



MEDICAL PHYSICS GRADUATE PROGRAM ALUMNI NEWSLETTER

July 2008

From the Program Director:

I am pleased to provide you with the third issue of the *Medical Physics Graduate Education Program Alumni Newsletter*. Keeping with the primary goals set forth in the first issue, in this issue we have provided updates on our entering class, current trainees, new and retiring faculty members, and recent graduates. New this year, however, we have special items related to the upcoming 50th anniversary meeting of the AAPM. As the Alumni Luncheon at the AAPM meeting this year will feature special speakers and a full agenda, we have incorporated the reports of the Radiation Physics and Imaging Physics department chairs in this newsletter. In addition, we are very pleased to provide a newsletter article from Dr. Peter Almond. In his article, Dr. Almond provides a brief history of physics at M.D. Anderson, and I wish to specifically thank him for this enlightening contribution.

As you review the newsletter, I think you will agree that the Program has had another successful year. This is due, of course, to the efforts of the faculty, support staff, and students. I would like to particularly thank George Starkschall, Deputy Program Director, and the members of the Program Steering Committee. In addition, the efforts of Georgeanne Moore and the support staff (Carla Stiggers, Elisa Mills, and Nikki Franklin) who contribute many hours to the Program are gratefully acknowledged.

I hope you enjoy this third issue of the newsletter, and please don't hesitate to let me or Georgeanne know if you have suggestions for future issues!

Ed Jackson

Admissions Update:

We are pleased to report the results of another successful recruitment cycle. Furthering the trend of increased enrollment, we admitted a total of 18

trainees for Fall Semester 2008. Of the PhD applicants offered admission, 77% accepted our offer; each of 8 SMS applicants offered admission accepted the offer. With an ever growing number of CAMPEP-accredited graduate programs (17 as of the writing of this newsletter), we are very pleased with this outcome. Such successful recruiting, of course, requires the help from everyone involved in the Program, including the faculty, current trainees, education program staff, and the GSBS. Also, we note that alumni certainly continue to contribute to our recruitment by their recommendations. We extend our thanks to everyone who participated!

Sincerely,
Ed Jackson

Recruitment Statistics for Admitted Trainees to the Medical Physics Program for the Last Ten Years:

Year	PhD Program	SMS Program
1999	3	4
2000	2	1
2001	5	3
2002	5	4
2003	4	2
2004	4	2
2005	4	4
2006	6	5
2007	6	4
2008	10	8

2008 Admitted Applicant Data for the Specialized Masters and PhD Programs:

Program	Verbal GRE	Quantitative GRE	Analytical GRE	GPA
SMS	561	740	4.6	3.4
PhD	562	759	4.6	3.5

Members of the Incoming Class for Fall 2008:

SMS in Medical Physics Program

Tony Blatnica* / Southwest TX State University

Joseph Dick / University of Florida
James Kerns / Point Loma Nazarene College
Kelly Kisling / GA Institute of Technology
Brad Lofton / University of Texas A&M
Kiley Pulliam* / Centenary College of LA
Derek Yaldo / Wayne State University
David Zamora / University of Texas - Austin

* Deferred admission until summer 2009

PhD Program in Medical Physics

Hua Ai / Peking University
Chad Bircher / University of Tennessee
Ryan Bosco / University of North Texas
Laura Broaded / Butler University
Jason Matney / Louisiana State University
Byung Pak / University of California – San Diego
Daniel Robertson / Brigham Young University
Sarah Scarboro / Georgia Institute of Technology
Yevgeny Vinogradskiy / UT GSBS – Houston
Henry Yu / Universtiy of Texas – Austin

Recent Graduates:

The following trainees completed their degree requirements in the 2007-08 academic year.

SMS in Medical Physics Program

- **Renee Dickinson** / Medical Physicist, University of Washington
- **Suzanna Lazar** / Medical Physicist, Ball Memorial Hospital
- **Alanna McDermott** / Alanna McDermott / Medical Physicist, Providence St. Joseph Medical Center
- **Paige Nitsch** / Medical Physicist, Dana Farber - Brigham & Womens Cancer Center

(MS)PhD Program in Medical Physics

MS

- **Whitney Bivens** / Medical Physicist, Harrington Cancer Center
- **Michael Bradley** / Applications Specialist, Varian Medical Systems
- **Richard Castillo** / Continuing on for his PhD

PhD

- **Melinda Chi** / Resident, UTMDACC, Radiation Physics
- **Jonas Fontenot** / Academic Medical Physicist, Mary Bird Perkins Cancer Center
- **Rebecca Weinberg** / Resident, Scott & White Cancer Center

Feedback from alumni is always welcomed by the Program! Please send all suggestions or comments to gmoore@mdanderson.org.

Honors and Awards During the 2007-08 Academic Year:

Annelise Giebeler (Mentor: Wayne Newhauser)

- ❖ Invited to present her paper, titled “Assessment of Implanted Helical Gold Markers for Patients Receiving Proton Radiotherapy for Cancer of the Prostate” at the ICRS-11/RPSD 2008 Topical Meeting (selected as one of the “best papers”).

Stephen Kry (Mentor: Mohammad Salehpour)

- ❖ Recipient of the 2008 Aaron Blanchard Award in Medical Physics

Michael (Mitch) Price (Mentor: Firas Mourtada)

- ❖ Finalist in the AAPM John R. Cameron Young Investigators Competition for 2008

Adam Riegel (Mentor: Tinsu Pan)

- ❖ Recipient of the 2008 Schissler Foundation Fellowship in Cancer Research (far right, below)



Brian Taylor (Mentor: R. Jason Stafford)

- ❖ Finalist in the AAPM John R. Cameron Young Investigators Competition for 2008

Robert J. Shalek Fundraiser 10th Biennial Fundraiser

Sixty-six M.S. and Ph.D. students have been supported by fellowships to date. We have raised \$14,650 from 35 individuals, \$12,000 from corporations for a total of \$26,650. The second round of letters for solicitation of donations for the

10th Biennial Fundraiser will be going out in September to all individuals and vendors for this very worthy cause. If anyone has any questions on how to make a donation, they may contact Georgeanne Moore at (713) 563-2548 or by sending an email to: gmoore@mdanderson.org.

New Program Faculty and Program Associates for 2007-08:

Clearly, the Program cannot succeed without the commitment of its faculty. We are happy to report that the following individuals have recently joined our Program.

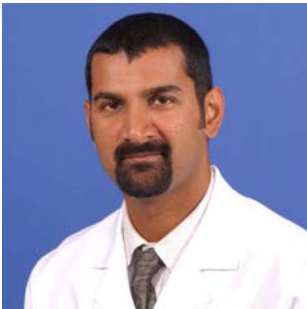
New Program Faculty

Rebecca Howell, PhD, Assistant Professor, Radiation Physics



Research Interests: Late effects after radiotherapy, neutron detection, and peripheral organ dose.

S. Cheenu Kappadath, PhD, Assistant Professor, Imaging Physics



Research Interests: Quantitative SPECT/CT; radiopharmaceutical dosimetry and therapy planning; optimization of clinical SPECT/CT protocols; Monte-Carlo simulation studies, iterative reconstruction and volumetric image analysis.

Stephen Kry, PhD, Instructor, Radiation Physics



Research Interests: Out-of-field dose, peripheral radiation, neutrons, late effects, secondary malignancies, risk models.

Program Associates

Oleg N. Vassiliev, PhD, Assistant Professor, Radiation Physics

Medical Physics Program Reaccreditation by CAMPEP:

We are pleased to report that the Program was reviewed by the CAMPEP Graduate Education Program Review Committee last fall and received a full 5-year reaccreditation award effective January 2008. The on-site review team made only very minor recommendations for improvement. This award of reaccreditation speaks to the commitment of those faculty and staff members who provide strong support of the program. It also speaks to the recognition of the quality of our current and past trainees.

I wish to sincerely thank all those who were involved in the reaccreditation process. In particular, I wish to thank George Starkschall, Deputy Director of the Program, and Georgeanne Moore and Carla Stiggers. The assembly of the vast amount of material required for the CAMPEP self-study is a major effort and could not have been accomplished without the dedication of these individuals. I also wish to thank all of the faculty members and trainees who took time from their schedules to meet with the site visit team.

Ed Jackson



**GSBS Medical Physics Program
Trainee Presentation Information
for the Upcoming AAPM Meeting
in Houston, TX**

Sunday, July 27, 2008

Joint Imaging-Therapy General Poster Discussion

3:00 – 4:30 PM, Exhibit Hall

Blake Cannon	Radiotherapy Response Assessment Using Deformed Serial ¹⁸ F-FDG PET/CT
Adam Riegel	Motion Assessment Using Phase- and Amplitude-Binned 4D-CT: Comparison with Cine CT
Adam Springer	Nanoshell-Mediated Laser Induced Thermal Therapy in an <i>In Vivo</i> Model
Brian Taylor	Image-guided Thermal Ablation in Bone Using Dynamic Chemical Shift Imaging

Sunday, July 27, 2008

General Poster Discussion – Imaging

3:00 – 4:30 PM, Exhibit Hall

Moiz Ahmad	Evaluation of cine-CT for quantifying respiratory displacement of lung tumors without a respiratory surrogate
Adam Riegel	Activity concentration degradation in PET of objects in motion

Sunday, July 27, 2008

Therapy General Poster Discussion

3:00 – 4:30 PM, Exhibit Hall

Scott Davidson	Verification of a Monte Carlo-Based Source Model for a Varian 10MV Photon Beam
Jonas Fontenot	Second Cancer Risks Following Proton Therapy and Intensity Modulated X-ray Therapy for Prostate Cancer
Adam Melancon	Improving Rectal Sparing with a Single Anterior Photon Beam: A Planning Study
Yevgeney Vinogradskiy	Deformable Lung Phantom for Verification of 4D Dose Calculations

Sunday, July 27, 2008

Young Investigators Symposium

4:00 – 6:00 PM, Auditorium C

Michael (Mitch) Price	The Imaging and Dosimetric Capabilities of a Novel CT/MR-Suitable, Anatomically Adaptive,
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	Shielded HDR/PDR Intracavitary Brachytherapy Applicator for the Treatment of Cervical Cancer
Brian Taylor	A Novel Approach to Multi-Parametric Dynamic Chemical Shifting Imaging

Tuesday, July 29, 2008

Therapy Scientific Session: Measurements

10:00 AM – 12:00 Noon, Auditorium B

Annelise Giebler	Dose Perturbations Caused by Implanted Helical Gold Markers Used in Patients Receiving Proton Radiation Therapy for Prostate Cancer
Malcolm Heard	Identification of a 3D Dosimeter Best-Suited for Use by the RPC

Tuesday, July 29, 2008

Imaging Poster Session: Imaging display, processing, and non-conventional Imaging

4:45 -5:30 PM, Exhibit Hall – Area 4

Malcolm Heard	Evaluation of the Performance of the Fast Scanning Platform of an OCT System
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Wednesday, July 30, 2008

Therapy Session: Therapy Planning and Delivery

10:00 AM – 12:00 Noon, Room M100F

Justin Mikell	Comparing Deformable Composite Planning with Conventional Composite Planning
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Thursday, July 31, 2008

Therapy Session: Therapy Planning and Delivery – New Techniques

10:00 AM – 12:00 Noon, Room 350

Ming Yang	Improving Accuracy of Electron Density Measurements in the Presence of Metallic Implants Using Orthovoltage CT
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Thursday, July 31, 2008

Joint Imaging/Therapy Session: Measurements-Calibration & QA

12:30 – 2:20 PM, Room 352

Jaclyn Homnick	Optically Stimulated Luminescence (OSL) Dosimeters Can Be Used for Remote Dosimetry Services
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Thursday, July 31, 2008 Therapy Scientific Session: Advanced Techniques and Risk Assessment

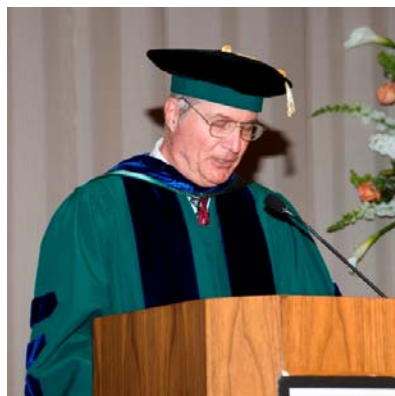
12:30 – 2:20 PM, Auditorium A

Maria Bellon	Risk of Secondary Fatal Malignancies from Cyberknife Radiosurgery
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Selected 2008 GSBS Graduation Highlights



Special Guest, former Associate Dean, Paul Darlington



Dr. Stancel welcomes families and graduates



Families and friends of 2008 graduating class enjoy opening remarks



UT-HSC President, Dr. James Wilkerson during his welcome address



GSBS Faculty Processional



2008 graduates awaiting start of the ceremony



Rebecca Weinberg receives her PhD Degree in Medical Physics



Melinda Chi receives her PhD Degree in Medical Physics

Our sincere thanks to our alumni, current students, faculty, and staff for another successful year for the Medical Physics Program!

Future Medical Physicists in Training



Amber Koch, daughter of PhD graduate Nicholas Koch and his wife, Joanna



Mason Parker, son of PhD graduate Brent Parker and his wife, Daina



Benjamin and Caroline, son & daughter of SMS graduate Michael Bieda and his wife, Jacqueline



Finn Fontenot, son of PhD graduate Jonas Fontenot and his wife, Shelley

OUR THANKS AND RECOGNITION OF THE 2008 CORPORATE SPONSORS FOR THE UTMDACC ALUMNI LUNCHEON

Best Medical International, Inc.
GAMMEX RMI, Inc.
NELCO

Radiation Dosimetry Services – UTMDACC
The University of Texas M.D. Anderson Cancer Center – President's Office

***** SPECIAL NEWSLETTER CONTRIBUTION *****

***The Physics Departments at
The University of Texas M. D. Anderson Cancer Center***

***Noted Contributions of MDACC Faculty to
The American Association of Physicists in Medicine***

By

Peter R. Almond, Ph.D.

Introduction

With the celebration of the fiftieth anniversary of the formation of the American Association of Physicists in Medicine (AAPM), it seemed appropriate to review the history of the physics departments at The University of Texas M. D. Anderson Cancer Center (MDACC), with special emphasis upon the contributions the departments have made to the AAPM.

From the formation of the AAPM through to the present, the involvement of personnel associated with physics at MDACC has been significant and noteworthy. In a short article it is not possible to cover every aspect of this subject, but the highlights will be discussed. In particular, the people who helped start the AAPM, charter members, presidents, and Coolidge Award winners will be highlighted. Association with MDACC will be taken to mean those that have served as faculty, staff, students, and post-doctoral fellows who spent a year or more in the department. Special mention will also be made of physicists who spent sabbaticals at MDACC. If any person or area has been omitted, it is certainly not intentional.

The Beginning, the Department of Physics: Dr. Leonard G. Grimmett 1949-1954

From the very beginning of the institution, when it was known as the M. D. Anderson Hospital for Cancer Research of the University of Texas (MDAH) and was housed in temporary quarters on the Baker estate close to downtown Houston, there were medical physics activities. Radium and x-ray equipment had been purchased even before the first patients were seen at the hospital in March 1944. But it was not until February 1948, with the appointment of Gilbert H. Fletcher, M.D. as chairman of the Department of Radiology, that a formal structure for physics existed. Dr. Fletcher oversaw the sections of radiology, radiotherapy, and physics, but he realized the need for qualified physicists. *"The success (of radiotherapy), both in actual treatment and in research, will depend upon our combined efforts,"* he said. Without the help of physicists, *"clinical radiotherapy is left with inadequate empirical methods."* Fletcher arranged for Leonard Grimmett, Ph.D., a medical physicist from England, whom he had met the previous year in London, to be hired. Grimmett arrived at MDAH in February 1949. A month later, he was appointed as chairman of the new Department of Physics. He recorded the event in a March 16, 1949 letter to his wife, who had remained in England for a few weeks. At the top of the letter he added a PPS:

"PPS. I am 'Physics Dept' now - got my own department! Hurray!"

This date can be taken as the beginning of the physics departments at MDACC. Not that it was a very impressive department. It was temporarily housed in a war surplus wooden hut that had been moved onto the grounds of the Baker estate and consisted of eight people total.

Of special interest here is that Grimmett was a founding member (1943) of the Hospital Physicists Association (HPA) in Great Britain that was influential in the formation of the AAPM fifteen years later. Had Grimmett lived, there is no doubt that he would have been among those agitating for such an association in the USA. Unfortunately he died suddenly of a heart attack on Sunday May 27, 1951. Although his work had barely

begun at MDAH, he laid the foundation of the department in all its aspects: patient treatment, research, education, and radiation safety. In 1976 Dr. R. Lee Clark said of him:

“Leonard Grimmatt was absolutely the man for the job. He was about forty-five years old. He died when he was forty-nine, but he had outlined the total physics department of Anderson Hospital as it is today. It was fantastic - the accumulated knowledge in that man’s mind and the way he could put it down.”

That statement is as true today as it was when first said, thirty-two years ago.

Dr. Grimmatt had close ties with the Rice Institute and a graduate student in the physics department at Rice would work part-time at MDAH as an Assistant in Physics. In 1950, Robert Shalek became that graduate student.

Upon Grimmatt’s death, Fletcher once again oversaw the running of the physics department. Dr. Tom Bonner, Chairman of Physics at the Rice Institute, was appointed as a consultant and the search for a new chairman began. To help fill the gap, Peter Wootton, a medical physicist at the Royal Infirmary, Glasgow, Scotland, joined the department in 1951 as an Instructor. Jack Morgan was hired as a research technician about this time, and Marilyn Stovall joined the department in 1953.

Dr. Warren K. Sinclair 1954-1960

In 1954, Dr. Warren Sinclair became the new chairman. He had spent two months at MDAH in 1953 while on an extended trip to the United States on behalf of the British Medical Research Council. Originally from New Zealand, he had obtained his Ph.D. from the University of London and joined the Royal Cancer (Marsden) Hospital in 1947 as a medical physicist. He recalled that:

“I had agonized over whether to stay at the Royal Cancer Hospital with Mayneord and concentrate on radiobiology... or to return to Houston... The U.S. was attractive to me and I was being offered a lead position in medical physics and a chance to put the new M.D. Anderson Hospital (and myself) on the medical physics map.”

By this time Peter Wootton had left the department for the Swedish Hospital in Seattle and Robert Shalek had just finished his Ph.D. at the Rice Institute. Sinclair met Shalek when he spent a year in England as a post-doctoral research fellow at the Royal Cancer Hospital under the direction of Sinclair’s boss, Dr. W. V. Mayneord. Sinclair hired him into a permanent position as an Assistant Physicist at MDAH. Sinclair also developed the nuclear medicine laboratory and hired Dr. William Dewey to run it. Dewey also combined efforts with Sinclair in order to get radiobiological studies underway.

The M. D. Anderson cobalt-60 unit (the first in the U.S.) and the Allis Chalmers 22-MV betatron were installed in the 1950s and resulted in the need for new calibration methods. This led to dose inter-comparisons between other institutions with similar equipment, one of the forerunners of the activities of the Radiological Physics Center (RPC).

Sinclair also worked to establish the graduate education programs within the department. He arranged for a viable Ph.D. program that allowed students to obtain University of Texas degrees. It was this initiative that would ultimately lead to today’s Graduate School of Biomedical Sciences (GSBS).

In 1959, Peter Almond came to the department as a Fellow in Medical Physics and a year later transferred to a Rice University Fellow in Physics position to work on his Ph.D. It was during this time that Sinclair was intimately involved with starting the American Association of Physicists in Medicine (AAPM). This came out of conversations that he had with Drs. Gail Adams and John Laughlin. A meeting was held in Chicago on November 17, 1958, prior to the annual meeting of the Radiological Society of North America (RSNA), with about 50 physicists present. The new association was clearly organized for primarily professional purposes. The need for such an organization had been growing for some time as the need for medical physicists increased. The Hospital Physicists Association (HPA) had been started in Great Britain in 1943, in part by Dr. Grimmatt, and by 1957 they were proposing the formation of an international organization related to medical physics

which would consist of national societies, not individuals. By 1958, these two forces, the need for professional recognition and the proposal of an international organization, had come together to create the conditions for the formation of the AAPM. It soon became apparent, however, that in order for the AAPM to have full credibility for its professional role and to remain relevant to the scientific interests of its members, it would have to have a strong scientific program and a publication outlet. At the urging of Warren Sinclair, the association made the move to a scientific organization in 1961.

Dr. Bob Shalek 1960-1984

By this time, Dr. Sinclair had left M. D. Anderson and Bob Shalek was appointed acting head in 1960, then as head of the department in 1961. He held this position until he retired in 1984. The importance of his tenure as chairman of the department and to the AAPM cannot be overstated. Not only did the programs in clinical physics, biophysics, and radiation biology continue to grow, but also activities in diagnostic imaging physics were initiated, education was placed on a firm foundation, and new cooperative activities were started.

New treatment modalities were investigated. Drs. Peter Almond and Ken Hogstrom established the physics of electron beam radiotherapy and combined x-ray computed tomography (CT) data directly into treatment planning through pencil beam calculations. Neutron radiotherapy was also thoroughly investigated, first through a cooperative effort with Dr. Jim Smathers at the Texas A&M variable energy cyclotron and subsequently with the installation of a cyclotron at MDAH. The basis for high-energy calibrations for all modalities was developed with ionization chambers, calorimeters, and chemical dosimetry and significant input was given to the calibration protocols of the AAPM.

Marilyn Stovall and Bob Shalek, with various collaborators, initiated 3D computer calculations for dose distributions around interstitial and intracavitary brachytherapy implants. The department has been involved with developing dosimetry computer programs ever since.

With the increase in the number of inter-institutional clinical trials in radiotherapy the reliability of the radiation dosimetry systems became important. In 1969 the Radiological Physics Center (RPC) was established with funding from the National Cancer Institute (NCI) and with oversight by the AAPM through its Radiation Therapy Committee (RTC). The RPC continues today as one of the most important activities of the AAPM and the Department of Radiation Physics each year hosts a visit from the AAPM's RTC for the RPC's annual review. In addition to the RPC, an Accredited Dosimetry Calibration Laboratories (ADCL) was also established in the department where it continues today. Bob Shalek became the first director of the RPC, ably assisted in the early days by Walter Grant. When Shalek retired, Dr. Will Hanson became Director.

With the establishment of The University of Texas Graduate School of Biomedical Sciences (GSBS) in Houston in 1963, graduate education in the department was put on a more formal basis. Physics programs included a special Masters in medical physics and a Ph.D. degree in biomedical sciences. An active program for post-doctoral training was established and several senior medical physicists chose to spend time in the department as part of their sabbatical leaves. Numerous short courses were also taught over the years to thousands of practicing medical physicists from around the country.

It was during this time that many of the future leaders in the AAPM received training at MDAH. There were numerous mechanisms for such training, including graduate students in the special MS medical physics program and PhD students, post docs, part-time employees who were working on their degrees, and special fellows. The list is too long to include here and the names of those associated with M.D. Anderson who have received special recognition by the AAPM can be found in the attached tables.

With the establishment of the UT GSBS medical physics program, the need for the Rice University Fellow in Physics no longer existed and the program was terminated in the mid 1960's. Arthur Boyer was the last Rice Fellow. However, the close cooperation between the two physics departments continues. Over the years, three presidents of the AAPM (Shalek, Almond, and Hogstrom) and four Coolidge Award winners (Shalek, Almond, Hogstrom, and Boyer) from M. D. Anderson had close ties with Rice University.

The department has always welcomed distinguished medical physicist who wished to spend their sabbatical or part of their sabbatical leaves in the department. The first such person was Dr. C. J. Karzmark in the 1960's (president of the AAPM in 1973). He was followed by others who went on to make substantial contributions to the AAPM including Arnold Feldman in 1973 (AAPM secretary 1979 and the first awardee for Achievement in Medical Physics in 1996), Don Herbert (AAPM Fellow) and Herb Attix (1994 Coolidge Award winner).

In 1967, a section of Diagnostic Physics was established in the Department of Diagnostic Radiology with the physicists in the section having joint appointments in the Physics Department. Dr. Al Zermeno was the first physicist in the section and was active in improving film images, in thermography, mammography, and digital radiology. James Hevezi and José BenComo became members of the section, which was later headed by Arthur Haus.

It was during this time period that the AAPM underwent substantial changes. When the AAPM membership was in the hundreds, the association was mainly run from the office of the President. This was the case for the presidencies of Sinclair, Shalek and Almond. During these terms the Physics Department office at MDAH handled much of the AAPM business. However, by 1976 the association had grown too large for this system to work efficiently and a professional management firm and executive director were hired to take over most of the association's business.

In 1969, the AAPM initiated its Summer School program. Peter Almond organized the first AAPM Summer School on dosimetry in Burlington, Vermont. This turned out to be such a success that the AAPM has held summer schools every year since. The Burlington dosimetry summer school was repeated in 1976, again directed by Peter Almond. Since then AAPM members associated with the physics departments have directed numerous summer schools for the association as shown in the attached table. The list of those lecturing in the summer schools since is too long to be included, but is quite extensive.

During this time period, the AAPM moved from having its annual meeting in association with the annual RSNA meeting in November to an independent summer meeting. The first one was held in Washington D.C. in July 1970. The second annual meeting was held in Houston during July 1971. Dr. Stewart Bushong from our neighbor institution, Baylor College of Medicine, was the local arrangements chairman. But the Department of Physics was very much involved since it was at this meeting where Peter Almond handed over the presidency to Dr. Fearghus O'Foghludha.

The Department of Radiation Physics, Dr. Kenneth R. Hogstrom 1985-2002

After the retirement of Bob Shalek, Dr. Peter Corry was appointed acting chairman of the department, but the institution was undergoing a major reorganization. Clinical divisions were established, with each division composed of several related departments. The departments maintained their identity and chairperson, but now reported to a division head. Most basic science departments remained as individual departments outside of the divisional structure and under the Vice-President for Research at the institution. This presented a dilemma for the physics department, which at the time was considered a basic science department, but did considerable clinical work. One proposal was that the various sections in the department go into the divisions where their clinical work was involved and appreciated but this would mean breaking up the department. The other proposal was that the department remain undivided and become more firmly under the direction of the Vice-President for Research where the department's clinical responsibilities would be less understood and funding would be more dependent upon the ability to get research grants. This was not an easy decision for anyone and strong and honest feelings were held on both sides of the issue. In the end, it was decided to dissolve the Department of Physics. It had existed for 35 years, but the institution was undergoing radical changes and physics at M. D. Anderson Hospital needed to change with it. From the old department, the sections of clinical physics, biophysics, and the physics shop combined to form the Department of Radiation Physics in the Division of Radiation Medicine (later Radiation Oncology). The Diagnostic Imaging Physics became a section in the Department of Diagnostic Radiology in the Division of Diagnostic Imaging, then under the leadership of Gerald D. Dodd, Jr., M.D. Radiation safety functions moved to the Safety Department where it was directly

responsible to the institution's administration. The radiation biology program components joined the Section of Experimental Radiotherapy to form the Department of Radiation Biology.

The Departments of Radiation Physics, Radiation Biology (presently Experimental Radiation Oncology), and Clinical Radiotherapy (presently Radiation Oncology) joined together to form the Division of Radiotherapy (presently Radiation Oncology) under the leadership of Lester J. Peters, M.D.

In 1986, Peter Corry left M. D. Anderson and the biophysics group was dissolved. About the same time, Ken Hogstrom was appointed permanent chairman of the Department of Radiation Physics and, with the strong backing of Dr. Peters, the department experienced a period of growth and success over the next 10 plus years in areas of patient services and treatment, clinically related research, and education.

Significant changes were taking place in radiation oncology, treatment-planning computers were becoming more sophisticated and CT based, 3D treatment planning was starting to emerge. Advances were being made in electron beam, photon beam, and brachytherapy. Accelerators were becoming more complex and computer controlled, and multi-leaf collimators and electronic portal imaging devices were being introduced. In order to respond to these changes the new department was organized into three sections: Clinical Dosimetry, Developmental Dosimetry, and Outreach Physics. John Horton was the inaugural chief of clinical dosimetry, and that section was credited with making considerable enhancements that included expanding treatment planning, implementing a block and mold room, improving patient immobilization, and growing quality assurance. Simultaneously, the implementation of an improved charge capture system significantly increased billing, which contributed greatly to the new department's image and its ability to secure funding for new medical physics, medical dosimetry, and other positions. The clinical section was also responsible for implementing commercial remote after-loaders into routine clinical use, including both low dose rate cesium for gynecological use and high dose rate iridium for intraluminal use.

Recruiting medical dosimetry staff to support this growth was difficult due to lack of training programs, so the department provided the leadership and teaching manpower to establish a Medical Dosimetry Training Program as part of the Allied Health Training Programs at M. D. Anderson. Chief of Dosimetry, Bob Gastorf, and other staff medical physicists and dosimetrists were responsible for its success.

In the late 1990s, the institution commenced establishing affiliate radiotherapy facilities both nationally and later internationally. For the first facility in Brazosport, for which the department was responsible for the physics and dosimetry, John Horton, Ken Hogstrom, and others wisely insisted on standards equal to those offered on campus. This paved the way, albeit with considerable effort from the Radiation Physics Department, in insuring that the quality of physics and dosimetry at these facilities was equivalent to that offered at M. D. Anderson Cancer Center.

Led by John Horton with his previous experience in neutron therapy, the clinical physics section provided ongoing support to the cyclotron facility. However, due to financial pressure to generate external income, the division embarked upon a commercial effort to produce radioactive isotopes. Despite considerable effort by the engineering section and radiation safety office, it never succeeded. In the early 1990s, Merritt Mallory was hired as cyclotron director, and culminating years of development effort, the cyclotron became a highly dependable machine for neutron therapy. However, the lack of strongly encouraging clinical data for neutron radiotherapy and the impending impact of managed care made the cyclotron vulnerable. Faced with making budget cuts of almost 20% and with reimbursement for PET scanning still lacking, the neutron therapy program was terminated. The cyclotron facility was closed and the equipment was transferred to the University of North Texas for use in its accelerator training programs.

Ken Hogstrom and deputy chief, Art Boyer (who joined the faculty in 1986), jointly supervised the developmental dosimetry section. The section played a major role in developing and implementing new accelerators and technology. Major new radiotherapy programs were (1) development and installation of an electron intraoperative electron accelerator with Siemens and its installation into a specially shielded OR, under the clinical leadership of Tyvin Rich, M.D.; (2) development of a 3D treatment planning system under the leadership of George Starkschall, Ph.D. first utilized for prostate irradiation by Alan Pollack, M.D.; (3) implementation of a stereotactic radiosurgery program which included the development of the world's first

clinical miniature multileaf collimator (patented and licensed to Radionics, Inc.) developed by Almon Shiu, Ph.D. and engineer Jim Ewton; and (4) implementation of intensity modulated radiation therapy using the Nomos system by Isaac Rosen, Ph.D..

The department faculty had many grants supporting research that led to these clinical developments as well as set the stage for others. Art Boyer and Ken Hogstrom continued to refine the fast Fourier and pencil-beam dose algorithms for photon and electron beam dose calculations, respectively. Art Boyer did considerable research in the use of multileaf collimators for conventional and intensity modulated beams. The radiation oncology staff was slow to pick up on the impact of IMRT, and Art Boyer left M. D. Anderson in 1995. Before his departure, Art was also studying the automated alignment of digital portal images with digitally reconstructed radiographs. This study provided the catalyst for the development of one of the first PACS specific for radiation therapy, the first phase providing a system for portal film verification (today referred to as image guided radiotherapy). Unfortunately this radiotherapy PACS, years ahead of its time, was not translated due to General Electric getting out of the radiotherapy business.

The section of outreach physics provided an effective structure for medical physics activities outside the M. D. Anderson clinic. Will Hanson served as section chief and as director of the RPC from 1986-2001, and after his retirement, Dr. Geoff Ibbott was recruited to the department in these roles. The section continued to operate and expand the role of its for-fee activities, which included Radiation Dosimetry Services supervised by Marilyn Stovall and its AAPM-accredited dosimetry calibration lab (ADCL). The outreach physics section had significant grant support through the RPC grant and numerous grants to study the late effects of radiation, for which Marilyn Stovall gained an international reputation.

In 1986, Ken Hogstrom became Program Director for the medical physics program in the Graduate School of Biomedical Sciences, which included both the M S in Medical Physics and the Ph.D. in Biomedical Sciences. With assistance from Will Hanson and academic faculty in the department, the M.S. program was enhanced, and in 1989 it received inaugural accreditation by the AAPM Committee on Accreditation, later replaced by the Commission on Accreditation of Medical Physics Educational Programs, Inc. (CAMPEP). As part of that effort, the Robert J. Shalek Graduate Medical Physics Fellowships were established to provide funding for first year M S students. Subsequently, a Ph.D. Program in Medical Physics was formed within the graduate school in 1996, and it became CAMPEP-accredited in 1998. During this time also the short courses continued to flourish. They were put on a more secure financial basis and many hundreds of medical physicists have participated in them.

It was also in this time that the department medical physics faculty played a major role in the establishment and implementation of licensure of medical physicists in Texas – the first such licensure program in the US.

With leadership from Ken Hogstrom, while he was AAPM president, the accelerator technologists played an active role in the establishment of their professional organization the, Radiotherapy Service Engineers' Association (RSEA).

In 1996 Dr. Lester Peters resigned from the institution and Dr. James Cox was selected as the new Division Head. In 2002, Dr. Hogstrom resigned as chairman of the Radiation Physics Department and retired from the institution in 2004 as Professor Emeritus.

Dr. Radhe Mohan 2002-present

After an extensive search, Dr. Radhe Mohan was appointed the current chairman of the Department of Radiation Physics in 2002. Dr. Michael Gillin joined the department in 2003 as chief of clinical services and, in 2007, Dr. Mary Martel became the deputy director of clinical services, the year she was also the president of AAPM. The department continues to provide safe, accurate, and high quality patient care for radiation oncology patients. Research is under the direction of Dr. Mohan, with major research projects being undertaken. The department's educational activities continue under the direction of Dr. George Starkschall.

With the expansion of the Division of Radiation Oncology, nine new linear accelerators, three new CT simulators, and a PET-CT for simulation and planning of treatments have been added in the last five years, with treatment facilities in both the Main Campus and the Mays Clinic.

The satellite facilities have increased from 2 to 5 in the last five years, each with its own compliment of simulation, planning, and delivery equipment and staffed by MDACC employees who must meet the required standards of the department.

Perhaps the major undertaking during this time has been the specification, design, and installation of the proton facility at the Proton Therapy Center (PTC). Dr. Al Smith rejoined the department in 2002 to lead this project. Dr. Ronald Zhu and Dr. Narayan Sahoo spearheaded clinical commissioning efforts. The first patient was treated in May 2006 and approximately 40 cranial spinal patients were treated in the first two years of operation. In May 2008, treatments commenced on the scanning beam facility of the PTC, thanks to significant contributions from Dr. Uwe Titt for Monte Carlo input of the 94 different beams, Dr. Martin Bues for developing simple models to compare measurements against, and a large number of another faculty and professional staff physicists.

Besides proton radiotherapy, research has centered on adaptive image-guided interventions in radiotherapy and radiation dose-response assessment, modeling and applications. Dosimetry research continues with investigations into scintillation dosimetry by Dr. Sam Beddar and radiation carcinogenesis by Dr. Marilyn Stovall. Research funding from NCI, industry, and other sources has increased over the last 5 years.

Dr. Ed Jackson of the Department of Diagnostic Imaging Physics directs the Medical Physics Program of the Graduate School of Biomedical Services with Dr. George Starkschall as deputy director. Since the inception of the GSBS in 1963, approximately 100 M.S. and 40 Ph.D. degrees have been awarded in the area of medical physics. In January 2008, the Medical Physics Graduate Education Program was reaccredited by CAMPEP for a full five years (until Dec 2012).

Post-doctoral fellows have always played a significant role in the life of the department and presently there are about twelve such fellows. In addition, there are several participants in the Radiation Physics Residency Program and the department has received funding for 5 residents by 2009.

The Department of Radiation Physics now has about 200 employees, including approximately 50 PhD faculty members and 15 MS professional staff members.

The Department of Imaging Physics 2002-2008, Dr. John Hazle

Imaging physics had been part of the institution for over fifty years, and a section of diagnostic imaging physics in the Department of Diagnostic Radiology was created in 1967. Although at that time it was a section of the Department Diagnostic Radiology, the physicists were also members of the Department of Physics. When the divisional structure within the institution took place in 1985, this arrangement was no longer viable and a section of diagnostic imaging physics was established within the Division of Diagnostic Imaging, then under the leadership of Dr. Gerald Dodd. By the mid-1990s the need to create a separate physics department in diagnostic imaging was evident and steps were initiated to do so. Dr. William A. Murphy, Jr., M.D., while Head of the Division of Diagnostic Imaging, began the official process of forming the Department of Imaging Physics. He appointed John Hazle as the section chief in 1993. Hazle immediately recruited Ed Jackson from the UT Medical School and Jeff Shepard from Baylor Medical Center in Dallas to staff the section.

The department was eventually established in 2002 in the Division of Diagnostic Imaging with Dr. Donald Podoloff serving as the interim Division Head. Following a national search, Dr. John Hazle was appointed chairman of the department. The mission of the department is to apply physics principles to medicine for the elimination of cancer by providing clinical medical imaging physics services, performing independent research in medical imaging sciences, participating in collaborative research using imaging technologies, and in actively educating the next generation of healthcare professionals in the medical imaging sciences.

The department rapidly expanded to include 15 clinical faculty members, six research faculty, five professional

staff, over 60 classified employees and 30 trainees. The department was eventually organized into three clinical sections: Magnetic Resonance and Ultrasound Physics led by Ed Jackson, Radiological Physics led by Dianna Cody and Medical Nuclear Physics led by Richard “Bud” Wendt. An Equipment Quality Assurance Group led by Jeff Shepard coordinates imaging physics activities to assure that radiological imaging instrumentation throughout the institution is operating in a safe and effective manner. The Radiological Engineering Group, led by Joe Forster, provides support for equipment installation, service and maintenance throughout M. D. Anderson. An Image Processing and Visualization Laboratory (IPVL) was developed to a broad range of clinical and research activities that require advanced image post-processing analysis, and/or rendering for visualization. Dr. Luc Bidaut was recruited to launch this facility.

In 1998, Dr. Chris Shaw was hired from the University of Pittsburg to establish the first research lab in the new department, the Digital Imaging Research Lab (DIRL). The focus of this lab was originally the characterization and application of novel digital imaging technologies. Eventually this evolved into research in tomosynthesis and most recently Dr. Shaw was awarded a grant to develop a dedicated breast CT scanner.

In 2000, John Hazle approached Vice President for Research, Dr. Margaret Kripke, about developing a laboratory for imaging small animals. This was actually a second attempt to develop such a lab after an unsuccessful attempt in the early 1990’s by Drs. Dodd, Sydney Wallace, and Hazle. Eventually, the lab was established as the Small Animal Cancer Imaging Research Facility (SACIRF, later renamed the Small Animal Imaging Facility or SAIF). In 2004, the facility was included in the Cancer Center Support Grant (CCSG, PI – John Mendelsohn) and has received continuous high scoring as an active component of the M. D. Anderson core research facilities. A second grant was obtained in 2007 by Drs. Hazle and Juri Gelovani (Experimental Diagnostic Imaging) to further expand small animal imaging research.

Department faculty perform independent research in digital x-ray imaging, magnetic resonance imaging (MRI), x-ray computed tomography (CT), nuclear medicine physics (imaging and therapy), imaging processing and visualization, and optical imaging. External research funding for fiscal year 2007 was nearly \$2.5M.

Dr. Ed Jackson serves as the Deputy Chair of the department and as Director of the Medical Physics Graduate Education Program. Dr. Hazle initiated a clinical imaging physics residency program in 2002 and served as Director of the program until 2007, when Dr. Charles Willis took over leadership. This program is still the only CAMPEP-accredited imaging physics residency program in the US. The department also sponsors several continuing imaging physics educational courses for professional medical physicists and a “mock board certification” preparation course. In addition, Imaging Physics faculty and staff members provide education support for the UT Medical School Radiology Residency Program, the MDACC Radiation Oncology Residency Program, and the MDACC School of Allied Health Sciences BSRT Program.

Summary

From its small beginnings in 1949 on the Baker estate in rebuilt wooden war-surplus army huts with a total staff of eight, the department of physics has grown in the intervening years into two separate departments with hundreds of faculty, staff, and students, spread over several campuses in Houston and beyond. Much of this growth can be attributed to the growth of the M.D. Anderson Cancer Center over the years, but part must also be attributed to the leadership of the departments as they responded to the increased demands upon the physicists’ time with wisdom and foresight. They made sure that the clinical services were always the best, that research was relevant and applicable, and that the educational programs were kept up-to-date to meet the needs not only of the institution and the state but also for the larger community of medical physicists. Nor can the close relationship between the departments and the AAPM be discounted. The involvement with the AAPM of individuals associated with the institution, their roles, and recognition by the AAPM is shown in the tables. Not only can the department claim to have been involved with the formation of the AAPM, but also consistently over the years members of the departments have been in positions of leadership and have been constantly recognized by the AAPM for the quality of their work.

This year, 2008, the annual meeting of the AAPM returns to Houston after thirty-seven years, to celebrate its Golden Anniversary. John Hazle is chairman of the local arrangements committee. In many ways, the growth

and success of the AAPM mirrors the growth and success of the departments of physics at MDACC and the two are intimately intertwined as the tables show.

Sixty years ago, Dr. Grimmiett laid the foundations for the department and fifty years ago Dr. Sinclair continued to build on what Grimmiett had started and with others initiated the formation of the AAPM and carefully steered it in the right direction. Neither could have foreseen what the department or the association would grow into. But Grimmiett would not be surprised, at heart he was a visionary and he wanted to do something significant at MDACC. He did! Warren Sinclair also wanted to do something of lasting value in the department and for the profession of medical physics; he wanted, he said, "...a chance to put the new M.D. Anderson Hospital...on the medical physics map." And he did!

Fifty years from now someone else will, hopefully, write a similar article. Will cancer be cured? Will the need for MDACC still exist? We cannot know. But physics will continue to impact upon the practice of medicine and I am confident that the association and the departments will still be closely associated and that the story of the next fifty years will far exceed the story of the last fifty.

Acknowledgements

- Input and suggestions from the current chairmen and previous chairmen are gratefully acknowledged.
- The pictures are from either, the institutional archives and manuscript collection held in the Historical Resource Center, Research Medical Library, University of Texas M.D. Anderson Cancer Center, or the Department of Radiation Physics archives and are used by permission.

AAPM Charter Members

William Dewey ¹	Arnold Feldman ²	Robert Golden ¹
Monroe Jahns ¹	Jack Morgan ¹	Robert Shalek ¹
Warren Sinclair ¹	Peter Wooton ¹	

¹ Staff

² Sabbatical

AAPM Officers

Presidents	Secretaries	Treasurers
Warren Sinclair ¹ , 1961	Arnold Feldman ² , 1979	Ann E. Wright ^{1,3} , 1974
Robert J. Shalek ¹ , 1966		Alex P. Turner ⁴ , 1984
Peter R Almond ¹ , 1971		James B. Smathers ⁵ , 1992
C. J. Karzmark ² , 1973		
Peter Wootton ¹ , 1978		
Robert G. Waggener ³ , 1980		
Ann E. Wright ^{1,3} , 1982		
James A. Purdy ⁴ , 1985		
Alfred R. Smith ^{1,4} , 1990		
Bhudatt R. Paliwall ³ , 1996		
Geoffrey S. Ibbott ¹ , 1999		
Kenneth R. Hogstrom ¹ , 2000		
Mary K. Martell ¹ , 2007		

¹ Staff

² Sabbatical

³ Graduate student

⁴ Postdoctoral fellow

⁵ Special mention

William D. Coolidge Award

Robert J. Shalek ¹	1973
Warren K. Sinclair ¹	1986
Peter R. Almond ¹	1990
F. Herb Attix ²	1994
Bhudatt R. Paliwal ³	2002
Kenneth R. Hogstrom ¹	2003
Arthur L. Boyer ¹	2007

¹ Staff

² Sabbatical

³ Graduate student

Award for Achievement in Medical Physics

Arnold Feldman ²	1996
William F. Hanson ¹	2000
Radhe Mohan ¹	2003
Marilyn Stovall ¹	2007

¹ Staff

² Sabbatical

Farrington Daniels Award

For the best article on radiation dosimetry published, the previous year, in Medical Physics

Kenneth R. Hogstrom ¹ , Alfred R. Smith ¹ , Peter R. Almond ¹ , Victor A. Otte ¹ , James B. Smathers ⁵	1976
Radhe Mohan ¹	1987
Radhe Mohan ¹	1989
Geoffrey S. Ibbott ¹	1997
Kristofer K. Kainz ⁴ , Kenneth R. Hogstrom ¹ , John A. Antolak ¹ , Peter R Almond ¹ , Charles Block ¹	2005
George Ciangaru ¹ , Jerimy C Polf ¹ , Martin Bues ¹ , Alfred R. Smith ¹	2006

AAPM Fellows

Peter R. Almond ¹	Mary K. Martel ¹
John Antolak ¹	Michael D. Mills ^{1,3}
Benjamin R. Archer ³	Radhe Mohan ¹
F. Herb Attix ²	George D. Oliver ⁴
Sam Beddar ¹	Bhudatt R. Paliwal ³
Arthur L. Boyer ¹	Jatinder R. Palta ⁴
James C. H. Chu ³	James A. Purdy ⁴
Dianna D. Cody ¹	Issac Rosen ¹
Carlos E. de Almeida ³	Timothy E. Schultheiss ¹
Arnold Feldman ²	Robert J. Shalek ¹
David S. Followill ^{1,3}	Subhash C. Sharma ⁴
Michael T. Gillin ¹	Chris C. Shaw ¹
William F. Hanson ¹	S. Jeff Shepard ¹
Arthur G. Haus ¹	Almon S. Shiu ^{1,3}
John D. Hazle ^{1,3}	Warren K. Sinclair ¹
James M. Hevezi ¹	James B. Smathers ⁵
Kenneth R. Hogstrom ¹	Alfred R. Smith ^{1,4}
John L. Horton ¹	George Starkschall ¹
Allen F. Hrejsa ⁴	Marilyn Stovall ¹
Geoffrey S. Ibbott ¹	Alexander Turner ⁴
Edward F. Jackson ^{1,3}	Robert G. Waggener ³
C. J. Karzmark ²	Peter Wootton ¹
Richard G. Lane ¹	Ann E. Wright ^{1,3}
Charles Lescrenier ¹	

¹ Staff

² Sabbatical

³ Graduate student

⁴ Postdoctoral fellow

⁵ Special mention

AAPM Summer School Directors

<i>Year, Subject</i>	<i>Director(s)</i>
1969, Dosimetry	Peter Almond ¹
1976, Dosimetry	Peter Almond ¹
1979, Medical Imaging	Arthur Haus ¹
1981, Hyperthermia	Gilbert Nussbaum ⁴
1982, Treatment Planning	Ann Wright ^{1,3} and Arthur Boyer ¹
1988, Hyperthermia	Bhudatt Paliwal ³ and others
1990, Radiation Oncology Physics	James Purdy ⁴
1998, Imaging in Radiation Therapy	Art Boyer ¹ and John Hazle ¹
2000, Radiation Oncology Physics for the 21 st . Century	Almon Shui ¹ and David Mellenberg ³
2008, PET/CT Imaging	Dianna Cody ¹ and Osama Mawlawi ¹

¹ Staff

² Sabbatical

³ Graduate student

⁴ Postdoctoral fellow

⁵ Special mention



1950 Refurbished war-surplus army huts on the Baker Estate.
First home of the Physics Department.



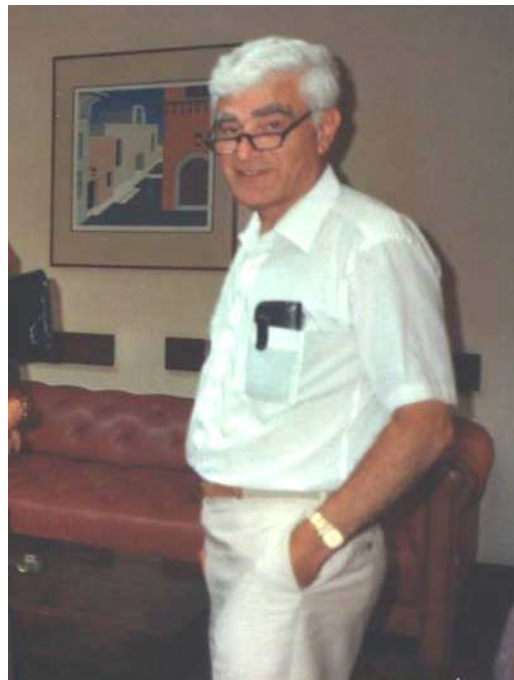
1950 Physics Department
Back Row: Jasper Richardson, Charles McLean, Bailey Moore, John Cecil Johnson, and Robert Watson.
Front Row: Trudy Kocian, Leonard Grimmert ,and Beverly Mutrux.



1960 Physics Department, Warren Sinclair's Farewell Party.

Front row: Gilbert Fletcher, Marilyn Stovall, Warren Sinclair, Joan Mathis (departmental secretary) and Robert Shalek.

William Dewey (AAPM charter member is behind Sinclair's right shoulder), Peter Almond center of back row, immediately behind Sinclair, almost blocked by Bailey Moore.



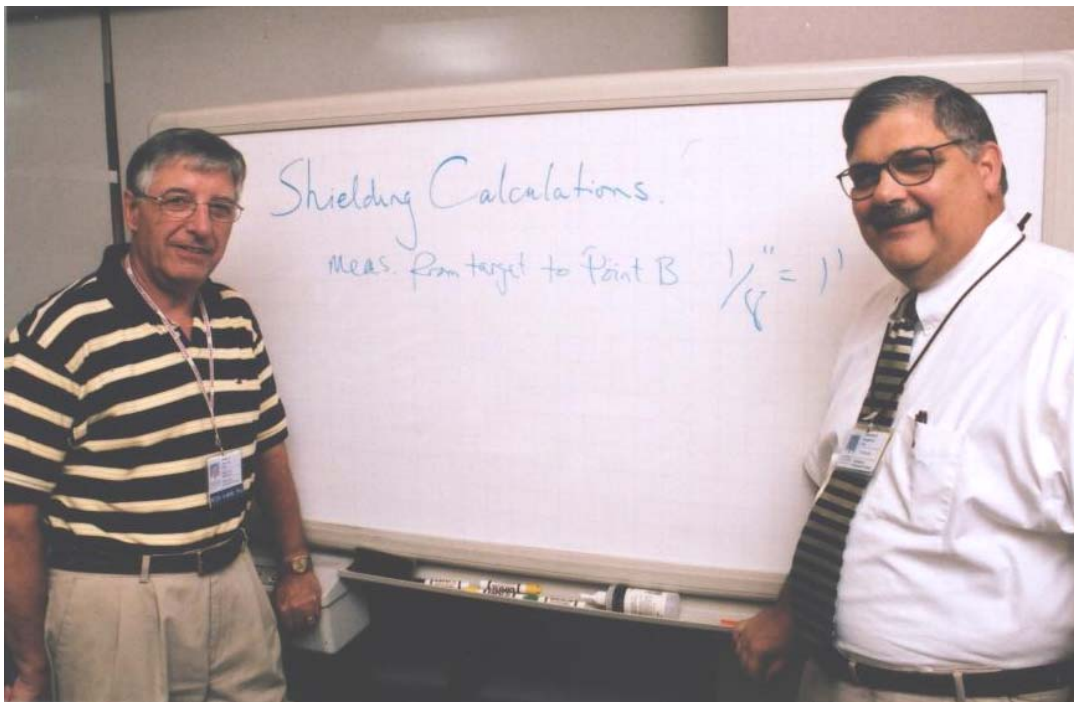
Arnold Feldman, First Visiting Scientist to the Radiological Physics Center in 1973, AAPM Secretary 1979-1982 and the first Award for Achievement in Medical Physics Winner in 1996.



1988 AAPM Annual Meeting, San Antonio, TX -- Jatinder Palta (AAPM Fellow), Bhudatt Paliwal (AAPM President 1996) and Robert Shalek (AAPM President 1966).



1989 AAPM Annual Meeting, Memphis, TN -- Ann Wright (AAPM President 1982) and Al Smith (AAPM President 1990).



Short Course Instructors 2002 - - Peter Almond (AAPM President 1971) and
Ken Hogstrom (AAPM President 2000)



Arthur Boyer -- 2007 Coolidge Award Winner



Radhe Mohan, PhD
Chairman, Department of Radiation Physics



John D. Hazle, Ph.D.
Chairman, Department of Imaging Physics

2008 Highlights from the Department of Imaging Physics

Faculty Recognitions and Promotions

Congratulations to Drs. Dianna Cody and Chris Shaw for being inducted as Fellows of the AAPM in 2008!

New Personnel

Faculty

Ping Hou, Ph.D., Assistant Professor,
Section of MR & Ultrasound Physics

Yiping Shao, Ph.D., Associate Professor,
Experimental Nuclear Imaging Lab

Faculty Promotions

Dianna D. Cody, Ph.D., promoted to Professor (tenured).

Konstantin Sokolov, Ph.D., promoted to Associate Professor with award of tenure.

Richard E. Wendt, Ph.D., promoted to Professor.

Classified Positions

Destry Dokes, M.B.A., Department Administrator

Tiffany Williams, Operations Manager

Andrew Elliott, Ph.D., Research Scientist

Anil Shetty, M.B., M.S., Research Engineer

Clinical Section Updates

Medical Nuclear Physics Section

- Acceptance tested, calibration and/or replacement of all detectors on 14 Siemens gamma cameras in preparation for ACR accreditation.
- Completed the transition to direct transmission of DXA bone mineral density quantitative results into BMD reports on the RIS from the scanner.
- Completed lung and blood dosimetric ^{131}I NaI therapy treatment planning for a pediatric thyroid cancer patient with diffuse lung mets.
- Developed and implemented internal Medical Physics competency training and testing for ^{90}Y microsphere liver-directed radiotherapy.
- Verified PACS vendor product, *Stentor*, as a lossless, permanent central archive for all clinical Nuclear Medicine scan data.
- Developed whole body bone SPECT/CT scanning.
- Developed procedures for generating fused transverse and coronal SPECT/CT slice stacks for transfer to *Stentor*.

- Acceptance tested a Siemens first clinically sited 16-slice SPECT/CT system
- Developed SPECT/CT based ^{153}Sm EDTMP tumor-uptake quantification for internal radionuclide therapy planning.
- Implemented a radiation exposure/environment monitoring program for all Nuclear Medicine clinics, including PET.
- Achieved ACR accreditation for the PET/CT clinic.
- Transition of PET/CT imaging from 2D to 3D with the following clinical implications:
 - Reduction of patient effective dose equivalent by an average of 7.77 mSv.
 - Reduction of operational cost of \$20-25/patient for a total savings of about \$350-400K/year.
- The collaboration with Radiation Oncology on 4D-CT has continued to be the standard of care for thoracic cancer patient in Radiation Oncology. The program has impacted over 2,000 patients since May 24, 2004. Dr. Tinsu Pan is the inventor of the 4D-CT technique used at MDACC.
- Dr. Pan also developed a technology for average CT in PET/CT imaging of the thorax, which has been implemented in radiation therapy treatment planning. Over 200 patients scanned with this technology to date. Additionally, average CT has been adopted by our Radiation Oncology as the CT data for dose calculation. This technology was featured in the General Electric booth at the Society of Nuclear Medicine meeting.
- Dr. Pan's average CT Application has also been applied to imaging the heart with PET/CT. This technology has helped improve the diagnostic quality of cardiac PET. It was estimated that 40% of the perfusion studies were potentially improved.
- The *Adios* program developed by Dr. Wendt was used to facilitate the treatment as outpatients of 69 radioiodine therapy patients in 2007, reducing the demand for hospital rooms.
- Completed Siemens *m.Cam* gamma camera performance characterization.
- Created code using IDL to segment rectangular FOV from re-binned square matrices and calculate percent uniformity for CFOV and UFOV of gamma cameras

MR & Ultrasound Physics Section

- Commissioned and provided physics and medical imaging technologist support for the new Siemens MR *Miyabi* system. This integrated technology includes a 1.5 T Siemens *Magnetom Espree* and Siemens *Axiom Artis* angiography system in the same Interventional MRI (iMRI) suite. Efforts

included site planning, system acceptance testing, imaging protocol development, technologist training, extensive MR safety training, and validation of MR-compatibility.

- Continued expansion of the level of support necessary for interventional MR applications in both interventional radiology (iMRI) and neurosurgery (BrainSUITE).
- Expanded support of rapidly evolving clinical MR imaging protocols as requested from a continuously increasing number of radiologists in neuro, body, musculoskeletal, breast, and thoracic radiology.
- Expanded support of specialized MR acquisition protocols in support of a rapidly growing interest in non-invasive MR imaging of biomarkers (functional MRI, dynamic contrast enhanced MRI, phase-sensitive MR, etc.) in support of state-of-the-art clinical applications and clinical research protocols.
- Developed an MR radiofrequency coil database for more efficient quality assurance and property control efforts in support of over 185 coils used on 15 MR scanners.
- Improved the efficiency of the in-house developed daily autoMRQC process
- Implementation of whole-body MR imaging protocols built upon rapid phase-sensitive MR techniques and diffusion imaging capabilities developed by Jingfei Ma and his research group.
- Provided all necessary physics support needed to obtain ACR Accreditation in General Ultrasound.
- Launched tracking of ultrasound QC reports using smart folders within QC Portal
- Acceptance tested 3 new US systems in Breast
- Acceptance tested 6 new US systems in Gen US

Radiological Physics Section

Computed tomography (CT)

- Commissioned 2 new 64-slice CT scanners.
- Updated and improved the daily QC process in CT.
- Added 8 Siemens CT scanners to daily QC process.
- Developed and implemented daily protocol edit monitoring program for all GE CT scanners in DI.

General Radiology -

- Upgraded DR to include tomosynthesis capability.
- Commissioned new DR unit in new Emergency Center; performed extensive adjustments to acquisition and display parameters in response to image quality concerns.
- Commissioned three replacement DR systems.
- Began evaluating DR technologies with wireless image transmission for a retained foreign object project.

Mammography -

- Upgraded CR in Alkek OR's to High Res (50 micron pixels) for Breast Specimen radiography.

- Commissioned 2 new full field digital mammography systems.
- Planning for two more full field digital mammography systems in FY08 as part of our transition to all-digital imaging
- Commissioned a stereotactic breast biopsy system.

PACS

- Began evaluating technology for replacement of CD-ROM burners and importers.
- Provided support to the Electronic Medical Record team for roll-out of a new *RadStation* and *ClinicStation* release including integrated QC reporting capabilities.

Image Processing & Visualization Lab and the Scientific Computing Resources Group

- Continued working with physicians and technologists to tune and set up imaging protocols and paradigms.
- Pursued the development and implementation of advanced imaging as an intrinsic part of the clinical workup to assist diagnosis and surgical or interventional procedure planning.
- Continued to improve QA/QC infrastructure for clinical modalities and supported patient care related usage of our servers and applications.

Research Updates

Center for Advanced Biomedical Imaging Research (CABIR)

The Center for Advanced Biomedical Imaging Research is a joint effort between M. D. Anderson, the UT Health Science Center at Houston and GE Healthcare Technologies. CABIR will be housed the 345,000 sq ft Advanced Imaging Research Building on South Campus. CABIR is part of the McCombs Institute for the Early Detection and Treatment of Cancer. The Department of Experimental Diagnostic Imaging is the anchor department, with the Department of Imaging Physics as a partner. Approximately 65,000 sq ft of shared space will be on the first floor, including a Translational Imaging Center with 3 T MR, PET/CT, new energy-discriminating volume CT and cyclotron, an experimental imaging facility. Approximately 20,000 sq ft of space on the second floor will be dedicated to instrumentation and application development labs. Construction is ahead of schedule, with Phase I occupation planned for June 2009.

Digital Imaging Research Lab (DIRL)

The DIRL, directed by Dr. Chris Shaw, moved to a 5,000 sq ft facility in the El Rio Building in June 2006. This allowed for the expansion of research to include the physics, instrumentation, and applications of cone beam CT techniques. A bench top scanner has been built and used to routinely image mastectomy breast specimen under an IRB protocol. The DIRL has received funding from the NCI to investigate the feasibility of dual-resolution cone beam breast CT. The results are currently being reviewed for extension into Phase II in which a prototype will be built and used to image patients. A paper related to this study was presented at the RSNA of 2007 and received the RSNA Trainees' Award. A subcontract has also been awarded from the NIST to evaluate a novel flat panel x-ray source for medical imaging use. The DIRL is also investigating cone beam CT applications to radiation therapy and interventional radiology. The research focus of the lab has also expanded to include techniques for scatter control, tomosynthesis, iterative reconstruction, Monte Carlo simulation, and 4D imaging. The group has expanded and will reach a total of 13 faculty, staff and trainees in the summer. The DIRL will move to the CABIR facility in 2010.

German Cancer Center Collaboration in Imaging Guided Surgery and Interventions.

Drs. Hazle and Stafford of Imaging Physics, with clinical colleagues Drs. Marshall Hicks and Kamran Ahrar from Interventional Radiology, were recently awarded a \$250,000 award to develop an international program in imaging guided interventions and surgery with colleagues from the Deutsches Krebsforschungszentrum (DKFZ) in Heidelberg. Drs. Wolfhard Semmler and Michael Bock lead the DKFZ team. This is an initiative developed by the institutional presidents to foster collaborative research between the two institutions. This proposal was one of two selected for funding from approximately 15 applications. Work in the initial phases is focused on sharing technologies developed by the MDACC group in imaging temperature and related tissues changes with device tracking technologies from the DKFZ team. The project will leverage the two unique Siemens 1.5 T Espree MR scanners in our *Myabi* Interventional Radiology suite and the *BrainSUITE* in Neurosurgery. Other collaborators include Dr. Luc

Bidaut from Imaging Physics and Dr. Jeffrey Weinberg from Neurosurgery.

Funded Grants:

- NIH/NCI – P50CA083639-08 (PI: Bast, Development grant: Bankson) : SPORE in Ovarian Cancer: Novel in-vivo imaging of tumor vascular structure and function in pre-clinical models of ovarian cancer, 7/01/08 – 6/30/09, \$50,000
- NIH/NCI – P30CA016672-33 (PI: Mendelsohn; Core director - Hazle), Cancer Center Support Grant: Small Animal Imaging Facility, 7/01/08 – 6/30/10, \$172,494
- NIH/NCI – R21CA135315-01 (PI: Sokolov): Aptamer-siRNA chimera/nanoparticle conjugates for MRI guided cancer therapy, 7/1/08 – 6/30/10, \$291,534
- NIH/NCI – R01EB008101-01 (PI: Sokolov): Acoustic imaging of sentinel node metastasis using plasmonic nanosensors, 9/01/07 – 5/31/11, \$27,169
- NIH/NCI – R21/33CA124585-01 (PI: Shaw): A dual-resolution cone beam CT system for 3-D breast imaging, 09/01/2007 – 08/31/2008, \$151,954
- NIST/ATP – 70NANB7H7030 (Subcontract PI: Shaw): Flat Panel X-Ray Sources, 2/12/08 – 10/31/09, \$136,775
- GE – SR2008-00023792EB (PI: Mawlawi): Motion Correction of PET Data using Amplitude Gating, 2/02/08 – 12/31/08, \$44,253
- MDA-IRG (PI: Shao): Multi-animal simultaneous PET-MR imaging , 7/01/08 – 6/30/09, \$50,000
- Covidien – LS2008-00023708LG (PI: Stafford): TVT colon tumor model, 7/01/08 – 6/30/09, \$71,732

The Department of Imaging Physics received \$1,768,316 of extramural funding for research in FY08.

2008 Highlights from the Department of Radiation Physics

Honors and Awards

- **Mary Martel, Ph.D.** – Chair, AAPM Board of Directors; ASTRO Fellow (2008); Received Society for Pediatric Radiology's 2008 Presidential Recognition Award; 2008
- **Yixiu Kang, Ph.D.** – 2007 ASTRO Plenary Presentation (top 6 abstracts out of 1,670 submissions), "Which lung volumes to use for radiotherapy planning of lung cancer: inspiration, expiration, averaged, or free-breathing?"
- **Naresh Tolani, M.S. DABR** and **Ramesh Tailor Ph.D.** - received the Medical Dosimetry Award 2006 - First Place - Poster Recognition Award 3D Treatment Planning System and Dose Verification for Pediatric Total Body Irradiation; received the Medical Dosimetry Award 2007 - Second Place - Poster Recognition Award - Use of MLC for Lung Blocking in Pediatric TBI Patients.
- **Sam Beddar, Ph.D.** – AAPM Fellow (2008).
- **Geoffrey Ibbott, Ph.D.** –ASTRO Fellow (2007)
- **Phillip Taddei, Ph.D., Dragan Mirkovic, Ph.D., Jonas Fontenot, M.S., Annelise Giebeler, B.S., Yuanshui Zheng, Ph.D., Uwe Titt, Ph.D., Shiao Woo, M.D., and Wayne Newhauser, Ph.D.** – Paper entitled, "Reducing stray radiation dose for a pediatric patient receiving proton craniospinal irradiation" selected as one of the best papers at the ICRS-11 / RPSD 2008 Topical Meeting. Dr. Taddei has been invited to present the paper at the American Nuclear Society winter meeting for the session, "Best of RPSD 2008."
- **Annelise Giebeler, B.S., Jonas Fontenot, M.S., Peter Balter, Ph.D., George Ciangaru, Ph.D., Ronald Zhu, Ph.D., Wayne Newhauser, Ph.D.** – Paper entitled, "Assessment of implanted helical gold markers for patients receiving proton radiotherapy for cancer of the prostate" has been selected as one of the best papers at the ICRS-11 / RPSD 2008 Topical Meeting. Ms. Giebeler has been invited to present the paper at the American Nuclear Society winter meeting for the session, "Best of RPSD 2008."
- **Stephen F. Kry, Ph.D., Rebecca M. Howell, Ph.D., Jerimy Polf, Ph.D., Radhe Mohan, Ph.D., Oleg N. Vassiliev, Ph.D.** – Paper entitled, "Vault shielding for a flattening-filter free clinac", presented at the 2008 ICRS-11/RPD and was selected as "one of the best papers at the conference." Dr. Kry has been invited to present during a special session of the American Nuclear Society winter meeting for the session, "Best of RPSD 2008."
- **Paul Keall, Ph.D., George Starkschall, Ph.D., Himanshu Shukla, Kenneth Forster, Vincente Ortiz, Craig Stevens, Sastry Vedam, Ph.D., Rohini George, Thomas Guerrero, Ph.D., Radhe Mohan, Ph.D.,** received the 2008 Physics in Medicine and Biology (PMB) Citations Prize for their paper, "Acquiring 4D thoracic CT scans using a multislice helical method."

New Personnel

New faculty since the last AAPM meeting:

- **Song Gao, Ph.D.** – Instructor
- **Stephen Kry, Ph.D.** – Instructor
- **Mark Marshall, M.S.** – Sr. Medical Physicist
- **Christopher Nelson, Ph.D.** – Instructor
- **Cole Robinson, M.S.** – Sr. Medical Physicist
- **Kazumichi Suzuki, Ph.D.** – Associate Professor

Promotions:

- **Sam Beddar, Ph.D.** – Professor
- **Jerimy Polf, Ph.D.** – Assistant Professor
- **Ramesh Tailor, Ph.D.** – Associate Professor
- **Ron Zhu, Ph.D.** – Professor

Major Clinical Accomplishments

- Proton Therapy Center: Commissioned small snout and Gantry 2; developed cranio-spinal techniques; commissioned scanning beam and IMPT and started its use for prostate treatments; treated over 600 patients to date at the Proton Therapy Center
- Implemented high precision volumetric image-guided adaptive radiotherapy for head & neck cancer

- Implemented the use of CBCT and OBI for improved image-guided positioning of supraclav fields for breast treatments

Major Achievements in Radiation Physics Research

- More than 120 peer-reviewed publications since January 2007
- NIH/NCI R01 (PI: Sam Beddar, Ph.D.)
Real-time in vivo Dosimetry in Radiation Therapy using Scintillation Detectors
- NIH/NCI R21 (PI: Mark Harvey, Ph.D.)
Secondary Neutron Exposures in Pediatric Proton Radiotherapy
- Sixel Technologies (PI: Stephen Kry, Ph.D.)
Phantom measurements and Validation of High Dose DVS
- Transpire (PI: Firas Mourtada, Ph.D.)
Deterministic Radiotherapy Dose Calculation Method
- Northern Illinois University (PI: Wayne Newhauser, Ph.D.)
Investigation of Dosimetry and Late Effects of Receiving Proton Beam Therapy
- Slane Company (PI: Wayne Newhauser, Ph.D.)
Radiation Shielding for a Proton and Heavy Ion Cancer Therapy Facility
- NIH/NCI K01 (PI: Rebecca Howell, Ph.D.)
Improving Effectiveness and Accuracy of Radiation Therapy
- NIH/NCI P01 (jointly led by Drs. Radhe Mohan and Thomas DeLaney (MGH))
Optimizing Proton Radiation Therapy – joint grant with Massachusetts General Hospital and U.T. M.D. Anderson Cancer Center

Radiological Physics Center

Section of Outreach Physics

Radiological Physics Center

- Principal Investigator, 0.63, Radiological Physics Center, CA 10953, 2005-2010, \$15,893,032 (\$3,614,839/year includes program income generated under the Additional Cost Alternative)
- 1,571 active institutions monitored. Eclipse treatment planning system installed at RPC is now used to allow RPC's independent re-

calculation of brachytherapy plans received digitally from participating institutions. RPC phantoms have been irradiated by more than 350 institutions for IMRT and SBRT protocols. Our experience shows that about 1/4 of institutions fail to irradiate the IMRT H&N phantom according to their own treatment plans on the first attempt. The RPC is presenting new data obtained from IMRT irradiations of the lung phantom at this meeting, that shows several planning systems overestimate the effects of the lung inhomogeneity. 1,667 credentials have been issued to physicians at 522 institutions for the RTOG/NSABP partial breast protocol, and numerous patient plans have been reviewed. The RPC has recently been asked to begin auditing proton facilities.

Other projects within the RPC

- Consultant, 0.05, Benchmark Beam Data: Improved Accuracy in Radiotherapy, SBIR Phase I Application, 2005-2006, \$5,622
- Associate Director, 0.05, Advanced Technology Radiation Therapy Quality Assurance Review Consortium, 2007-2012, \$508,385 (\$101,677/year)
- Consultant, 0.05, Benchmark Beam Data: Improved Accuracy in Radiotherapy, SBIR Phase II Application, 2006-2008, \$107,034 (\$53,517/year)
- Consultant, 0.01, Dosimetric Characterization of Cesium-131 Brachytherapy Sources, 2006-2007, SRA, \$47,661

RPC staff and students are presenting their work on the following topics at this meeting. Most projects are collaborations with staff or faculty in the Departments of Radiation Physics and Diagnostic Imaging Physics; at Washington University, UT Southwestern Medical Center, Duke University Medical Center, UT San Antonio, LA Children's Hospital; or at several industrial partners:

- Requirements for Addressing Respiratory Motion in Cooperative Group Clinical Trials
- Optically Stimulated Luminescence (OSL) Dosimeters Can Be Used for Remote Dosimetry Services
- Evaluation of the Performance of the Fast Scanning Platform of an OCT System

- Identification of a 3D Dosimeter Best-Suited For Use by the RPC
- Verification of a Monte Carlo-based Source Model for a Varian 10 MV Photon Beam
- Has IMRT Delivery Improved in the Last 5 Years?
- Risk of Secondary Fatal Malignancies from Cyberknife Radiosurgery
- A Comparison of Heterogeneity Correction Algorithms
- Evaluation of PRESAGE/optical-CT 3D Dosimetry for Commissioning a Linac for IMRT
- Quality Audits of the Calibration for TG-51 Non-Compliant Beams by the Radiological Physics Center

Accredited Dosimetry Calibration Laboratory (Geoffrey Ibbott)

- The ADCL underwent a surveillance visit last year as required by our compliance with the AAPM accreditation program and ISO 17025. The visit was generally successful, but generated a number of recommendations that have been addressed. The ADCL is preparing a reaccreditation site visit this year.

Late Effects Group (Marilyn Stovall)

- Childhood Cancer Survivor Study (CCSS), St. Jude Children's Research Hospital, 12/1/2006-11/30/2011 (NCI), \$2,368,944
- Radiation Dose and Risk of Nonmelanoma Skin Cancer in Cancer Survivors, Lance Armstrong Foundation, University of Minnesota, C6437382101, 1/1/2006-12/31/2008, \$202,494
- Genetic Consequences of Therapies for Childhood Cancer, International Epidemiology Institute, Ltd.(NCI), 9/12/2005-5/31/2010, \$105,200
- Support Services for Medical Radiation Dosimetry for Epidemiology Studies, (NCI), 4/15/2005 – 4/14/2010, \$1,869,540
- Breast Cancer, Radiation Exposure and the ATM Gene, Memorial Sloan Kettering (NCI), 4/1/2008 – 3/31/2013, \$415,683/pending
- Heart Disease Following Cancer Treatments of Children and Young Adults, Vanderbilt University, 4/1/2009 - 3/31/2014, \$522,066, pending

Radiation Dosimetry Services (Marilyn Stovall)

- 850 active institutions. Services offered: Check of machine output for photon and electron beams, check of absorbed dose for stereotactic radiosurgery, and check of blood irradiators. We have recently started checks of IMRT in collaboration with the Radiological Physics Center.

Education (Starkschall)

Postdoctoral Fellows

- Several postdoctoral fellows have completed their appointments and gone on to further their careers.
 - Keith Britton, MD, PhD (Starkschall) returned to his native Panama, where he is at the Instituto Oncológico Nacional (ION) in Panama City. [Question: Can his office be termed an “ION chamber”?]
 - Veni Ezhil, MD (Starkschall) returned to the UK, where she is a practicing radiation oncologist.
 - Yuanshui Zheng, PhD (Newhauser) completed his appointment and took a position at Washington University in St Louis.

Several new fellows have joined the Department this past year. **Myriam Bouchard, MD**, a radiation oncologist from Laval University, has joined Dr Beddar's group, as well as **Falk Pönisch, PhD**, who was a fellow in our Department several years ago and has returned from two-years' research in his native Germany. **Mark Harvey, PhD**, who previously worked in Dr Newhauser's group, returns from a semester at TSU having been awarded an F-32 grant. Congratulations are in order to Dr Harvey for winning this grant. **Gabriel Sawakuchi, PhD**, joined Dr Titt's group in December after receiving his PhD from Oklahoma State University. Finally, **Yong Peng, PhD**, joined Dr Vedam's group in January after completing a postdoctoral appointment at the Cyclotron Institute at Texas A & M. We welcome all our new and returning postdoctoral fellows.

Medical Physics Residency Program

At the end of last summer **Patricia Lindsay, PhD**, completed her training and joined the faculty at Princess Margaret Hospital in Toronto. **Jennifer O'Daniel, PhD**, will complete her training this summer. Our other two residents, **Melinda Chi, PhD**, and **Colleen Schinkel, PhD**, will be beginning their 2nd year of residency this summer. Three new residents will be joining our program. **Heng Li, PhD**, will be changing his office, after completing a postdoctoral appointment in Dr Zhu's group, as will **Xin Wang, PhD**, who will be completing a postdoctoral appointment in Dr Gillin's group. Finally, **Julianne Pollard, PhD**, will be joining us in September, as soon as she finishes her PhD research at UCLA. We wish Drs. Lindsay and O'Daniel success in their careers, and all of our residents a rewarding training period.

Proton Education Program

For the past year, we have held a series of lectures on physics of proton radiation therapy, based, to a large extent on our experience with the Proton Center. Most of the lectures have been recorded and placed on our educational website.