addition to mastering the principles of the various imaging modalities, they also learn the technical aspects of the various diagnostic and therapeutic procedures performed in the Department, especially in the cardiovascular/interventional, neuroradiology, ultrasound and body computed tomography areas.

During the second and third years, the residents again spend one month each year in each of these areas, thus enabling them to refresh their knowledge and polish their technical skills. Having achieved basic competence in diagnostic and interventional procedures, residents are prepared to tackle more difficult and challenging procedures. Furthermore, the continued exposure each year to every area helps prepare them better for the written board examinations in Radiology, taken at the beginning of the fourth year. Residents are encouraged to participate in ongoing research activities within the department.
The fourth year residency is largely an elective year. The residents can spend a block of time in one or more areas of radiology. This gives them an opportunity to acquire additional expertise in the subspecialty of their interest. Our residency program aims at producing radiologists well-trained in all aspects of diagnostic imaging who will feel comfortable in either an academic or a private practice environment.

A distinctive feature of our residency program is that during each work day, 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 additional effort from radiology staff physicians, but is worthwhile for good residency training and patient care.

Our residents are actively involved in the ongoing research projects in the department. Twelve scientific papers including oral presentation, posters and exhibits were presented by the residents at national meetings, namely RSNA, AUR and ARRS.

I am pleased to report that the restructured residency program is working well. During the past year, the residency training program maintained its tradition of academic excellence. Our four graduating residents passed the written board examination given by ABR and have obtained excellent fellowship or staff positions for the year beginning July 1, 1988. Brad Dick, M.D. will be a fellow in cardiovascular/interventional Radiology at the University of California, San Francisco. Cathy Piccoli, M.D. will be a fellow in US/CT/MRI with us at Thomas Jefferson University itself. Irene Raisis, M.D. will be staying with us as a junior staff faculty member. Horatio Yeung, M.D. will be joining a private practice group in Baltimore, Maryland. It is gratifying to note that 6 out of 12 graduating residents and fellows have been accepted into academic positions.

**Resident Selection:** The Radiology Residency Program at Jefferson is much sought after. Over 300 applications were received last year, from which 53 were selected for interviews. Of these, nearly 30 were within top 10% of their class. Each of these candidates were interviewed by at least three members of the Residency Selection Committee which is chaired by Alfred B. Kurtz, M.D. Four first year residents were selected from this group.

The first year residents beginning July 1, 1988 are listed below with their medical schools:

1. Steven Domiano - State University of New York, AOA
2. Andrew Gallant - Emory University
3. Kenneth Kaplan - New York Medical College, AOA
4. Jonathan Shapiro - New York Medical College

The total number of residents for the year 1987-88 were 17, with distribution as follows:

- Fourth year: 4
- Third year: 6
- Second year: 4
- First year: 3

**Resident Teaching and Conferences:** Throughout the four years of residency, our residents attend 2 hours of conferences in diagnostic interpretation given daily by attending staff. These conferences are a mixture of didactic lectures and case presentation conferences where residents have the opportunity to discuss the radiographic findings and differential diagnosis.

**Radiologic Physics Course (RAD 521) for Residents in Radiology:** This course which until last year consisted of some 140 lecture hours presented over a two year period was condensed into a one year course of 80 lecture hours for 1987-88. Also, the lecture schedule was changed from the noon hour to 7 am. By February 1988 it became increasingly apparent that the early lecture hour was not popular with the residents as evident by their declining attendance. Accordingly, upon the recommendation of the medical physics faculty, the course was terminated in March 1988 and a new course was drafted by Dr. John Boone to be presented daily at the noon hour from mid June to early September primarily for the second, third and fourth year residents. This course, approximately 55 lecture hours, is off to a good start with good attendance. Radiology residents from Pennsylvania Hospital also attend the classes.
A much shorter introductory physics course is planned for the new first year residents during August 1988.

**Radiology-Pathology Conference:** Interdepartmental radiologic-pathologic correlation conferences continued to be very popular. Moderated by Vijay M. Rao, M.D., interesting cases are discussed by the senior residents, followed by final pathologic diagnosis presented by the pathologist.

**Postgraduate Review Course for Radiology Residents:** A citywide bi-annual refresher course in cardiac radiology was presented to the residents by Drs. Levin and Steiner in 1987. The course was held for 2-hour nightly sessions, one per week for 8 weeks, and was attended by approximately 75 residents. The second course is again being planned for the spring of 1989.

**Pediatric Case of the Week for Radiology Residents:** Under the direction of George Gross, M.D., various imaging studies of children accompanied by clinical information and one or more questions are presented weekly for the radiology residents. A diagnosis, explanation, and discussion of findings are then provided for teaching purposes.

**Philadelphia Roentgen Ray Society Meeting:** Our residents are encouraged to attend the monthly conferences held by PRRS at the College of Physicians. The meeting consists of a lecture and a panel discussion followed by a business dinner, sponsored for the residents by the Radiology Department.

**Blue Ribbon Lectures:** This city wide course is designed for the Radiology residents in the Delaware Valley by the Blue Ribbon Graduate Course Committee, a chapter of the Philadelphia Roentgen Ray Society. The lectures are given by well-known authorities within the city and are held monthly.

**Orthopedic Radiologic-Pathologic Conferences (ORP):** Resident are also encouraged to attend these city wide conferences held monthly. Interesting orthopedic cases are discussed by a panel of distinguished radiologists.

### C. Training Program for Fellows

The Department of Radiology offers 1, 1-1/2, and 2 year fellowships in each of the following areas: Cardiovascular/Interventional Radiology, Neuroradiology/ENT, and Ultrasound/CT/MRI. Candidates must be board certified or in the certification process.

**Cardiovascular/Interventional Fellowships:** The Cardiovascular/Interventional Fellowship has been extended to three fellowship positions offered yearly for a one or two year period. This fellowship is under the direction of Geoffrey Gardiner, M.D. The first year consists of three months in cardiac angiography and nine months on the combined vascular/interventional service. On cardiac rotation, the fellow works in the Cardiac Catheterization Laboratory performing cardiac catheterization and coronary angiography. Radiographic interpretation of cardiac studies is enhanced by combined conference with the cardiologists. A nine month rotation through the vascular/interventional service exposes the fellow to a wide variety of vascular and non-vascular interventional and diagnostic procedures. Daily ward rounds and morning work conferences are held, during which time all cases are reviewed. There are monthly conferences with the vascular surgeons. Resident teaching conferences are presented by the staff. Both the teaching file and computerized patient database are carefully maintained and updated. Since the two-year program is intended for fellows with academic interests, ample research time is allotted during the second year with additional experience offered in pediatric vascular and non-vascular procedures and in cardiac imaging (using digital technique, echocardiography and MRI) and congenital heart disease.

**Neuroradiology/ENT Fellowship:** The Neuroradiology/ENT Fellowship is a two year program with two fellows appointed each year for a total of four fellows. This fellowship is under the direction of Carlos Gonzalez, M.D. The Division has state-of-the-art angiography (including digital subtraction), myelography, CT and MRI equipment all located adjacent to dedicated Neuroradiology/ENT film interpretation and consultation areas. Extensive training is received in interpretation of plain films, tomograms, CT and MRI examinations as well as in the technical aspects and interpretation of myelograms, neuroangiograms and in interventional neuroradiologic procedures. Daily film
interpretation and reporting is done with the Neuroradiology Staff. Consultation with referring physicians from neurology, neurosurgery, orthopedic surgery, head and neck surgery, medical oncology and radiation oncology is an ongoing responsibility and learning opportunity. There is weekly active participation in Neurosurgery Grand Rounds, Neurology Grand Rounds, ENT Grand Rounds, Head and Neck Tumor Conference as well as two weekly Neuroradiology Conferences for residents and a weekly conference with the clinical staff of the Regional Spinal Cord Trauma Center based at TJUH. There are regular working conferences with the neuropathologists for neuroradiology-neuropathology correlation. There is an extensive teaching file of proven examples of neurologic abnormalities. Ample opportunities exist for research at the clinical and basic science level and are strongly encouraged.

Ultrasound/CT/MRI Fellowship: The Ultrasound/CT/MRI fellows participate in one of two programs: 1) a one-year program consisting of seven months of ultrasound, and two-and-a-half months each of Body CT and MRI, and 2) a 1-1/2 year program consisting of rotating in ultrasound, Body CT and Body MRI, and 2 months of research. This fellowship is under the direction of Barry B. Goldberg, M.D. The Ultrasound portion of this program offers training in adult and pediatric abdomen and pelvis, neonatal brain, obstetrics and gynecology, small parts (including testes, neck and breast), peripheral vascular, echocardiography, endosonography, intra-operative ultrasound, and aspiration-biopsy and abscess drainage techniques. In Body CT, training is given in chest, abdomen and extremities. Aspiration-biopsy and abscess drainage techniques are taught during the Body CT rotation. MRI training consists of all aspects of body and extremity studies and the physics involved with image production. Additionally, an introduction to spectroscopy and neuro MRI is available. Morning conferences are held daily in the Ultrasound, CT, and MRI divisions during which time interesting cases from the previous day are reviewed. Monthly research meetings and specialty conferences with the perinatologists, neonatologists, orthopedists and the Division of Nuclear Medicine (Department of Radiation Therapy and Nuclear Medicine) are held. Research is encouraged.

Research and Clinical Fellowship-Division of Radiation Biology: Under the direction of Robert Brent, M.D., Ph.D., this training program provides the opportunity to obtain research training in experimental embryology, radiation biology, teratology, developmental immunology, genetics and developmental biochemistry. The training program is conducted by a multidisciplinary research team. Trainees in both the basic medical and clinical sciences are accepted into the program and are expected to function in the basic science or the clinical departments as developmental biologists. Developmental biological input in the fields of pharmacology, biochemistry, physiology, anatomy, microbiology, obstetrics and pediatrics is important for education, the discovery of new information, and in providing special expertise in obstetrics, pediatrics and genetic counseling. Individuals with this background can also be expected to be of value in the pharmaceutical industry and in government regulatory agencies. The trainees receive broad enough training to prepare them for a position in teaching and/or research in a basic science or clinical department or to function in industry or government as a specialist in these fields.

The training program includes: 1) assignment of all trainees to a preceptor; 2) exposure of all trainees to a basic spectrum of techniques and tools necessary to run a developmental biology laboratory --from animal handling to biochemical and physiological procedures; 3) weekly research work conferences, seminars and journal clubs; 4) exposure to the developmental biological aspects of drug testing and the multiple aspects of meeting the legal and moral commitments to complications of human malformations; 5) courses in teratology, embryology, radiation biology that are available to all trainees, plus 24 related elective courses available for the trainees. The training program is personalized with extensive contract between supervisors and trainees. A collegial relationship is developed that persists long after the trainee leaves the program.

CONTINUING MEDICAL EDUCATION (CME) PROGRAMS

Radiology Grand Rounds: Grand Rounds in Radiology, were held biweekly and covered topics of interest in all radiology subspecialties. 18 Grand Rounds sessions were given during the year; 12 were presented by invited speakers and 6 were by the department faculty. A listing of speakers and their topics is presented at the end of this section.
Eighth Annual Leading Edge in Diagnostic Ultrasound Courses: The Ultrasound division's eighth annual Leading Edge in Diagnostic Ultrasound, held in Atlantic City, was a major success. This year's meeting featured a pre-conference tutorial on cerebrovascular imaging and Doppler. The whole program was approved for 7.5 to 24.5 CME Category I hours, depending on dates of attendance. In addition to approximately 150 biomedical engineers, scientists, nurses, administrators, business managers and sales representatives, 450 course participants qualified for CME hours.

During this academic year, the Division of Ultrasound also offered 40 two to five day courses in ultrasound applications for the abdomen, obstetrics and gynecology, non-invasive vascular diagnosis, urologic and prostate ultrasound, neonatal brain, ultrasound in surgery, physics and instrumentation, cross-sectional anatomy, and echocardiography. These courses are approved for 1.5 to 31 AMA Category I hours.

Research Conferences: Another major feature this year was the continuation of bi-weekly Radiology Research Conferences, under the direction of Matthew Rifkin, M.D. This allowed everyone in the department the opportunity to present the results of their research activities. Residents are encouraged to become involved in research projects, to write abstracts and papers, and to present their work at local and national meetings. A listing of the research conference topics and their presenters is included at the end of this section.
**RADIOLOGY GRAND ROUNDS**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Speaker</th>
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<tbody>
<tr>
<td>Sept. 15, 1987</td>
<td>Roentgenographic Workup of the Pulmonary Nodule: The Value of the Percutaneous Aspiration Biopsy</td>
<td>Dr. Nagi Khouri John Hopkins Hospital Baltimore</td>
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<td>Sept. 29, 1987</td>
<td>CT of the GI Tract</td>
<td>Dr. Emil Balthazar New York University Medical Center</td>
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<td>Oct. 13, 1987</td>
<td>Hysterosalpingography</td>
<td>Dr. Stephen Karasick TJUH Radiology</td>
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<td>Oct. 27, 1987</td>
<td>MRI of Bone and Soft Tissue Tumors</td>
<td>Dr. D. Lawrence Burk TJUH Radiology</td>
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<td>Nov. 10, 1987</td>
<td>Why Image Suspected Lung Cancer?</td>
<td>Dr. Robert Pugatch Harvard Medical School Boston</td>
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<td>Nov. 24, 1987</td>
<td>The Role of MRI in Evaluation of Central Nervous System Neoplasm</td>
<td>Dr. George Krol Cornell University New York</td>
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<td>Dec. 8, 1987</td>
<td>Extracorporeal Membranous Oxygenation: Radiologic Appearances and Complications</td>
<td>Dr. George Gross TJUH Radiology</td>
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<td>Jan. 5, 1988</td>
<td>Coordinated Breast Imaging</td>
<td>Dr. Daniel Kopans Massachusetts General Hospital, Boston</td>
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<td>Jan. 19, 1988</td>
<td>Fast Imaging of the Body</td>
<td>Dr. David Stark Massachusetts General Hospital, Boston</td>
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<td>Feb. 2, 1988</td>
<td>Infertility and Ovarian Follicular Development</td>
<td>Dr. Harvey Neiman Western Pennsylvania Hospital, Pittsburgh</td>
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<td>Feb. 16, 1988</td>
<td>Imaging of Laryngeal Carcinoma</td>
<td>Dr. Hugh Curtin Eye &amp; Ear Hospital Pittsburgh</td>
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<td>Mar. 1, 1988</td>
<td>Dilatation of GI Stents</td>
<td>Dr. Julio Palmez Univ. of Texas Health Science Center San Antonio</td>
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<tr>
<td>Mar. 15, 1988</td>
<td>Treatment of Congenital Heart Disease in the Catherization Lab</td>
<td>Dr. Kenneth Fellows Childrens Hospital of Philadelphia</td>
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<tr>
<td>Date</td>
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<td>Mar. 29, 1988</td>
<td>Radionuclide Bone Imaging in the Evaluation of Athletic Injuries</td>
<td>Dr. Larry Holder</td>
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<td>Apr. 12, 1988</td>
<td>Endorectal Prostate Ultrasound</td>
<td>Dr. Matthew Rifkin</td>
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<td>Apr 26, 1988</td>
<td>Trauma to the Cervical Spine</td>
<td>Dr. Murray Dalinka</td>
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<tr>
<td>May 3, 1988</td>
<td>The First Annual Philip J. Hodes Lecture: Magnetic Resonance Imaging: The Development of a National Consensus</td>
<td>Dr. Herbert L. Abrams</td>
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<tr>
<td>May 24, 1988</td>
<td>Color Doppler: Its Place in Diagnostic Ultrasound</td>
<td>Dr. Donald Mitchell</td>
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<td>June 7, 1988</td>
<td>Cross-Sectional Imaging of the Chest Wall</td>
<td>Dr. Richard Wechsler</td>
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<tr>
<td>Date</td>
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<td>Presenter(s)</td>
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<td>October 6, 1987</td>
<td>1.5T Gradient Echo MRI of the Knee Biliary-Hepatic Venous Fistulae</td>
<td>D. Lawrence Burk, Jr., M.D</td>
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<td>November 17, 1987</td>
<td>Prospective Evaluation of Umbilical Artery Waveforms in High Risk Pregnancy Gradient Moment Nulling versus Respiratory-Sorted Phase Encoding for Motion Artifact Reduction in the Upper Abdomen Pathways to the Scrotum</td>
<td>David Levy, M.D. Donald Mitchell, M.D. Bradley Dick, M.D.</td>
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<tr>
<td>December 15, 1987</td>
<td>Federal Research Support in the Late 1980's</td>
<td>Samuel Herman, P.h.D.</td>
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<td>January 12, 1988</td>
<td>Normal Detailed Embryonic Anatomy with Endovaginal Sonography Evaluation of the Complementary Role of Hand-Held and Water Path Sonomammography to X-Ray Mammography Potential Retroperitoneal Recess Anterior to the Stomach: The Omental Fossa of the Anterior Pararenal Space</td>
<td>Oksana Baltarowich, M.D. Maria Vilaro, M.D. Cynthia Miller, M.D.</td>
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<td>January 26, 1988</td>
<td>Percutaneous Embolization of Spinal Hemangiomas Chemical Shift Artifact</td>
<td>Edward Podgorski, M.D. Bradley Dick, M.D.</td>
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February 9, 1988
Long-Term Results of Balloon Catheter Dilatation of Ureteroenteral Strictures
Marcelle Shapiro, M.D.

February 9, 1988
Massive Hemoptysis Associated with Pulmonary Aspergilloma - A New Percutaneous Treatment
Marcelle Shapiro, M.D.

February 23, 1988
Moyamoya Disease: Clinical Manifestations, Radiographic Findings, Classification and Treatment
Kim Koo, M.D.

March 2, 1988
Quality Control in Mammography
Benjamin Galkin, Ph.D.
Stephen Feig, M.D.

March 8, 1988
Marrow Infarction in SCA: Correlation with Marrow Type and Distribution by MRI
Vijay M. Rao, M.D.

March 8, 1988
Oblique Plane MR Imaging of the Brachial Plexus
Ashok Babaria, M.D.

April 5, 1988
MRI of Paranasal Sinuses: Normal and Pathologic Appearance at 1.5T
Paul Davis, M.D.

April 5, 1988
CT Appearance of Villus Adenoma
Pamela Hendricks, M.D.

April 5, 1988
Patterns of Clinical and Radiographic Relapse in Pulmonary Sarcoidosis
Robert Steiner, M.D.

May 17, 1988
Thoracic CT in the Preoperative Staging of Breast Cancer
David March, M.D.

May 17, 1988
Reduced Flip Angle Spin Echo Imaging: Faster T2 Weighted Images
Donald Mitchell, M.D.

May 31, 1988
Basic Statistics for the Academically Oriented Radiologist
Thomas Pajak, Ph.D.
<table>
<thead>
<tr>
<th>Title of Project</th>
<th>Investigator // Co-Investigator(s)</th>
<th>Source of Support (Amount)</th>
<th>Period of Support</th>
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<tbody>
<tr>
<td>Stroke Research</td>
<td>R. Bell, M.D. // R. Schwartzman M.D. // H. Doan, M.D.</td>
<td>(non-funded) Project with TJUH Department of Neurology</td>
<td>Ongoing Clinical Research</td>
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<td>Image Processing Computer System</td>
<td>J. Boone, Ph.D.</td>
<td>Radiology Research Fund</td>
<td>Sept 1987 to June 1988</td>
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<tr>
<td>Regulation of Normal and Abnormal Bone Growth in Utero</td>
<td>R. Brent, M.D., Ph.D., D.Sc. // J. Carbone, Ph.D. // T. Koszalka, Ph.D.</td>
<td>Foerderer Foundation ($64,090)</td>
<td>Feb 1988 to Jan 1989</td>
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<td>Title of Project</td>
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<td>Light Scan Oriented Doppler Detection of Breast Cancer</td>
<td>P. Burns, Ph.D.</td>
<td>National Institutes of Health ($50,000)</td>
<td>Feb 1988 to Aug 1988</td>
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<tr>
<td>Calibration of Acoustic Intensity and Beam Shape in Ultrasound Imaging and Doppler Instruments</td>
<td>P. Burns, Ph.D.</td>
<td>State of Pennsylvania Center of Excellence in Biomedical Engineering ($13,245) Radiology Research Fund</td>
<td>Mar 1988 to Sept 1988</td>
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<td>Back Muscle Atrophy Due to Denervation</td>
<td>H. Doan, M.D. // C. Gonzalez, M.D. J. Osterholm, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<tr>
<td>An Independent Evaluation of the Technical Quality of Mammography in Centers Accredited by the American College of Radiology</td>
<td>B. Galkin, M.S. // S. Feig, M.D</td>
<td>(non-funded)</td>
<td>Ongoing Physics Research</td>
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<td>Title of Project</td>
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<tr>
<td>Fractal Imaging of Breast Calcifications</td>
<td>B. Galkin, M.S. // C. Miller S. Feig, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Physics Research</td>
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<tr>
<td>Formation of a Regional Peripheral and Renal Angioplasty Registry</td>
<td>G. Gardiner, M.D. // D. Levin, M.D (With Physicians-Univ of Penna)</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<tr>
<td>Minimally Invasive Techniques for Characterization of Atherosclerotic Plaque</td>
<td>B. Goldberg, M.D. // J. Reid, Ph.D. (Drexel) V. Newhouse, Ph.D. P. Pederson, Ph.D.</td>
<td>National Institutes of Health ($100,179)</td>
<td>Jan 1986 to Dec 1987</td>
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<td>Title of Project</td>
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<td>The Use of Fluorocarbon Emulsion as a Contrast Media in the Central Nervous System</td>
<td>C. Gonzalez, M.D./J. Osterholm, M.D./R. Bell, M.D.</td>
<td>Johnson &amp; Johnson Cerebral Ischemia Study (sub-project) with TJUH Department of Neurosurgery (non-funded)</td>
<td>Ongoing Clinical Research</td>
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<td>Balloon Occlusion of the Carotid Artery in Patients with Neck Neoplasms</td>
<td>C. Gonzalez, M.D./J. Moret, M.D. (Rothschild Foundation - Paris, France)</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<tr>
<td>Measurement of Cerebral Vascular Flow with Use of Xenon</td>
<td>R. Bell, M.D./R. Schwartzman, M.D./A. Babaria, M.D./M. Mishkin, M.D./C. Gonzalez, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<td>D. Mitchell, M.D.</td>
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<td>H. Desai, M.D.</td>
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<td>F. Pidcock, M.D.</td>
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<tr>
<td>Development of Software for Optimal Imaging - Chest, Abdomen, Bone</td>
<td>G. Gross, M.D. // R. Steiner, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing</td>
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<td></td>
<td>G. Shaber, M.D.</td>
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<td>Clinical Research</td>
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<td></td>
<td>Y. Wang, M.D.</td>
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<tr>
<td>Combination Digital Processing for Pediatric Chest Images</td>
<td>G. Gross, M.D. // Y. Wang, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing</td>
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<td>Clinical Research</td>
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<tr>
<td>Digital Images for Bronchopulmonary Dysplasia in Children</td>
<td>G. Gross, M.D. // Y. Wang, M.D.</td>
<td>(non-funded)</td>
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<td>Clinical Research</td>
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<tr>
<td>A Digital Imaging System for Routine Radiographic Examination of Pediatric Patients</td>
<td>G. Gross, M.D. // Y. Wang, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing</td>
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<td>Clinical Research</td>
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<tr>
<td>Survey of Radiological Practice Patterns in Academic Institutions</td>
<td>D. Levin, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing</td>
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<td>Clinical Research</td>
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<tr>
<td>Evaluation of a New Mammography Unit</td>
<td>D. Levin, M.D. // S. Feig, M.D.</td>
<td>Thomson -CGR Medical Corporation ($40,000)</td>
<td>Jan 1988 to Dec 1988</td>
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<td>B. Galkin, M.S</td>
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<tr>
<td>Coronary Stenosis Morphology</td>
<td>D. Levin, M.D. // G. Gardiner, Jr., M.D</td>
<td>(non-funded)</td>
<td>Ongoing</td>
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<td></td>
<td>S. Goldberg, M.D.</td>
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<td>Clinical Research</td>
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<tr>
<td>Title of Project</td>
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<td>Source of Support (Amount)</td>
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<tr>
<td>Magnetic Resonance Imaging of Experimental Pulmonary Emboli</td>
<td>D. Levy, M.D. / M. Thakur, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<td>S. Vinitski, Ph.D.</td>
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<td>M. Rifkin, M.D.</td>
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<tr>
<td>Defecography</td>
<td>E. Mapp, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<tr>
<td>Rotator Cuff Tears: Ultrasound Sensitivity</td>
<td>C. Miller, M.D. / A. Kurtz, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<td>D. Karasick, M.D.</td>
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<td>J. Fenlin, M.D.</td>
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<td>J. Osterholm, M.D.</td>
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<td>S. Vinitski, Ph.D.</td>
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<tr>
<td>MRI of Patient with Spinal Cord Injury: A Comparison with Myelography and Computed Tomography</td>
<td>M. Mishkin, M.D. / A. Flanders, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<td>A. Babaria, M.D.</td>
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<td>L. Burk, M.D.</td>
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<td>J. Osterholm, M.D.</td>
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<td>P. Gorsuch, M.D.</td>
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<tr>
<td>Perisellar Meningiomas</td>
<td>M. Mishkin, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<tr>
<td>Title of Project</td>
<td>Investigator // Co-Investigator(s)</td>
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<td>Fat Back Syndrome</td>
<td>J. Osterholm, M.D. // H. Doan, M.D.</td>
<td>(non-funded) Project with TJUH Department of Neurosurgery</td>
<td>Ongoing Clinical Research</td>
</tr>
<tr>
<td>Clinical and Radiologic Assessment of Atypical Mycobacterium in Normal and Immunosuppressed Patients</td>
<td>D. Prince, M.D. // R. Steiner, M.D. P. Spirn, M.D. D. Peterson, M.D</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
</tr>
<tr>
<td>Clinical and Radiologic Assessment of Relapse in Pulmonary Sarcoidosis</td>
<td>R. Steiner, M.D. // V. Rao, M.D. H. Israel, M.D. J. Gottlieb, M.D. H. Patrick, M.D. P. Davis, M.D</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<td>MRI Rectal Coil Development</td>
<td>M. Rifkin, M.D.</td>
<td>Radiology Research Fund</td>
<td>Ongoing Clinical Research</td>
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<tr>
<td>High Resolution CCD Planar Array Digital Radiography</td>
<td>G. Shaber, M.D. // C. Lockard E. Nerlinger J. Boone, Ph.D.</td>
<td>Radiology Research Fund</td>
<td>Ongoing Research</td>
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<tr>
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<td>Acceleration of Arterial Thrombolysis Using High Dose Transthorombus Bolus Technique</td>
<td>K. Sullivan, M.D. // G. Gardiner Jr., M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<tr>
<td>Computerized Turnaround Time Studies</td>
<td>Y. Wang, M.D. // C. Lockard G. McArdle R. Steiner, M.D. G. Shaber, M.D. D. Levin, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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<tr>
<td>Ti Profile of Human Tissues</td>
<td>Y. Wang, M.D. // V. Rao, M.D. R. Steiner, M.D.</td>
<td>(non-funded)</td>
<td>Ongoing Clinical Research</td>
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PUBLICATIONS


- 50 -


ABSTRACTS


SCIENTIFIC PRESENTATIONS

OKSANA H. BALTAROWICH, M.D.
November 29 - December 3, 1987
The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Normal detailed embryonic anatomy with endovaginal sonography"

JOSEPH BONN, M.D.
June 21, 1988
Grand Rounds, Elmer Community Hospital, Elmer, NJ
- "Current interventional radiology practice"

JOHN M. BOONE, Ph.D.
November 29 - December 3, 1987
The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "X-ray spectroscopic imaging using color display"

ROBERT L. BRENT, M.D., Ph.D.
June 28 - July 1, 1987
Invited Faculty Lecturer, University of Vermont Postgraduate Course in Pediatrics, Sugarbush, Warren, VI
- "Causes and prevention of human birth defects"
- "Epidemiology for the clinician"

September 15, 1987
Guest Lecturer, Geisinger Medical Center, Danville, PA
- "Etiology of human birth defects: Will we ever eliminate this clinical problem?"

September 22, 1987
Visiting Professor, Boston University Medical School, Boston City Hospital, Boston, MA
- "The physician as expert witness and defendant"

September 25, 1987
Pediatrics for Pharmacists Conference, The Hospital for Sick Children, Toronto, Ontario, Canada
- "Etiology and prevention of human birth defects"
November 2-5, 1987
"Radionuclides in the food chain", Laxenburg Conference Center, Laxenburg, Austria, Sponsored by International Life Sciences Institute. Invited participant to discuss the impact of Chernobyl Nuclear Disaster

December 4, 1987
Participant in March of Dimes Conference on Environmental Exposure and Fetal Development, Sacramento, CA
- "Introduction to teratogenesis: Etiology and prevention of human birth defects"
- "Radiation in pregnancy: Fact and fallacy"
- "Medicolegal issues in teratology"

January 7, 1988
Visiting Professor, Bay State Medical Center, Springfield, MA
- "Physicians function as defendant and expert witness"
- "Contributing factors to the present negligence litigation crisis and their eventual resolution"

January 21, 1988
Guest Lecturer, Walter Reed Army Medical Center, Washington, D.C.
- "Mutagenic and carcinogenic risks of radiation and other environmental hazards"

March 9-13, 1988
Annual Meeting of the Association of Medical School Pediatric Department Chairmen, Tucson AZ. Chairman: Workshop on Resident and Medical Education

April 12-13, 1988
Developmental Toxicology and Teratology Course, University of North Carolina, Chapel Hill, NC
- "Medicolegal aspects of teratology"

April 12-13, 1988
Grand Rounds, University of North Carolina, Chapel Hill, NC.
- "Effects of radiation embryology"

April 14, 1988
Guest speaker at symposium honoring Dr. Josef Warkany, Cincinnati, OH
- "Etiology and prevention of human birth defects"

April 22, 1988
Guest Speaker, OB Grand Rounds, Greater Baltimore Hospital Medical Center, Baltimore, MD
- "Radiation and the embryo"

April 28, 1988
AOMA Meeting, New Orleans, LA
- "The application of basic developmental biology principles for estimating the reproductive environmental risks"
May 2-5, 1988

American Pediatric Society/Society for Pediatric Research Meeting, Washington, DC
- "Pathologic ultrastructural changes in the yolk sac produced by teratogenic antirat yolk sac polyclonal and monoclonal sera"
- "In vivo and in vitro introduction of cartilage in bone in brachymorphic mice"
- "Effects of medroxyprogesterone on the in vitro development of rat embryos"

May 7, 1988

Guest Speaker, Teratology Conference, "The Patient at Risk for Birth Defects - Physician Responsibility and Liability", Illinois Masonic Medical Center, Chicago, IL
- "Radiation effects on the embryo"

June 1-3, 1988

Ionizing Radiation Course, Harvard School of Public Health, Boston, MA
- "Effects of radiation on the embryo"

June 13-15, 1988

Teratology Society Meetings, Breakers Hotel, Palm Beach, FL
- "Bendectin: Our most famous tortogen-litogen and the best studied human non-teratogen. The absence of a clinical bendectin syndrome"
- "Effects of medroxyprogesterone on the in vitro development of rat embryos"
- "Scanning electron microscopic (SEM) study of the yolk sac membranes after exposure of rat embryo to teratogenic monoclonal antibodies (MCA)"
- "Evaluation of bone mineralization using the brachymorphic mouse (bm/bm) model"
- "Prenatal ultrasound exposure and postnatal growth and development"
- "A new technique for analyzing behavioral teratologic data"
- "Effects of prenatal x-irradiation on the 14th-18th day on adult behavior in the Wistar rat"
- "Physiologic alterations due to x-irradiation on postnatal days 3-7 in the Wistar rat"

D. LAWRENCE BURK, JR., M.D.

August 1, 1987

MRI for Technologists - A Practical Introduction, Philadelphia, PA
- "Optimizing scan protocols"
- Musculoskeletal MRI - A Practical Introduction (Workshop)

October 8, 1987

Delaware Valley MRI Society, Philadelphia, PA
- "Strategies for musculoskeletal MRI"
November 29- December 3, 1987

The 73rd Scientific Assembly and Annual Meeting of the Radiologic Society of North America, Chicago, IL
- "Spin-echo and gradient-echo MR imaging of meniscal cysts of the knee"

December 10-12, 1987

3-D Imaging in Medicine Course, Department of Radiology, Hospital of the University of Pennsylvania, Philadelphia, PA
- Speaker: "Pelvic and acetabular fractures"
- Moderator: Clinical applications - Part I
- Moderator: Clinical experience - Part I
- Program Committee

February 18, 1988

The Philadelphia Roentgen Ray Society Blue Ribbon Lecture, Philadelphia, PA
- "Imaging of the knees: anatomy and pathology"

February 29, 1988

6th Annual Meeting of the Society of Magnetic Resonance Imaging, Boston, MA
- "1.5 T MRI of meniscal and ganglion cysts of the knee"

March 23, 1988

The Cleveland Clinic Foundation, Cleveland OH
- Basics of Magnetic Resonance Course:
  - "Musculoskeletal MRI"
  - "Knee MRI"

May 22, 1988

The Philadelphia Orthopaedic Review Course, Philadelphia, PA
- Orthopedic Imaging

June 16, 1988

First Scientific Meeting, Society of Digital Imaging, Management and Communication Radiological Philadelphia, PA
- "Clinical applications of 3-D Imaging"

June 24-25, 1988

MRI for Radiologic Technologists, Hospital of the University of Pennsylvania, Philadelphia, PA
- "Optimizing scan protocols"
- Workshop Leader: "Imaging of the lower extremities (hips, ankle, knee)"

PETER N. BURNS, Ph.D.

July 3, 1987

University of Alabama Southern Medical Center, Department of Radiology, Birmingham AL
- "Doppler in obstetrics"

July 22, 1987

Guest Speaker, Minnesota Society of Diagnostic Ultrasound, Annual Meeting, Minneapolis, MN
- "Horizons in Doppler ultrasound"
September 22-23, 1987  
Symposium on Ultrasound Imaging, Drexel University, Philadelphia, PA  
• "Biomedical tissue characterization using Doppler ultrasound"

September 24, 1987  
Andre-Viallet workshop on the hemodynamic aspects of liver disease, University of Montreal, Montreal, Canada  
• "Non-invasive methods for measurement of hepatic flow"

September 25, 1987  
University of Bologna, Conference on recent advances in Rh hemolytic disease, Bologna, Italy  
• "Doppler ultrasound evaluation of fetuses at risk for Rh disease"

September 26, 1987  
University of Bologna, Department of Gastroenterology Seminar, Bologna, Italy  
• "Blood flow measurement in splachnic vessels using ultrasound"

October 5, 1987  
5th International Conference on the Ultrasonic Examination of the Breast, New Orleans, LA  
• "Doppler ultrasound of the breast: A review"

October 7-9, 1987  
The 32nd Annual Convention of the American Institute of Ultrasound in Medicine Annual Meeting, New Orleans, LA  
• "Doppler physics and instrumentation"  
  (Categorical course moderator and speaker)

December 12, 1987  
Institute for Medical Studies, Washington, DC  
• "Deep Doppler" (Course faculty Session Chairman)

January 14, 1988  
American Association of Physicists in Medicine, Delaware Valley Chapter, Philadelphia, PA  
• "Doppler ultrasound in clinical blood flow measurement"

February 22-23, 1988  
Noninvasive Techniques in Vascular Disease, San Diego, CA  
• "Deep Doppler principles" (Session chairman and speaker)  
• "Deep Doppler" (Course Faculty Session Chairman)

March 12, 1988  
Iowa Radiological Society, Annual Meeting, Iowa City, IO  
• "Present and future applications of diagnostic ultrasound"
March 19, 1988
Society for Gynecological Investigation, Annual Meeting, Baltimore, MD
• "Fetal blood flow measurements: Basic aspects"

March 25, 1988
Department of Medical Physics, Temple University, Philadelphia, PA
• "Physical basics of artifacts in Doppler ultrasound"

April 23, 1988
Societe Canadienne Francaise de Radiologie, University of Montreal, Montreal, Canada
• "Doppler flow measurements"

May 4-6, 1988
The Leading Edge in Diagnostic Ultrasound, Atlantic City, NJ
• "Interpretation of the Doppler spectrum"

May 23, 1988
International Perinatal Doppler Society, Kansas City
• "Perinatal Doppler flow measurements" (Session Chairman and Speaker)

June 11-12, 1988
Society for Noninvasive Vascular Technology, Annual Meeting, Chicago, IL
• "Interpretation of the Doppler spectrum" (Invited Speaker, Education Day)

WOLFGANG F. DAHNERT, M.D.

September 18-20, 1987
AUA Course. Ultrasonography in Urology, San Diego, CA
• "Transrectal ultrasound of the prostate - equipment and technique."
• "Ultrasonography of prostate cancer revisited"

November 18, 1987
Reading General Hospital, Reading, PA
• "Sonographic diagnosis of cancer of the prostate"

March 10, 1988
New Jersey Institute of Ultrasound in Medicine, Summit, NJ
• "A standardized endorectal prostate examination"

March 25, 1988
International Symposium and Workshop Endosonography, Orlando, FL
• "Ultrasound of the scrotum"
• "A standardized endorectal examination of the prostate"

May 7, 1988
The Leading Edge in Diagnostic Ultrasound, Atlantic City, NJ
• "Prostate ultrasound: Normal anatomy"
Segundo Curso Internacional de Ultrasonido
Puebla, Mexico
• "Ultrasonografia de escroto y testiculo; de vejiga urinary"
• "Ultrasonido del rinon"
• "Ultrasonido de la prostata 1a. parte (equipo, tecnica y anatomia normal)"
• "Ultrasonido del la prostata 2a. parte (pathologia)"

HUYNH T. DOAN, M.D.
June 9 - June 10, 1988

King's Daughters' Medical Center,
Ashland, KY
• "Applications of MRI in evaluation of the brain and spinal cord lesions"
• "Technique and limitations of brachial approach for cerebral angiography using a 4-French catheter"

STEPHEN A. FEIG, M.D.
July 11-12, 1987

Breast Imaging Seminar, Sponsored by the Los Angeles Radiological Society, Los Angeles, CA
• "Positioning, technique and quality control in breast imaging"
• "Guidelines and rationale for patient screening"
• "Preoperative needle localization"

August 9-14, 1987

Symposium on Breast Disease: Diagnostic Imaging and Current Management, Sponsored by the University of Michigan Medical School, Department of Radiology, Grand Traverse Village, MI
• "Principles of screen-film mammography"
• "Xeromammography technique and quality control"
• "Methods for localizing non-palpable lesions prior to biopsy"
• "A current assessment of the benefits and risks of screening mammography"

August 27, 1987

Vanderbilt University School of Medicine, Department of Radiology, Nashville, TN
• "Differential diagnosis of breast masses"

August 19-28, 1987

Third Annual Breast Imaging Symposium, Sponsored by Vanderbilt University School of Medicine, Department of Radiology, Nashville, TN
• "Technical aspects of optimal mammographic imaging"
• "Screening for breast carcinoma"
September 3-4, 1987
Symposium Mammographicyum '87, Sponsored by the Royal College of Radiologists, Nottingham, England
- "An overview of mammography" (Keynote address)
- "Benefits and risks of mammography"

September 11-13, 1987
Mammography Symposium, American College of Radiology, Chicago, IL
- "Calcifications"
- "The mammography report"

October 6, 1987
Radiology Grand Rounds, Department of Radiology, State University of New York Downstate Medical Center Brooklyn, NY
- "Imaging breast masses"

October 6, 1987
Brooklyn Radiologic Society, Brooklyn, NY
- "Breast cancer screening"

October 9-11, 1987
Workshops in Mammography, Inc. Washington, DC
- "Risks and benefits of mammography"
- "Evaluation and workup of breast masses"

October 30- November 1, 1987
Mammography Symposium, American College of Radiology, San Francisco, CA
- "Calcifications"
- "The mammography report"
- "Localization of non-palpable lesions"

November 29 - December 4, 1987
The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Mammographic interpretation: Problems, pearls and pitfalls", Refresher course No. 816

December 28, 1987
Albert Einstein College of Medicine, Department of Radiology, New York, NY
- "Screening mammography"

December 29, 1987
Radiology Grand Rounds, Albert Einstein College of Medicine, Department of Radiology, New York, NY
- "Breast calcifications and masses"

January 14, 1988
Radiology Grand Rounds, University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School, Department of Radiology, New Brunswick, NJ
- "Breast calcifications and masses"
February 29 - March 4, 1988
23rd National Conference on Breast Cancer, Sponsored by American College of Radiology, Los Angeles, CA
- "Breast cancer risk factors: Radiation"
- "Basic xeromammography interpretation"
- "Preoperative localization of non-palpable lesions"

March 11-14, 1988
Workshops in Mammography Inc., Key Biscayne, FL
- "Risks and benefits of mammography"
- "Establishing a quality assurance program for mammography"
- "Mammographic interpretation: Problems, pearls, pitfalls"

April 6, 1988
Mercy Catholic Medical Center, Fitzgerald-Mercy Division Department of Diagnostic Radiology, Darby, PA
- "Imaging evaluation of breast masses"

May 8-13, 1988
88th Annual Meeting of the American Roentgen Ray Society, San Francisco, CA, Categorical Course on Breast Imaging
- "Screen-film mammography: Principles, equipment, technique, quality control"
- "Issues in screening"
- "Writing the mammographic report"

June 3-5, 1988
American College of Radiology Symposium on Mammography, Philadelphia, PA
- "Calcifications"
- "The mammography report"

GEOFFREY A. GARDINER, JR., M.D.

October 10, 1987
Park Plaza Hospital and St. Joseph Hospital, Houston, TX
- "Thrombolytic therapy in peripheral arterial occlusions"

December 4, 1987
The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Graft thrombolysis: Long term results"

December 11, 1987
University of Nevada, Washoe Medical Center, Reno NV
- "Overview in treatment of peripheral arterial occlusions"

January 26, 1988
Indiana University Medical Center, Indianapolis, Indiana
- "Salvage of occluded arterial bypass grafts using thrombolysis"
April 8-9, 1988

Tutorial on Percutaneous Intra-arterial thrombolysis, University of Nevada, Washoe Medical Center, Reno, NV
• "Overview of thrombolysis and graft thrombolysis"

ROBERT O. GORSON, M.S.

July 24-26, 1987

4th Annual Meeting of the American College of Medical Physics, Bay City, MI
• "The medical physicist as an expert witness"

BARRY B. GOLDBERG, M.D

September 20-22, 1987

Symposium on Ultrasound Imaging and Tissue Characterization, Bryn Mawr, Pennsylvania, sponsored by Drexel University, Philadelphia, PA
• "History of Ultrasound"
• "The future of ultrasound from a clinical outlook"

October 5, 1987

5th International Congress on the Ultrasonic Examination of the Breast, New Orleans, LA
• "Ultrasound: An alternative to x-ray guided needle localization of non-palpable breast masses"

October 6-9, 1987

The 32nd Annual Convention of the American Institute of Ultrasound in Medicine, New Orleans, LA
• "Evaluation of iatrogenic pseudoaneurysms using color Doppler imaging"

October 20, 1987

Visiting Professor, Mallinkrodt Institute of Radiology, St. Louis, MI
• "Abdominal Doppler and endorectal ultrasound, including prostate and rectum"

October 20, 1987

42nd Annual Carman Lecture, Co-sponsored by the Greater St. Louis Society of Radiologists and the St. Louis Metropolitan Medical Society, St. Louis MI
• "A look into the future of ultrasound"

November 28 - December 3, 1987

The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America Meeting, Chicago, IL
• "Ultrasound contrast agent evaluation and potential uses"

February 4, 1988

Visiting Professor, Long Island Jewish Medical Center, New York, NY
• "Endoscanning: Endovaginal and endorectal"
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<th>Date</th>
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<tr>
<td>February 4, 1988</td>
<td>Radiology Grand Rounds, Long Island Jewish Medical Center, New York, NY</td>
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<td>• &quot;Advances in diagnostic ultrasound: Color Doppler and contrast agents&quot;</td>
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<td>February 24, 1988</td>
<td>Dr. Hector M. Valles Memorial Lecturer, Puerto Rico Chapter of the American College of Radiology, San Juan, Puerto Rico</td>
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<td>• &quot;Past, present and future of ultrasound&quot;</td>
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<td>February 24-28, 1988</td>
<td>Puerto Rico Chapter of the American College of Radiology, San Juan, Puerto Rico</td>
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<td>• &quot;Ultrasound evaluation of renal obstruction&quot;</td>
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<td>March 12-18, 1988</td>
<td>International Association of Medical Specialists Workshop, Beaver Run, Breckenridge, CO</td>
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<td>• &quot;Diagnostic ultrasound: Its present uses and a look into the future&quot;</td>
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<td>• &quot;Contrast agents in ultrasound&quot;</td>
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<td>March 19, 1988</td>
<td>15th Anniversary of the Einstein Alumni Society, Bala Cynwyd, PA</td>
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<td>• &quot;New frontiers in ultrasound&quot;</td>
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<tr>
<td>March 24-27, 1988</td>
<td>Endosonography in Diagnostic Ultrasound, International Symposium and Workshop, sponsored by the International Association for Endosonography, and Co-sponsored by the American Institute of Ultrasound in Medicine, Orlando, FL</td>
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<td></td>
<td>• &quot;Physical principles of endovaginal scanners&quot;</td>
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<tr>
<td></td>
<td>• &quot;Other applications of ultrasound in urologic practice: Kidneys&quot;</td>
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<tr>
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<td>• &quot;Panel Discussion: &quot;The current and future role of endovaginal scanning&quot;</td>
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<tr>
<td></td>
<td>• Panel Discussion: &quot;Should endosperms be used for screening?&quot;</td>
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<tr>
<td></td>
<td>• &quot;Endovaginal sonography, instrumentation and technique&quot;</td>
</tr>
<tr>
<td>April 21, 1988</td>
<td>Central New York Radiological Society, Syracuse, NY</td>
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<tr>
<td></td>
<td>• &quot;New horizons in ultrasonic endoscaning&quot;</td>
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<td>• &quot;Color Doppler and contrast agents in ultrasound&quot;</td>
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<tr>
<td>April 21-22, 1988</td>
<td>Visiting Professor, State University of New York at Syracuse, Syracuse, NY</td>
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<tr>
<td></td>
<td>• &quot;Doppler ultrasound of the abdomen and pelvis&quot;</td>
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<tr>
<td></td>
<td>• &quot;Normal ultrasound obstetrical measurements: An update&quot;</td>
</tr>
</tbody>
</table>
April 23, 1988
Quantum Medical Systems Course, Philadelphia, PA
• "Abdominal color Doppler"
• "Pseudoaneurysms"
• "Contrast Agents"

May 4-7, 1988
The Leading Edge in Diagnostic Ultrasound, Atlantic City, NJ
• "Ultrasound contrast agents"

June 8-10, 1988
Obstetrical and Gynecological Ultrasound:1988, A comprehensive overview, First Kenneth Gottesfeld-Charles Hohler Educational Symposium, New York, NY
• "GYN - vaginal probes"

June 22, 1988
11th Annual 1988 Eastern Shore Medical Symposium, sponsored by the University of Delaware and Thomas Jefferson University Hospital, Rehoboth Beach DE
• Panel Discussion: "Place of ultrasound compared to MRI and CT"

CARLOS F. GONZALEZ, M.D.

November 29 - December 4, 1987
Sociedad Medico del Sur Ponce, Puerto Rico
• "Advances in neuro MRI"
• "Tumor imaging in neuroradiology"
• "Orbital imaging"

May 28-29, 1988
Visiting Professor, University of Dusseldorf, Dusseldorf, Germany
• "Imaging in neuroophthalmology"

June 29, 1988
Visiting Professor, University of Marseilles, Marsielles, France
• "Fluorocarbons as protecting agents in brain ischemia: radiographic aspects"

GEORGE W. GROSS, M.D.

October 13, 1987
Continuing Education Series, Crozer-Chester Medical Center, Chester, PA
• "Newer developments in pediatric imaging"

October 22, 1987
Pediatric Grand Rounds, York Hospital, York, PA
• "MRI in pediatrics: Current status"

December 16, 1987
Continuing Education Series, Wernersville State Hospital, Wernersville, PA
• "Interpretation of radiographic examinations" (workshop)
DAVID KARASICK, M.D.

September 3, 1987
Mercy Catholic Hospital, Department of Radiology, Darby, PA Lecturer -
• "Approach to arthritis"

ALFRED B. KURTZ, M.D.

September 19, 1987
Harvard Medical School, Brigham and Women's Hospital, Department of Obstetrics and Gynecology, Course on Fetal Sonography 1987, Cambridge, MA
• "Fetal measurements and determination of gestational age"

September 28, 1987
Resident Staff, Department of Obstetrics and Gynecology, Lankenau Hospital Philadelphia, PA
• "Prenatal ultrasound: Obstetric measurements"

October 6-9, 1987
The 32nd Annual Convention of the American Institute of Ultrasound in Medicine, New Orleans, LA
• "Evaluation of iatrogenic pseudoaneurysms using color Doppler imaging"
• "The neonatal Circle of Willis during ECMO: Color Doppler imaging"

October 22, 1987
Department of Radiology, William Beaumont Hospital, Royal Oak, MI
• "2nd and 3rd trimester fetal evaluation"
• Case presentations to residents

October 22, 1987
Michigan Ultrasound Society
• "The use of obstetrical measurements in the accurate assessment of fetal age"

December 15, 1987
Greater Delaware Valley Ultrasound Society, Philadelphia, PA
• "Obstetrical measurements: Their use in determination of fetal age"
• "Obstetrical "small parts" measurements: Their value today and in the future"

January 7, 1988
Department of Medical Imaging, Presbyterian-University of Pennsylvania Medical Center, Philadelphia, PA
• "The current state of ultrasonography of the pancreas and spleen"

January 11, 1988
Department of Radiology, Monmouth Medical Center, Long Branch, NJ
• "GYN Ultrasound "

- 72 -
January 20, 1988
Greater Louisville Radiological Society,
Louisville, KY  
- "Pancreas - Comparison of ultrasound and  
computed tomography" presented to  
residents at the University of Louisville,
Louisville, KY  
- "The new standards in obstetrical  
Ultrasound"

February 7-10, 1988
9th Annual Intermountain Imaging Conference,  
Steamboat Springs, Colorado  
- "GYN abnormalities of adnexa"  
- "GYN abnormalities of uterus"  
- "Obstetrical measurements"  
- "The endometrium, normal and abnormal"  
- "Multiple gestations"  
- "Growth retardation and biophysical  
profile"  
- "Analysis of abnormal fetal anomalies"

March 21, 1988
The Department of Radiology, Montefiore  
Hospital Medical Center, Bronx, NY  
- "The uncomplicated obstetrical  
examination"

April 8-9, 1988
The Second Clinical Seminar in Diagnostic  
Ultrasound, The Western Pennsylvania  
Hospital, Pittsburgh, PA  
- "Ultrasound evaluation of the pancreas"  
- "Doppler evaluation of the abdomen"  
- "Multiple gestations"  
- "Obstetrical measurements : 1988 update."

May 5-7, 1988
The Leading Edge in Diagnostic Ultrasound,  
Atlantic City, NJ  
- "Obstetric measurements: 1988 update"  
- "Selected topics in fetal measurement"  
- "The fetal thorax"

DAVID C. LEVIN, M.D.

September 16, 1987
North Shore University Hospital  
Manhasset, NY.  
- "Stenosis morphology - a new way of  
looking at the coronary arteriogram"

October 5-6, 1987
Harvard Medical School Course,  
"Angiography and Interventional Radiology -  
1987", Boston, MA  
- "Understanding digital imaging"  
- "Current clinical role of digital subtraction  
angiography"  
- "Results and advances in renal angioplasty"  
- "The radiologist and coronary angioplasty"
October 14-15, 1987
30th Annual W. Edward Chamberlain Lecture, Temple University Hospital, Philadelphia, PA
- "Coronary stenosis morphology - a new way of looking at coronary arteriograms"
- "Renal angioplasty - technical aspects and clinical results"
- "Thoracic interventional angiography"

December 2, 1987
The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Diagnostic and interventional coronary angiography"

January 28, 1988
American College of Cardiology Course
"Diagnostic and Interventional Cardiac Catheterization - 1988", Bethesda, MD
- "Technical and methodological considerations in image acquisition"
- "Digital subtraction angiography - present and future use"

March 14-15, 1988
National Visiting Guest Lecturer, Armed Forces Institute of Pathology, Bethesda, MD
- "Plain film analysis of acquired heart disease"
- "Non-cardiac interventional radiology in the thorax"
- "Coronary angiography" - Part I & II
- "D- and I- transposition of the great arteries"

April 18, 1988
Society of Chairmen of Academic Radiology Departments, New Orleans, LA
- "Turf in academia"

June 6, 1988
Harvard Medical School Course, "Coronary Angiography - 1988"
- "Maximizing cine imaging"
- "The complex coronary plaque"
- "Major equipment purchase"

June 7, 1988
Grand Rounds, Brigham and Women's Hospital, Boston, MA
- "Do radiologists control imaging procedures?"

June 17, 1988
First Scientific Meeting - Society of Digital Imaging Management and Communication. Philadelphia, PA
- "Technical aspects of digital angiography"
DAVID W. LEVY, M.D.

December 1-4, 1987

The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Prospective Doppler Evaluation of umbilical artery wave forms in presumed abnormal pregnancy"

April 7, 1988

Philadelphia Roentgen Ray Society, Philadelphia, PA
- Film Panelist

May 4-7, 1988

The Leading Edge in Diagnostic Ultrasound, Atlantic City, NJ
- "Ultrasound case analysis"

ESMOND MAPP, M.D.

August 3-5, 1987

92nd Annual NMA, New Orleans, LA
- "GI effects of sickle cell disease"
- Moderator: "Multiple imaging and treatment modalities"

January 16-20, 1988

17th Annual Meeting of the Society of Gastrointestinal Radiologists, Nassau, Bahamas
- Faculty: Post-graduate course
- Panelist: Unknown case panel

April 19, 1988

Grand Rounds, Elmer Community Hospital, Elmer, NJ
- "CT and MR imaging correlations"

May 11, 1988

Visiting Professor, Mercy Catholic Medical Center, Darby, PA
- "Radiology of the stomach"

CYNTHIA MILLER, M.D.

December 4, 1987

The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Potential retroperitoneal recess anterior to the stomach: the "omental fossa" of the anterior pararenal space"

May 12, 1988

88th Annual Meeting of the American Roentgen Ray Society, San Francisco, CA
- "Limited sensitivity of ultrasound for the detection of rotator cuff tears"
MARK M. MISHKIN, M.D.

October 17, 1987

New York Radiological Society, State University of New York, NY
- "Resource-based relative value scale versus experienced-based relative value scale implications for diagnostic radiology"

November 2-6, 1987

Symposium on Diagnostic Imaging, Beijing, China
- "Imaging modalities in orbital disease"
- "Radiologic evaluation of spinal stenosis"
- "Cross-sectional imaging of disease of the liver"
- "The socio-economic aspects of the practice of diagnostic radiology in the United States"

February 8, 1988

Lehigh Valley Radiology Society, Allentown, PA
- "Ionic versus non-ionic contrast agents—medical, economic, and legal implications"

February 17, 1988

Visiting Professor, Albany Medical College, Albany, NY
- "Meningiomas arising from the cavernous sinus"

February 17, 1988

Northeastern New York Radiological Society, Albany, NY
- "Alphabet soup - DRG for DOCS, DRG for RAPS, AMA and EBRVS, and HCFA"

May 18, 1988

Visiting Professor, Presbyterian University of Pennsylvania Hospital, Philadelphia, PA
- "Cerebral angiography: localization and characterization of supratentorial mass lesions"

DONALD G. MITCHELL, M.D.

September 28-30, 1987

VII Congresso Argentino de Radiologia Diagnostico por Imagenes y Terapia Radiant, Mendoza, Argentina
- "MRI vs ultrasound in gynecology"
- "MRI vs ultrasound of pelvic pathology"

October 6-9, 1987

32nd Annual Convention of the American Institute of Ultrasound in Medicine, New Orleans, LA
- "The neonatal Circle of Willis during ECMO: Color Doppler imaging"
November 13, 1987
The George Washington University Hospital, Washington, DC
- "The biologic basis of tissue contrast in extracranial MRI"
- "Direct imaging of flow: MRI and Color Doppler imaging"

November 30, 1987
The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Color Doppler imaging of the neonatal Circle of Willis during extracorporeal membrane oxygenation"

March 1, 1988
Society for Magnetic Resonance Imaging, 6th Annual Meeting, Boston, MA
- "Optimizing long TR/TE images of the upper abdomen at 1.5 Tesla"

March 19, 1988
The Children's Hospital of Philadelphia, Philadelphia, PA
- "Color Doppler imaging: Pediatric applications"

March 25, 1988
Quantum Angiodynamography Advanced Users' Seminar, Orlando, FL
- "Radiology applications of color Doppler imaging"
- "Color Doppler imaging of the newborn brain"
- Pseudoaneruysms: Color Doppler diagnosis"

April 23, 1988
Quantum Medical Systems Conference - Angiography: A New Real-Time Imaging Modality for the Study of Arteries and Veins
- "Color Doppler imaging of the newborn brain"
- "Deep vein thrombosis: Color Doppler imaging"

May 5, 1988
The Leading Edge in Diagnostic Ultrasound Atlantic City, NJ
- "Color Doppler imaging: A 1988 perspective"

June 25, 1988
Neonatal Intracranial Ultrasound Washington, DC
- "Diagnostic ultrasound: An update"
- "Color Doppler Imaging: Non-cardiac applications, Parts I and II"

LAURENCE NEEDLEMAN, M.D.

October 30-31, 1987
Diagnostic Ultrasound Update '87, West Virginia University School of Medicine, Morgantown, WV
- "Abdominal Doppler"
- "Obstetrical Doppler"
March 24, 1988
Philadelphia Roentgen Ray Society Blue Ribbon Lecture, Philadelphia, PA
• "Doppler ultrasound applications: Carotid and abdominal"

April 15-16, 1988
2nd Annual Meeting of the West Virginia Diagnostic Ultrasound Society, Charleston, WV
• "Principles and applications of Doppler in obstetrics"

May 4-7, 1988
The Leading Edge in Diagnostic Ultrasound, Atlantic City, NJ
• "Cerebrovascular studies in real time": Case presentations
• "Venous ultrasound and its use in deep vein thrombosis"
• "High risk pregnancy: Ultrasound - perinatal correlation"

May 27-28, 1988
12th Annual Sonography Symposium, Vanderbilt University School of Medicine, Nashville, TN
• "Obstetrical Doppler sonography"
• "General applications of Doppler sonography"

June 8-12, 1988
11th Annual Meeting of the Society of Non-Invasive Vascular Technology, Chicago, IL
• "Advances in the use of duplex imaging: Obstetrical Doppler"

REBECCA G. PENNELL, M.D.

December 9, 1987
Philadelphia Roentgen Ray Society
• Film Panel moderator (Ultrasound)

January 13, 1988
Sponsored by Toshiba Imaging Systems, Airport Marriott Hotel
• "Applications of endovaginal sonography"

February 23, 1988
The Greater Delaware Valley Ultrasound Society
• "Endovaginal sonography in obstetrics and gynecology"

May 6, 1988
The Leading Edge in Diagnostic Ultrasound, Atlantic City, NJ
• "Endovaginal ultrasound: Equipment and techniques"
• "Endovaginal sonography in the first trimester of pregnancy"
• "Second and third trimester uses of endovaginal ultrasound"
VIJAY M. RAO, M.D.

February 29, 1988
6th Annual Meeting of the Society for Magnetic Resonance Imaging, Boston, MA
- "Avascular necrosis in sickle cell anemia: MR characteristics"

April 17-21, 1988
36th Annual Meeting of the Association of University Radiologists, New Orleans, LA
- "Marrow infarction in SCA: Correlation with marrow type and distribution by MRI"
- "Magnetic resonance imaging of the paranasal sinuses: Normal and pathologic appearance at 1.5T"

April 26, 1987
Annual Meeting of the Broncho-Esophageal Association, Fl
- "Lateral pharyngeal diverticula"

May 13, 1988
Temporomandibular Joint Arthroscopy - Two Day "Hands-on" Workshop and Symposium, Department of Oral and Maxillofacial Surgery, Thomas Jefferson University Hospital, Philadelphia, PA
- "Basic principles of MRI and MRI of the TMJ"

May 27, 1988
Annual Meeting of the American Association of Clinical Anatomists, CA
- "Development, use and value of embedded sectioned materials in pre- and postgraduate medical education"

MATTHEW D. RIFKIN, M.D.

July 10-11, 1987
5th International Symposium on Endoscopic Ultrasonography, Munich, Germany
- "Comparison of CT, MR and endosonography in rectal cancer staging"

September 7-10, 1987
First Copenhagen Symposium on Uroradiology, Copenhagen, Denmark.
- "Ultrasonography of the upper urinary tract imaging and intervention"
- "Ultrasonography of the transplanted kidney"

September 12, 1987
Advances in Sectional Imaging, San Diego, CA
- "Abdominal Doppler applications"
- "Endoscopic ultrasound: Prostate applications"

September 17-18, 1987
10th Annual Seminar in Diagnostic Ultrasound, Ann Arbor, MI
- "Prostate imaging;"
- "Thyroid and parathyroid imaging"
- "Doppler ultrasound in the high-risk obstetrical patient"
September 22, 1987  
**Transrectal Ultrasound in the Diagnosis and Management of Prostate Cancer, Detroit, MI**  
- "Transrectal ultrasound in America"

September 26-27, 1987  
**American College of Radiology 64th Annual Meeting, San Diego, CA**  
- "Doppler applications in obstetrics"
- "Sonography of the prostate"

October 6-7, 1987  
**32nd Annual Convention of the American Institute of Ultrasound in Medicine, New Orleans, LA**  
- "Non-prostatic intracavitary ultrasound"  
- Moderator: Abdominal Scientific Session  
Update on small parts imaging

October 19, 1987  
**The New York Roentgen Society, New York, NY**  
- "Ultrasonography of the prostate"
- "Scrotal ultrasound"

October 23-25, 1987  
**The Annual Scientific Meeting of Radiologists in Ultrasound, Denver, CO**  
- "The clinical significance of the peripherally oriented hypoechoic prostate lesions"

November 29- December 4, 1987  
**The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL**  
- "Ultrasound of the prostate"
- "Prostate imaging"
- "Endorectal prostatic ultrasound: Significance of non-palpable lesions"
- "Comparison of CT and endorectal ultrasound in staging rectal cancer"

January 15-16, 1988  
**American Urological Association Meeting, Boston, MA**  
- "Equipment and techniques for general and transrectal ultrasonography"
- "Scrotal ultrasonography"
- "Equipment and techniques for imaging the prostate"
- "Sonographic features of prostate cancer"
- "Interpreting sonographic images of the prostate"
- "Prostate biopsy under sonographic control: Techniques and complications"
- "Ultrasonography of the prostate - equipment, techniques and indications"  
(Panel Discussion)

February 1-4, 1988  
**Uroradiology '88, Sponsored by the Society of Uroradiology, Orlando, FL**  
- "Ultrasound of the prostate"
February 13-20, 1988
Sun Valley Imaging, Sun Valley, ID
- "Prostatic sonography"
- "Imaging the neck"
- Informal case presentations
- "The scrotum"
- "MRI of the lower urinary tract"

March 24-26, 1988
The International Association of Endosonography Meeting, Orlando, FL
- "Acoustic patterns of malignant prostatic disease"
- "Prostate biopsy under ultrasound guidance"
- "Urinary bladder ultrasound"

April 15-16, 1988
The University of Manitoba Health Sciences Center, Manitoba, Canada
- "Interventional ultrasound"
- "Prostate sonography - normal abnormal"
- "Sonography of the bladder and perivesical spaces"
- "Scrotal ultrasound"

May 7, 1988
The Leading Edge in Diagnostic Ultrasound, Atlantic City, NJ
- "Prostate ultrasound: Differential diagnosis"
- "Ultrasound staging of rectal tumors"

May 12, 1988
American Roentgen Ray Instructional Course, San Francisco, CA
- "Endoluminal sonography - transvaginal and transrectal"

May 20-21, 1988
12th Annual Spring Symposium in Diagnostic Ultrasound, Brooklyn, NY
- "Hepatobiliary ultrasound"
- "Current application in small parts sonography"
- "Transrectal ultrasound and lower urinary tract"
- "Interventional and intraoperative ultrasound"

May 23, 1988
Department of Radiology, Visiting Professor, University of Cincinnati, Cincinnati, OH
- "Ultrasound of the scrotum"
- "Pelvic MRI"

May 23, 1988
The Greater Cincinnati Radiological Society, Cincinnati, OH
- "Ultrasound of the scrotum"
- "Pelvic MRI"
June 22, 1988

11th Annual 1988 Eastern Shore Medical Symposium, sponsored by the University of Delaware and Thomas Jefferson University Hospital, Rehoboth Beach, DE
• "Clinical indications for MRI"
• "Clinical indications for CT"

GARY S. SHABER, M.D.

November 30- December 4, 1987

The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
• "Improved digital mammography with charge-coupled device planar array"
• "High resolution digital mammography utilizing charge-coupled device planar array"

January 31 - February 5, 1988

Annual meeting for the International Society for Photo-Optical Instrumentation Engineers, Newport Beach, CA
• "High resolution digital radiography utilizing CCD planar array"
• "ROC detectability evaluation of a filmless digital radiographic system"

MARCELLE J. SHAPIRO, M.D.

November 29 - December 4, 1987

The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
• "Long-term results of balloon catheter dilatation of ureteroenteral strictures"

ROBERT M. STEINER, M.D.

October 3, 1987

Grand Rounds, Latrobe Area Hospital, Latrobe, PA
• "The current applications of MRI of the body"

December 9, 1987

Solis-Cohen Medical Society Meeting, Philadelphia, PA
• "The current applications of MRI of the body"

January 12, 1988

Mercy Catholic Hospital, Darby, PA
• Interesting case conference

February 8, 1988

John Hopkins University, School of Occupational Health, Baltimore, MD
• "The radiology of asbestosis"

March 8, 1988

Laennec Society of Philadelphia, PA
• "The radiology of sarcoidosis - 1988 update"
<table>
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<tr>
<th>Date</th>
<th>Event Description</th>
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</table>
| March 25, 1988 | The University of Leiden, Departmental Conference, Leiden, The Netherlands  
- "Magnetic resonance in hematologic disorders" |
| April 20, 1988 | 36th Annual Meeting of the Association of University Radiologists, New Orleans, LA  
- "Clinical and radiologic patterns of relapse in pulmonary sarcoidosis" |
| June 15, 1988 | University of Rome, Departmental Conference, Rome, Italy  
- "Magnetic resonance imaging in disease of bone marrow" |
| June 17, 1988 | University of Rome, Departmental Conference, Rome, Italy  
- "Pitfalls in chest radiology" |
| June 21, 1988 | University of Rome, Departmental Conference, Rome Italy  
- "Critical care radiology" |
| June 28, 1988 | University of Rome, Departmental Conference, Rome, Italy  
- "CT of the chest wall" |
| July 1, 1988  | L'Aquila University, Departmental Conference, L'Aquila, Italy  
- "Pitfalls of CT of the chest" |
| July 2, 1988  | L'Aquila University, Departmental Conference, L'Aquila, Italy  
- "MR of bone marrow" |

**KEVIN L. SULLIVAN, M.D.**

<table>
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<tr>
<th>Date</th>
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</table>
| April 18, 1988 | 36th Annual Meeting of the Association of University Radiologists, New Orleans, LA  
- "Porcine model for the development of interventional techniques in the" |

**MARIA M. VILARO, M.D.**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
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</table>
| November 29 - December 4, 1987 | The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL  
- "Intraoperative US to facilitate breast mass resection"  
- "Evaluation of the complimentary role of hand-held and waterpath sonomammography to x-ray mammography" |
SIMON VINITSKI, PhD.

July 19-23, 1987
29th Annual Meeting of the American Association of Physicists in Medicine, Detroit, MI
- "Optimization of fast gradient refocusing techniques"

November 29 - December 4, 1987
The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Variable flip angle in fast spin echo MRI"

January 20, 1988
Biomedical Institute, Drexel University
- "Fast magnetic resonance imaging"

March 1-4, 1988
6th Annual Meeting of the Society of Magnetic Resonance Imaging, Boston, MA
- "Sampling interval in simultaneous gradient refocusing and spin echo imaging"

YEN WANG, M.D., D.Sc.

December 2, 1987
The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Tl profiles of human tissues"

February 4, 1988
Annual Meeting for the International Society of Photo-optical Instrumentation Engineers, Newport Beach, CA
- "Update ACR-NEMA digital imaging and communication standards"

May 10, 1988
88th Annual Meeting of the American Roentgen Ray Society, San Francisco, CA.
- "Incidence and long-term follow-up of breast calcification on mammograms"

June 16, 1988
First Scientific Meeting - Society of Digital Imaging, Management and Communication, Philadelphia, PA
- "Comparison of analog and digital processed neonatal chest radiographs"

RICHARD J. WECHSLER, M.D.

November 29 - December 4, 1987
The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL
- "Pathways to the scrotum: A cross-sectional analysis"

December 8, 1987
Fitzgerald Mercy Catholic Hospital, Philadelphia, PA
- "Anterior cardiophrenic murmur"
March 29, 1988

Society of Thoracic Radiology Annual Post-Graduate Course, Washington, DC
• "Cross-sectional imaging of the chest wall"

May 5, 1988

The Leading Edge In Diagnostic Ultrasound, Atlantic City, NJ
• "Ultrasound and CT: Detection and analysis of abdominal collection".

* * * * * * * * * * * * * * * * * * * *
EXHIBITS AND POSTER PRESENTATIONS

The 6th Annual Meeting of the Society of Magnetic Resonance in Medicine, New York, NY, 1987

- "1.5 T multislice interleaved gradient echo MRI of the knee." Poster session. (Co-exhibitors: DL Burk, M Scheibler, M Dalinka, L Axel, R Lenkinski, H Kressel)

- "Optimization of hydrogen and sodium high field MRI." Poster session. (Co-exhibitors: S Vinitski, B Griffey, R Griffey, MD Rifkin, DM Mitchell, R Prost)

The 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL, 1987


- "High resolution 1.5 T MR imaging of acoustic neuromas and cerebellopontine angle tumors." Poster session. (Co-exhibitors: E Kanal, H Curtin, JA Brunberg, DL Burk, RE Latchaw, GL Wolf)

- "High resolution digital mammography utilizing charged-coupled device planar array." (Co-exhibitors: G Shaber, RE Wallace, C Lockard)

36th Annual Meeting of the Association of University Radiologists, New Orleans, LA, 1988

- "Color Doppler imaging of iatrogenic femoral arterial injuries." (Co-exhibitors: V Igidbashian, DG Mitchell, L Needleman, AB Kurtz, BB Goldberg)


- "Spine abnormalities in sickle cell anemia: Correlation with number of alpha genes". (Co-exhibitors: FF Guglielmo, RM Steiner, VM Rao, S Ballas)

- "Combination digital processing for optimal chest images." (Co-exhibitors: Y Wang, ME Harned, GS Shaber, A D'Adamo, GW Gross, RM Steiner)

- "Computerized monitoring and analyzing radiology report turnaround time." (Co-Exhibitors: Y Wang, CD Lockard, GS Shaber, GH McArdle, RM Steiner, DC Levin)

- "Thoracic CT in the preoperative staging of breast carcinoma." (Co-exhibitors: DE March, RJ Wechsler, AL Rosenberg)

- "Extension of cancer along the nerve roots." (Co-exhibitors: H Doan, C Gonzalez, T Bergeron)

- "MRI visualization of thrombus in cerebral arteries." (Co-exhibitors: H Doan, A Flanders)
American Academy of Neurology Meeting,  
Cincinnati, OH, 1988


Annual Meeting of the American Thoracic Society,  
Las Vegas, Nevada, 1988

- "Treatment of severe hemoptysis associated with pulmonary aspergilloma by percutaneous intracavitary instillation of Amphotericin-B and N-acetylcysteine." (Exhibitor: MJ Shapiro)

88th Annual Meeting of the American Roentgen Ray Society,  
San Francisco, CA, 1988

- "Enhanced sonographic diagnosis of deep vein thrombosis using color Doppler imaging." (Co-exhibitors: SD Herman, DG Mitchell, L Needleman, AB Kurtz, BB Goldberg)  
Award: Certificate of Merit

- "Chest radiographic appearances in neonates on ECMO (extracorporeal membrane oxygenation)." (Exhibitor: GW Gross,) Award: Certificate of Merit

Annual Meeting of the Pennsylvania Radiological Society,  
Gettysburg, PA, 1988

- "Color Doppler imaging of iatrogenic femoral arterial injuries." (Co-exhibitors: V Igidbashian, DG Mitchell, L Needleman, AB Kurtz, BB Goldberg)

American Urological Association Meeting,  
Boston, MA, 1988

- "Ultrasound localization for shockwave fragmentation of renal calculi." (Co-exhibitors: DH Bagley, W Dahnert, BB Goldberg)

Audiovisual Cassette

- Sponsored by Albert Einstein College of Medicine/Montefiore Medical Center, Birmingham AL, May 1988 "Screen-film mammography" (10 Minute audio-visual cassette by Stephen A. Feig, M.D.) Practical reviews in Radiology, Vol. 14, No. 1A and 1B Educational Reviews, Inc.
HONORS, EDITORIAL ACTIVITIES, SERVICE FOR NATIONAL OR REGIONAL ORGANIZATIONS

JOSEPH BONN, M.D.
- Program Committee, Philadelphia Angiography and Interventional Radiology Society
- Reviewer, RADIOLOGY, INVESTIGATIVE RADIOLOGY

JOHN M. BOONE, Ph.D.
- Member AAPM Task Force In Image Intensifiers - TV Systems
- Reviewer, MEDICAL PHYSICS

ROBERT L. BRENT, M.D., PH.D.
- Committee Member to the Teratogen User Group of the National Library of Medicine (by appointment)
- Third Annual Dr. Danis Lecturer, Cardinal Glennon Children's Hospital, St. Louis, Missouri
- Honorary Doctor of Science Degree from the University of Rochester, Rochester, New York

PETER N. BURNS, PH.D.
- International Perinatal Doppler Society, elected to Board of Directors
- Radiology Advisory Panel, Advanced Technology Laboratories, Inc.
- Reviewer, AMERICAN JOURNAL OF PHYSIOLOGY
- Reviewer, GASTEROENTEROLOGY
- Reviewer, IEEE TRANSACTIONS ON SONICS AND ULTRASONICS
- Reviewer, INVESTIGATIVE RADIOLOGY
- Reviewer, JOURNAL OF CLINICAL ULTRASOUND
- Reviewer, JOURNAL OF ULTRASOUND IN MEDICINE
• Reviewer, MEDICAL INSTRUMENTATION

• Reviewer, RADIOLOGY

• Reviewer, ULTRASOUND IN MEDICINE AND BIOLOGY

STEPHEN A. FEIG, M.D.

Serving on the following committees under the Commission of Diagnostic Radiology of the American College of Radiology:
• Committee on Breast Imaging
• Committee on Professional Self-Evaluation and Continuing Education, Chairman of the Section on Breast Diseases
• Committee on ACR Symposia
• Committee on Systematized Refresher Courses (Co-Chairman) Faculty on Breast Disease
• Breast Task Force

• Expert Witness, Mammography Section, Task Force for Standard Setting in Radiology

• American Roentgen Ray Society: Program Chairman, American Roentgen Ray Society Categorical Course on Breast Imaging, 88th Annual Meeting, San Francisco, CA

• Member, Executive Committee, Society of Breast Imaging

• Editorial Board, THE INTERNATIONAL JOURNAL OF BREAST DISEASE

• Reviewer, AMERICAN JOURNAL OF ROENTGENOLOGY

• Reviewer, INVESTIGATIVE RADIOLOGY

• Reviewer, JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

• Reviewer, RADIOGRAPHICS

• Reviewer, CANCER

BENJAMIN M. GALKIN, M.S.

• Member, Publishing Policy Committee, American Institute of Physics

GEOFFREY A. GARDINER, JR., M.D.

• Consulting Editor, JOURNAL OF CARDIOVASCULAR and INTERVENTIONAL RADIOLOGY

• Reviewer, RADIOLOGY, (Cardiac, Interventional and Vascular sections)
BARRY B. GOLDBERG, M.D.

- 42nd Annual Carman Lecturer, Greater St. Louis Society of Radiologists and the St. Louis Metropolitan Society

- Dr. Hector M. Valles Memorial Lecturer, Puerto Rico Chapter of the American College of Radiology

- President, Solomon Solis-Cohen Society

- Treasurer, World Federation for Ultrasound in Medicine and Biology

- Treasurer, International Congress on the Ultrasonic Examination of the Breast

- Chairman, Archives Committee, American Institute of Ultrasound in Medicine

- Chairman, Archives Committee, World Federation for Ultrasound in Medicine and Biology

- Co-Chairman, Audit Committee, World Federation for Ultrasound in Medicine and Biology

- Member, International Commission on Radiological Education, Radiological Society of North America

- Member, Advisory Editorial Board and International Liaison Committee, Ultrasound in Medicine and Biology

- Member, Administrative Council, World Federation for Ultrasound in Medicine and Biology

- Member, Committee on Accreditation, American College of Radiology

- Member, Commission on Ultrasound, American College of Radiology

- Member, Committee on Quality Assurance, American College of Radiology

- Member, Channel 10 Medical Advisory Board, WCAU-TV, CBS Television Stations, Philadelphia, PA

- Member, Committee on Radiology Education in the Third World, Radiological Society of North America

- Member, Awards Committee, American Institute of Ultrasound in Medicine

- Member, Executive Committee, International Association for Endosonography

- Coordinator of Ultrasonography for Topics in Radiology, JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

- Associate Editor of SURGICAL ENDOSCOPY, ULTRASOUND, AND INTERVENTIONAL TECHNIQUES

- Editorial Advisory Board, CLINICS IN DIAGNOSTIC ULTRASOUND

- Editorial Advisory Board, ULTRASOUND IN MEDICINE AND BIOLOGY
CARLOS F. GONZALES, M.D.

- Member, American Society of Neuroradiology, Committee on CT and MRI Contrast Media

ROBERT O. CORSON, MS.

- Member of the Board of Chancellors of the American College of Medical Physics
- Treasurer, American Board of Medical Physics
- Chairman of the Awards Committee of the American College of Medical Physics
- Chairman of the History Committee of the American Association of Physicists in Medicine
- Member of the Committee on Governmental Relations, American College of Radiology
- Member of the Committee on Radiologic Units, Standards and Protection, American College of Radiology
- Representative for the RSNA, American Radium Society and American Academy of Dermatology to the National Council On Radiation Protection
- Member of the National Council on Radiation Protection, Scientific Committee No. 16 on Dental X-Ray protection
- Member of the National Council on Radiation Protection, Scientific Committee No. 9 on X-Ray and Gamma Beam Structural Shielding
- Member of the American College of Radiology Commission on Radiologic Units, Standards and Protection, Committee on Disaster Planning
- Representative of the American College of Radiology to the ANSI Medical Devices Technical Advisory Board
- Member of the Committee on Standards and Protection, Pennsylvania Radiological Society
- Member of National Council on Radiation Protection, Scientific Committee No. 44 on Medical Radiation Exposure
- Reviewer, for RADIOLoGY, MEDICAL PHYSICS and HEALTH PHYSICS
GEORGE W. GROSS, M.D.

- A. Edward O'Hara, M.D. Award for Excellence in Teaching

DAVID KARASICK, M.D.

- Skeletal Examiner - (Oral Boards) American Board of Radiology
- Chairman, Orthopedic-Radiology-Pathology Conference (citywide) 1987-1988
- Participant on WCAU Radio: Dr. Marty Weisberg Show 1-3 p.m.
- Book Reviewer, AMERICAN JOURNAL OF ROENTGENOLOGY
- Consulting Editor, SKELETAL RADIOLOGY
- Reviewer, AMERICAN JOURNAL OF ROENTGENOLOGY, RADIOLOGY, RADIOGRAPHICS

STEPHEN KARASICK, M.D.

- Examiner, (Oral Boards), Genito-Urinary Section, American Board of Radiology
- GU Exam Committee, (Written Boards), American Board of Radiology

ALFRED B. KURTZ, M.D.

- Member, Committee on Biologic Effects of the Commission on Ultrasound, American College of Radiology
- Member, Committee on Education and Training of the Commission on Ultrasound, American College of Radiology
- Examiner, Oral Boards, Ultrasound Category, The American Board of Radiology
- Member, Education Committee of the American Institute of Ultrasound in Medicine
- Secretary, Society of Radiologists in Ultrasound
- Member, Blue Ribbon Ad Hoc Committee on Physician Certification in Ultrasound, American Institute of Ultrasound in Medicine
- Chairman, Constitution Committee, American Institute of Ultrasound in Medicine
- Member, Scientific Exhibits Committee, Radiological Society of North America
- Member, Committee on Ultrasonography, Pennsylvania Radiological Society
- Chairman, Program Committee, Greater Delaware Valley Ultrasound Society
David C. Levin, M.D.

- Executive Committee, Association of University Radiologists
- Director-at-Large, North American Society for Cardiac Radiology
- Program Committee, Radiological Society of North America
- Scientific Advisor, RSNA Research and Education Fund, Radiological Society of North America
- Cardiac Radiology Task Force, American College of Radiology
- Vice-Chairman of the Council on Cardiovascular Radiology, American Heart Association
- Board of Trustees, Society for Cardiac Angiography
- Scientific Program Committee, Association of University Radiologists
- Ethics Committee, Society of Cardiovascular and Interventional Radiology
- Training Programs Committee, Society of Cardiovascular and Interventional Radiology
- Associate Editor, RADIOLOGY
- Board of Editors, INVESTIGATIVE RADIOLOGY
- Associate Editor, CARDIOVASCULAR AND INTERVENTIONAL RADIOLOGY
- Reviewer, AMERICAN JOURNAL OF ROENTGENOLOGY, (Cardiac, Interventional and Vascular Radiology)
- Editorial Board, AMERICAN JOURNAL OF CARDIAC IMAGING
- Reviewer, NEW ENGLAND JOURNAL OF MEDICINE
ESMOND MAPP, M.D.

- Treasurer, Philadelphia Roentgen Ray Society
- Chairman, Membership Committee, Pennsylvania Radiological Society
- Alternate Counselor, American College of Radiology
- Consultant, Radiologic Devices Panel, Center for Devices and Radiologic Health Food and Drug Administration
- Member, American College of Radiology-Relative Value Scale Project Subpanel Executive Committee Inter-Society Commission
- Member, Committee on Manpower, American College of Radiology

MARK M. MISHKIN, M.D.

- Member, Board of Chancellors, American College of Radiology
- Chairman, Commission on Human Resources, American College of Radiology
- Chairman, Committee on Fellowship Credential, American College of Radiology
- Chairman, Neuroradiology Section Written Examination, American College of Radiology
- Treasurer and Member, Executive Committee, Eastern Radiological Society
- Chairman, Committee on Drugs and Contrast Media, American College of Radiology
- Board of Trustees, American Registry of Pathology
- Member, Board of Trustees, American College of Radiology Foundation
- Member, Committee on Radiologic Units Standards and Protection - American College of Radiology
- Member, Board of Trustees, American College of Radiology Institute
- Member, Committee on Continuing Education of Post Graduate Education, American College of Radiology
- Reviewer, CANCER
DONALD G. MITCHELL, M.D


• Reviewer of abstracts for Scientific Papers and Works in Progress, Society for Magnetic Resonance Imaging, 6th Annual Meeting

• 1987 Editor's Recognition Award with Distinction. For review of RADIOLOGY Manuscripts

• Reviewer, OBSTETRICS AND GYNECOLOGY

LAURENCE NEEDLEMAN, M.D

• Member, Small Parts Review Committee, 1988, World Federation for Ultrasound in Medicine and Biology Meeting

• Member, Board of Directors, Joint Review Committee on Education in Cardiovascular Technology (representative of the American College of Radiology)

• Member, Abdominal Doppler Review Committee, 1988, World Federation for Ultrasound in Medicine and Biology Meeting

• 1987 Editor's Recognition Award with Special Distinction from RADIOLOGY

• Occasional Reviewer, ANNALS OF INTERNAL MEDICINE

• Journal Reviewer, RADIOLOGY

REBECCA G. PENNELL, M.D

• Member, American College of Radiology

VIJAY M. RAO, M.D.

• Member, Graduate Course Committee, Blue Ribbon Society, A Chapter of the Philadelphia Roentgen Ray Society

MATTHEW D. RIEKIN, M.D.

• Radiological Society of North America- Member, Refresher (Categorical Course) Committee

• American Institute of Ultrasound in Medicine: Site Surveyor - The Joint Review Committee on Education in Diagnostic Medical Sonography

• Delaware Valley Magnetic Resonance Imaging Society - President
• Delaware Valley Magnetic Resonance Imaging Society - Executive Committee

• Editorial Board, JOURNAL OF ULTRASOUND IN MEDICINE

• Editorial Board, URORADIOLOGY

• Reviewer, RADIOLOGY

• Reviewer, AMERICAN JOURNAL OF ROENTGENOLOGY

• Reviewer, INVESTIGATIVE RADIOLOGY

• Reviewer, JOURNAL OF ULTRASOUND IN MEDICINE

• Reviewer, JOURNAL OF CLINICAL ULTRASOUND

GARY S. SHABER, M.D.


MARCELLE J. SHAPIRO, M.D.

• Programming Committee, Philadelphia Angiography-Interventional Radiology Society

• Reviewer, AMERICAN JOURNAL OF ROENTGENOLOGY (Cardiovascular-Interventional Radiology Section)

ROBERT M. STEINER, M.D.

• Program Chairman, North American Society of Cardiac Radiology

• Member, Program Committee, Scientific Exhibits Committee, and Committee on Diagnostic Radiology, Pennsylvania Radiological Society

• Member, Scientific Exhibits Committee, Radiological Society of North America,

• Member, Fellowship Training Committee, Society of Thoracic Radiology

• Editorial Board, AMERICAN JOURNAL OF CARDIAC IMAGING

• Editorial Board, HEART AND VESSEL
• Abstracter and Reviewer, RADIOLOGY
• Reviewer, AMERICAN JOURNAL OF ROENTGENOLOGY
• Editor, RADIOLOGY REPORTS
• Advisory Panel, CRITICAL REVIEWS IN DIAGNOSTIC IMAGING

**YEN WANG, M.D.**

• Chairman, Validation and Implementation Committee, ACR-NEMA Digital Imaging And Communication Standard
• Chairman, American College of Radiology, Digital Radiographic Committee
• Member, ACR-NEMA Digital Imaging And Communication Standards Committee
• Member, ACR-NEMA. RIS/IHS/PACS Committee
• Organizer, Society of Digital Imaging, Management, and Communication and of its 1st Scientific Meeting.
• Editor, CRITICAL REVIEWS IN DIAGNOSTIC IMAGING
• Editorial Reviewer, AMERICAN JOURNAL OF ROENTGENOLOGY

**RICHARD J. WECHSLER, M.D.**

• Program Committee of Philadelphia Roentgen Ray Society

* * * * * * * * * * * * * * * * *
ADDENDUM

Office of Radiation Safety

1987 Annual Report
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Personnel Monitoring Program (ALARA)</td>
<td>2-3</td>
</tr>
<tr>
<td>II. Radioisotope Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Receipt</td>
<td>3</td>
</tr>
<tr>
<td>Disposal</td>
<td>3</td>
</tr>
<tr>
<td>Inventory Control</td>
<td>3-4</td>
</tr>
<tr>
<td>III. Radioisotope Laboratory Survey Program</td>
<td>5</td>
</tr>
<tr>
<td>IV. Bioassays</td>
<td>5</td>
</tr>
<tr>
<td>Thyroid Uptakes and Urinalysis</td>
<td>5</td>
</tr>
<tr>
<td>V. Air Sampling</td>
<td>5</td>
</tr>
<tr>
<td>VI. Interactions with the Nuclear Regulatory Commission</td>
<td>5</td>
</tr>
<tr>
<td>Misadministrations</td>
<td>5</td>
</tr>
<tr>
<td>New NRC License (Cs-137 Animal Irradiator)</td>
<td>6</td>
</tr>
<tr>
<td>License Amendment</td>
<td>6</td>
</tr>
<tr>
<td>License Renewal</td>
<td>6</td>
</tr>
<tr>
<td>VII. X-ray Survey Program</td>
<td>6</td>
</tr>
<tr>
<td>VIII. Microwave and Electron Microscope Survey Program</td>
<td>6</td>
</tr>
<tr>
<td>IX. New Construction Consultation</td>
<td>6</td>
</tr>
<tr>
<td>X. Teaching</td>
<td>6-7</td>
</tr>
<tr>
<td>XI. Research</td>
<td>7</td>
</tr>
<tr>
<td>Grant</td>
<td>7</td>
</tr>
<tr>
<td>XII. Honors</td>
<td>7</td>
</tr>
<tr>
<td>XIII. Publications</td>
<td>7</td>
</tr>
<tr>
<td>XIV. New Institutional Radioisotope Licenses</td>
<td>8-9</td>
</tr>
</tbody>
</table>
I. SUMMARY OF PERSONNEL MONITORING PROGRAM FOR 1987

ALARA EVALUATION

1987 ANNUAL DOSE RANGES (in rems)  NUMBER OF PERSONS

<table>
<thead>
<tr>
<th>No measurable exposure</th>
<th>Body</th>
<th>Hand</th>
<th>Eye</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.010 - 0.100</td>
<td>807</td>
<td>31</td>
<td>1</td>
<td>7 collar</td>
</tr>
<tr>
<td>0.101 - 0.250</td>
<td>175</td>
<td>8</td>
<td>1</td>
<td>2 collar</td>
</tr>
<tr>
<td>0.251 - 0.500</td>
<td>30</td>
<td>11</td>
<td>1</td>
<td>4 collar</td>
</tr>
<tr>
<td>0.501 - 0.750</td>
<td>12</td>
<td>8</td>
<td>-</td>
<td>5 collar</td>
</tr>
<tr>
<td>0.751 - 1.000</td>
<td>1</td>
<td>5</td>
<td>-</td>
<td>1 collar</td>
</tr>
<tr>
<td>1.001 - 2.000</td>
<td>-</td>
<td>7</td>
<td>-</td>
<td>2 collar</td>
</tr>
<tr>
<td>2.450</td>
<td>1</td>
<td></td>
<td></td>
<td>1 collar</td>
</tr>
<tr>
<td>3.020</td>
<td>1</td>
<td></td>
<td></td>
<td>1 leg</td>
</tr>
<tr>
<td>4.080</td>
<td>1</td>
<td></td>
<td></td>
<td>1 collar</td>
</tr>
<tr>
<td>4.190</td>
<td>1</td>
<td></td>
<td></td>
<td>1 leg</td>
</tr>
<tr>
<td>4.440</td>
<td>1</td>
<td></td>
<td></td>
<td>1 collar</td>
</tr>
<tr>
<td>5.210</td>
<td>1</td>
<td></td>
<td></td>
<td>1 leg</td>
</tr>
<tr>
<td>6.220</td>
<td>1</td>
<td></td>
<td></td>
<td>1 collar</td>
</tr>
<tr>
<td>7.720</td>
<td>1</td>
<td></td>
<td></td>
<td>1 leg</td>
</tr>
<tr>
<td>11.350</td>
<td>1</td>
<td></td>
<td></td>
<td>1 leg</td>
</tr>
<tr>
<td>12.300</td>
<td>1</td>
<td></td>
<td></td>
<td>1 leg</td>
</tr>
</tbody>
</table>

TOTALS 1,505 178 13 28 collar 1 wrist 3 leg

Whole Body Monitoring

Nineteen-thousand, five hundred and forty-eight radiation dosimeters (film badges, ring badges etc.) were issued during calendar 1987 to monitor 1,505 persons who, by the nature of their duties, were occupationally exposed to x-radiation, gamma radiation, and/or energetic beta radiation. This represents a 60.9% increase over 1986 in the use of personnel monitors. Of the 1,505 persons who were monitored approximately 75% were from clinical departments and 25% were from basic science departments.

Thirty-two percent of those monitored for whole body exposure received no measurable exposure. Over 99.9 percent received less than 10% of the maximum permissible whole body dose (MPD). Only one person reached 15% of the MPD.
Hand Monitoring

Of the 1,505 persons monitored for whole body exposure 178 were also monitored for possible exposure to the hands. These people routinely handled milliCurie amounts of gamma emitting radionuclides, energetic beta emitters (P-32) or else routinely performed special x-ray studies. All received less than 9% of the MPD (for hands).

Eye-Head Monitoring

Thirteen physicians who routinely performed special x-ray studies were also monitored for possible exposure to the eyes. None exceeded 10% of the MPD.

II. RADIOISOTOPE STATISTICS FOR 1987

Receipt

The amount of radioactivity received during 1987 was 566.53 Curies compared with 568.73 Curies in 1986, a 1% decrease from 1986. Over 95% of the radioisotopes was for the clinical Nuclear Medicine and Radiation Therapy programs.

Disposal (Commercial)

During 1987 there was more use of in-house "decay-to-background" disposal of radioactivity resulting in less use of outside commercial services. Compared with 1986 commercial disposal was up by 41% in terms of radioactivity (582 mCi vs. 412 mCi), and down 29% in terms of volume (1050 gallons vs. 1463 gallons). The latter is important since commercial disposal fees are based on volume.

Inventory Control Report

Page 4 contains summary reports of the receipt, disposal and transfer of radioactive materials for calendar 1987.
Radioisotope Inventory Control Report

<table>
<thead>
<tr>
<th>Isotope</th>
<th>Receipt Amount (mCi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-3</td>
<td>609.87</td>
</tr>
<tr>
<td>C-14</td>
<td>108.69</td>
</tr>
<tr>
<td>P-32</td>
<td>331.18</td>
</tr>
<tr>
<td>S-35</td>
<td>119.02</td>
</tr>
<tr>
<td>Ca-45</td>
<td>2.00</td>
</tr>
<tr>
<td>Cr-51</td>
<td>70.15</td>
</tr>
<tr>
<td>Co-57</td>
<td>0.15</td>
</tr>
<tr>
<td>Fe-59</td>
<td>2.07</td>
</tr>
<tr>
<td>Ga-67</td>
<td>1,671.49</td>
</tr>
<tr>
<td>Mo-99</td>
<td>215,280.00</td>
</tr>
<tr>
<td>Tc-99m</td>
<td>312,248.30</td>
</tr>
<tr>
<td>In-111</td>
<td>110.65</td>
</tr>
<tr>
<td>I-125</td>
<td>3,021.88</td>
</tr>
<tr>
<td>I-131</td>
<td>2,706.29</td>
</tr>
<tr>
<td>Xe-133</td>
<td>15,446.74</td>
</tr>
<tr>
<td>Ir-192</td>
<td>11,969.30</td>
</tr>
<tr>
<td>Au-198</td>
<td>100.00</td>
</tr>
<tr>
<td>Tl-201</td>
<td>2,729.41</td>
</tr>
<tr>
<td>TOTAL</td>
<td>566,527.19</td>
</tr>
</tbody>
</table>

Disposal (in approximate milliCuries)

<table>
<thead>
<tr>
<th>Isotope</th>
<th>via sewer system</th>
<th>commercial source</th>
<th>released to atmosphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-3</td>
<td>205.709</td>
<td>331.419</td>
<td></td>
</tr>
<tr>
<td>C-14</td>
<td>37.005</td>
<td>61.904</td>
<td></td>
</tr>
<tr>
<td>P-32</td>
<td>72.658</td>
<td>28.190</td>
<td></td>
</tr>
<tr>
<td>S-35</td>
<td>37.450</td>
<td>50.310</td>
<td></td>
</tr>
<tr>
<td>Ca-45</td>
<td>0.035</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Cr-51</td>
<td>13.931</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Co-57</td>
<td>0.088</td>
<td>0.089</td>
<td></td>
</tr>
<tr>
<td>Fe-59</td>
<td>0.183</td>
<td>0.104</td>
<td></td>
</tr>
<tr>
<td>I-125</td>
<td>103.952</td>
<td>110.041</td>
<td>0.250</td>
</tr>
<tr>
<td>I-131</td>
<td>0.100</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Xe-133</td>
<td>--</td>
<td>--</td>
<td>1156.9*</td>
</tr>
<tr>
<td>TOTAL</td>
<td>471.111</td>
<td>582.057</td>
<td>1157.15</td>
</tr>
</tbody>
</table>

* Estimated loss to atmosphere during clinical use

Transfer (outside Jefferson)

<table>
<thead>
<tr>
<th>Isotope</th>
<th>Activity (in milliCuries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-3</td>
<td>0.080 (to other researchers)</td>
</tr>
<tr>
<td>S-35</td>
<td>0.015 (to other researchers)</td>
</tr>
<tr>
<td>I-125</td>
<td>0.200 (to other researchers)</td>
</tr>
<tr>
<td>Ir-192</td>
<td>6,964.800 (returned to vendor)</td>
</tr>
</tbody>
</table>
III. RADIOISOTOPE LABORATORY SURVEY PROGRAM

During 1987 personnel from the Radiation Safety Office conducted 575 inspections of Jefferson's radioisotope laboratories. This represents an increase of 3.3% over the previous year.

IV. BIOASSAYS

Thyroid Monitoring Program

During 1987, the Radiation Safety staff performed 49 thyroid counting procedures on 16 individuals who could have been exposed to radioiodine during the course of their work. The results from these procedures indicate that all of these individuals received little or no thyroid dose. All thyroid doses were well below maximum permissible limits of 15 rem/yr. Results of the monitoring program are summarized below:

<table>
<thead>
<tr>
<th>Range of Thyroid Dose Commitment</th>
<th>Number of Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01 rem or less</td>
<td>8</td>
</tr>
<tr>
<td>&gt;0.01 to 0.09 rem</td>
<td>5</td>
</tr>
<tr>
<td>&gt;0.09 to 0.17 rem</td>
<td>3</td>
</tr>
<tr>
<td>&gt;0.17 rem</td>
<td>0</td>
</tr>
</tbody>
</table>

Urinalysis for Tritium

In addition to the urinalyses performed under the supervision of individual licensees, the Office of Radiation Safety performed 1 urinalysis for tritium on 1 individual who handled bulk quantities of tritium (>10 mCi). The measured body burden of tritium was less than 1.0% of permissible limits. Total body dose commitment was estimated to be less than 1 mrem.

V. AIR SAMPLING

Air samples were collected during 26 iodine labelling experiments and 8 iodine therapy drinks, to quantitate the airborne release of radioactivity to controlled and uncontrolled areas. The results indicate that average yearly airborne concentrations were well below permissible limits.

VI. INTERACTION WITH THE U.S. NUCLEAR REGULATORY COMMISSION

Misadministrations of Radioactive Materials

Three diagnostic misadministrations occurred during 1987. All were reported to the NRC as required by regulations, and to the University Radiation Safety Committee. Corrective actions were taken in each instance.
New NRC License (Cs-137 Animal Irradiator) License #37-00148-07

An application for use of a 4-5 kilocurie Cs-137 animal irradiator was filed with the NRC in May 1987. The license was issued in September 1987. The unit is located in the Department of Radiation Therapy and Nuclear Medicine and is under the supervision of Dr. Mansfield.

Byproduct Material License Amendment

A request to amend our Radioactive Materials License was filed in March 1987. The amendment was issued in November 1987.

License Renewal

An application to renew the Universities Broad Byproduct Material License was filed in December 1987. The application is still pending.

VII. X-RAY SURVEY PROGRAM

The radiation safety survey program for x-ray equipment in the Medical College, College of Allied Health Sciences and Hospital continued on a regularly scheduled basis throughout the year. These surveys were conducted by or under the supervision of the Medical Physics Division or the Office of Radiation Safety.

VIII. MICROWAVE EQUIPMENT AND ELECTRON MICROSCOPES

The Office of Radiation Safety has an on-going program to check microwave units and electron microscopes.

IX. NEW CONSTRUCTION

Prof. Galkin in consultation with Mr. George McArdle of the Department of Radiology provided the radiation shielding specifications for several new x-ray rooms in the hospital. He also inspected the installation of the shielding during construction.

X. TEACHING

Radiation Safety Indoctrination Sessions

Mr. John Keklak conducted six (6) bi-monthly sessions for isotope users
to acquaint them with radiation safety practices and policies at Jefferson.

Nine new isotope data and license condition forms were prepared by the Radiation Safety Staff.

Resident and Staff Training

Prof. Benjamin Galkin conducted a 20 hour physics review course for radiology residents preparing to take the American Board of Radiology examination. He also presented 12 hours of radiation safety lectures to first and second year radiology residents.

Numerous other one-on-one and small group sessions were held with the staff from nursing services, cardiac catheterization, radiation therapy, radiology, nuclear medicine, etc.

XI. RESEARCH

Prof. Galkin was the P.I. on a one year NIH grant that expired 9/27/87. The co-investigator was Dr. Stephen Feig, Professor of Radiology. Amount: $34,374 direct and indirect cost. He is also P.I. on two additional grant applications submitted to NIH. The co-investigator is Dr. Feig.

XII. HONORS

Mr. John Keklak was recertified by the American Board of Health Physics through 1991.

XIII. Publications

Prof. Galkin was the principal author on 3 publications and co-author with Dr. Feig on 2 additional publications.
## XIV. INSTITUTIONAL RADIOISOTOPE LICENSES ISSUED DURING 1987

<table>
<thead>
<tr>
<th>Licensee &amp; Department</th>
<th>Isotope</th>
<th>Possession Limit</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>T. Bjornsson</td>
<td>H-3</td>
<td>100 mCi</td>
<td>Plasma protein binding of drugs, enzyme activity and cell proliferation assays, autoradiography.</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>C-14</td>
<td>50 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P-32</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-35</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I-125</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cs-137</td>
<td>Sealed Source</td>
<td></td>
</tr>
<tr>
<td>M. Chu</td>
<td>H-3</td>
<td>15 mCi</td>
<td>Biochemical experiments: radiolabelling of protein and nucleic acids.</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>C-14</td>
<td>5 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P-32</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-35</td>
<td>15 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I-125</td>
<td>5 mCi</td>
<td></td>
</tr>
<tr>
<td>E. Tan</td>
<td>H-3</td>
<td>40 mCi</td>
<td>H-3 proline will be used to label amino acids in collagenous proteins in cell culture. H-3 glucosamine and S-35 to be used carbohydrate residues in protoglycans and glycosaminoglycans.</td>
</tr>
<tr>
<td>Pathology</td>
<td>S-35</td>
<td>30 mCi</td>
<td></td>
</tr>
<tr>
<td>M. Denison</td>
<td>H-3</td>
<td>40 mCi</td>
<td>Radioactive materials will be used in basic research as metabolic precursors studying the replication of viruses in tissue culture or translation of viral RNA in vitro or in vivo (cell cultures).</td>
</tr>
<tr>
<td>Microbiology</td>
<td>C-14</td>
<td>1 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-35</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td>R. Knowlton</td>
<td>P-32</td>
<td>10 mCi</td>
<td>Labeling DNA or RNA probes for in vitro hybridization experiments. Labeling DNA for sequencing.</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>S-35</td>
<td>5 mCi</td>
<td></td>
</tr>
<tr>
<td>A. Epple</td>
<td>H-3</td>
<td>5 mCi</td>
<td>Radioenzymatically determine the blood and tissue titers of catecholamines (dopamine, norepinephrine, epinephrine, octopamine). In vitro use of radioisotopes only.</td>
</tr>
<tr>
<td>Anatomy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Stubbs</td>
<td>H-3</td>
<td>10 mCi</td>
<td>Metabolic studies in isolated cellular systems.</td>
</tr>
<tr>
<td>Pathology</td>
<td>C-14</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P-32</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Isotope</td>
<td>Activity (mCi)</td>
<td>Sample/Activity Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------</td>
<td>---------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>M. Shy Neurology</td>
<td>P-32</td>
<td>2 mCi</td>
<td>Prepare nick translated or primer extended probes for hybridization.</td>
</tr>
<tr>
<td>R. Korngold Microbiology</td>
<td>H-3</td>
<td>5 mCi</td>
<td>To determine cellular proliferation upon stimulation by incorporation of H-3 thymidine mixed lymphocyte reactions.</td>
</tr>
<tr>
<td></td>
<td>Cr-51</td>
<td>20 mCi</td>
<td>Label target cells for release cytotoxicity assays.</td>
</tr>
<tr>
<td>J. Hoek Pathology</td>
<td>H-3</td>
<td>10 mCi</td>
<td>In vitro experiments with biological samples prepared from rats, rabbits and mice.</td>
</tr>
<tr>
<td></td>
<td>C-14</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P-32</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-35</td>
<td>5 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ca-45</td>
<td>5 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rb-86</td>
<td>2 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I-125</td>
<td>5 mCi</td>
<td></td>
</tr>
<tr>
<td>J. Uitto Dermatology</td>
<td>H-3</td>
<td>25 mCi</td>
<td>Nick translation of DNA, DNA sequencing reactions, in vitro labeling of cell cultures, enzyme assays, protein labeling.</td>
</tr>
<tr>
<td></td>
<td>C-14</td>
<td>5 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P-32</td>
<td>10 mCi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-35</td>
<td>10 mCi</td>
<td></td>
</tr>
</tbody>
</table>

There were 93 licensees at the end of 1986.