

**AAPM SURVEY OF MEDICAL
PHYSICS TRAINING PROGRAMS**



FOREWORD

This document "AAPM Survey of Medical Physics Training Programs" is the fifth in a series of AAPM Reports. This document is designed to facilitate the entry of students into educational programs in the field of Medical Physics. This particular report was proposed by a Subcommittee of the Committee on Training of Medical Physicists and has been endorsed by the Council on Education of the AAPM. Issuance of such reports is one of the means that the AAPM employs to carry out its responsibility to prepare and disseminate technical information in medical physics and related fields. In fulfillment of this purpose, the AAPM through a structure of task forces, committees, and councils prepares recommendations, policy and reviews in the form of reports. These reports cover topics which may be scientific, educational, or professional in nature, and final approval is given by the Council of the Association charged with responsibility for the particular concerns of that report. The contents of symposia sponsored by the AAPM are also published as monographs.

John S. Laughlin, Ph.D.
Chairman, Publications Committee

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AAPM REPORT No. 5

AAPM SURVEY OF MEDICAL PHYSICS TRAINING PROGRAMS

**Subcommittee of the Committee on
Training of Medical Physicists**

C. Mistretta, Chairman

**B. Ahluwalia
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D.E. Cunningham
B. Hoop, Jr.**

**L. Lanzl
E.S. Sternick
D.E. Velkley
P. Stansbury**

**E.L. Chaney, Chairman
Educational Council**

June 1980

AAPM
Survey of Medical Physics Training Programs

A subcommittee of the Committee on Training of Medical Physicists has undertaken a survey designed to determine the nature and extent of medical physics training programs in the United States. The institutions surveyed were with a few additions the same ones contacted during a previous survey¹. We have not searched extensively to find additional programs except for announcement of the project at the Summer 1978 business meeting of the AAPM in San Francisco. Our emphasis has been on gathering more extensive data on established programs, and in particular to determine which of these are consistent with AAPM guidelines².

Responses from 33 institutions were eventually obtained. The results are summarized in three tables. Table 1 lists the institution, program title, program director and number of trainees. A question was included in order to estimate the number of full-time equivalent teaching staff associated with each program. However, due to difficulties in estimating this number, especially in institutions where large numbers of staff had part-time involvement in the teaching programs, the responses to this question were not tabulated.

There may be some ambiguity regarding the time required for completion of the Ph.D. degree. The question asked did not specify whether the response should indicate time following the M.S. or following the B.S. We have converted all responses to time required after the B.S. degree where the intent of the response was obvious. However, students would be well advised to inquire directly to the program directors for specific information.

Table 2 lists the organization sponsoring each program, the areas of training at the MS, Ph.D. and postdoctoral levels, the emphasis of the program, regarding research, service or teaching, and the extent of clinical experience provided. The abbreviations R_x, D_x, NM and US represent radiotherapy, diagnostic nuclear medicine and ultrasound physics, respectively.

Table 3 deals with entrance requirements, program duration, tuition and support. Under Funding Status the following abbreviations apply.

- A. All students are fully supported
- B. Partial support through training period
- C. Full support for part of training period
- D. Little or no support available

Under Funding Methods the following abbreviations have been used.

- A. Fellowships
- B. Teaching Assistantship
- C. Research Assistantship
- D. Part Time Training-Related Employment

When more than one funding method is used, those listed first are used most frequently.

Conclusions

The number of training programs has increased from 25 to 33 since the survey conducted in 1976. The total number of trainees has increased from 198 in the 1976 survey to the present value of 340. The pattern over the last several years is as follows

	<u>Total</u>	<u>MS</u>	<u>Ph.D.</u>	<u>Postdoc</u>
1973	304			
1975	174	81	67	24
1976	198	83	84	33
1978	340	153	134	53

There are 8 programs with 14 or more trainees. These programs contain approximately 55% of the total number of trainees. There are 6 programs limited to postdoctoral training.

1. J.A. Sayeg, K. Banerjee and C. Mistretta, Current Status of Medical Physics Training Programs - 1976 Status Report. AAPM Committee on The Training of Medical Physicists. AAPM Report #2B, 1977.
2. K. Banerjee, B.E. Bjarngard, K.R. Corey, J. Hale, C.A. Kelsey, J.G. Keriakes, C.E. Metz, S.A. Sayeg, E. Siegel, V. Smith and J.D. Wright. Guidelines for Training Programs in Radiological Medical Physics. AAPM Report #2A, 1977.

Table 1 - Institutions Offering Training Programs Related To Medical Physics

University	Title of Program	Department and Location	Program Director	Trainees (1978)	
				<u>M</u>	<u>Ph.D.</u> <u>PD</u>
Univ. of Calif. Berkeley	Graduate Group in Biophysics, & Medical Physics & Bioradiology	Donner Lab Berkeley, CA 94702	Dr. C.A. Tobias (415)486-6173	5	12 6
Univ. of Calif. Los Angeles	Medical Physics	Dept. of Radiological Sciences Medical Physics Division AR-259 Cntr. for Health Sci. Los Angeles, CA 90024	Moses A. Greenfield (415)825-7811	14	23 4
Univ. of Calif. San Francisco	Postdoctoral Resch. Training in Radiol. Physics	Radiation Oncology Dept. University of California San Francisco, CA 94143	Vernon Smith (415)666-1208		1
University of Chicago	Graduate Study in Medical Physics	Dept. of Radiology Box 429 950 East 59th Street Chicago, IL 60637	C. E. Metz (312)947-5939	2	6 1
Chicago Medical Schl.	Graduate and Post- doctoral Training in Medical Physics	Dept. of Clinical Radiation Physics Hines VA Hospital Hines, IL 60141 and Dept. of Physiology and Biophysics The Chicago Medical School Chicago, IL 60637	John H. LeVan (312)261-6700 X-2174	2	3 1
Univ. of Cincinnati	MS Radiological Science	E555 Medical Sciences Bldg. Cincinnati, OH 45267	James G. Kereiakes (513)872-5476	4	1
Univ. of Colorado	Medical Physics	Dept. of Radiology Univ. of Colorado Medical Center 4200 East Ninth Avenue Denver, CO 80252	William R. Hendee (303)394-7817	10	2 2

University	Title of Program	Department and Location	Program Director	Trainees (1978) M Ph n pn
Emory University	Radiological Science	P.O. Box 22991 Emory University Atlanta, GA 30322	Dr. Richard C. Palmer	8 0 0 0
University of Florida	Radiological Sci.	202 Nuclear Science Cntr. Gainesville, FL 32611	Genevieve Roessler	15 12 0 0
Georgia Institute of Technology *Emory Univ. Clinic	Radiological Physics	Emory University Clinic Div. of Radiation Therapy 1365 Clifton Road Atlanta, GA 30322	Patton H. McGinley (404)377-9111 X475	3 1 0 0
Harvard	Medical Radiological Physics Training Program	Dept. of Radiation Therapy 44 Binney Street Boston, MA 02115	Bengt Bjarngard (617)732-1000 X3596	8 5 2 2
Johns Hopkins	Radiological Science	School of Hygiene and Public Health Dept. of Environ. Health Sciences 615 No. Wolfe St. Baltimore, MD 21205	Thomas G. Mitchell (301)955-3350 X3350	5 11 16 16
Thomas Jefferson Univ.	Postdoctoral Training in Medical Radiologic Physics	Medical Physics Division Stein Research Center Thomas Jefferson Univ. 920 Chancellor Street Philadelphia, PA 19107	Robert O. Gorson or N. Suntharalingam (215)928-8855	0 0 1 1
University of Kansas	Radiation Therapy Physics Program	Medical Center 39th and Rainbow Kansas City, KA 66103	R. Dale Dean (913)831-6815	7 0 0 0
University of Kentucky	Medical Radiation Dosimetry	Dept. of Health Radiation Sci. College of Allied Health Prof. Medical Center Lexington, KY 40506	Joseph A. Sayeg (606)233-6178	7 0 0 0
Massachusetts General Hospital	Training Program in Radiological Physics	Physics Research Laboratory Massachusetts General Hosp. Boston, MA 02114	Nathaniel M. Alpert	4 4 4 4

University	Title of Program	Department and Location	Program Director	Trainees (1978)		
				M	Ph.D.	PD
Memorial Sloan-Kettering Cancer Center	Postdoc Training Fellowships in Hospital Radiol.	Medical Physics 1275 York Avenue New York, NY 10021	John S. Laughlin (212)794-7413	1	3	3
	Ph.D. in Biophysics					
	MS in Radiation Physics					
University of Missouri Columbia	Medical Physics	0038 Engineering Columbia, MO 65201	Stanley R. Bull (314)882-4552	9		
MIT	Radiological Physics	Depart. of Nuclear Eng. Cambridge, MA 02138	Gordon L. Brownell (617)726-3805	3	4	
Univ. of North Carolina	Radiological Hygiene	Dept. Env. Science and Eng. Chapel Hill, NC 27514	Paul S. Stansbury (919)966-1370	5		
Northwestern	Radiation Health	Northwestern University Technological Institute Evanston, IL 60201	Prof. Herman Cember	3	6	1
University of Oklahoma	Radiological Sci.	Dept. of Radiological Sciences Health Sciences Center P.O. Box 26901 Oklahoma City, OK 73190	Gail D. Adams (405)271-5641	6	3	0
Univ. of Pittsburgh	Radiation Health Training Program	Graduate School Public Health Pittsburgh, PA 15261	Joseph A. Watson	13	2	
Rush Presbyterian- St. Luke's	Radiological Physics Training Program	College of Medicine Department of Ther. Radiol. Section of Medical Physics 1753 West Congress Chicago, IL 60612	Anthony Chung-Bin (312)942-5764			1
University of Texas		The Univ. of Texas System Cancer Center 6723 Bertner Avenue Houston, TX 77030	Robert J. Shalek (713)792-3230	4	10	0

University	Title of Program	Department and Location	Program Director	Trainees (1978)		
				M	Ph.D.	PD
Texas A & M	Bioengineering	Bioengineering Division College Station, TX 77840	James B. Smathers (713)845-5531 X205	7	3	0
University of Texas UTHSO	Radiological Physics	Radiology Department Dallas, TX 75235	Dr. J.E. Dowdey (214-631-3220 X2295	4	4	
Tufts-New England Medical Center	Radiation Oncology Research Training Program - Medical Physics	Tufts New England Medical Center Medical Physics Div. Box 246, 171 Harrison Ave. Boston, MA 02111	E.S. Sternick and/or J.E. Rogers (617)956-6171			2
Vanderbilt University	Ph.D. in Physics/ Medical Physics	Dept. of Radiology Vanderbilt University Medical Center Nashville, TN 37232	Ed Siegel (615)322-2501	-	2	-
Univ. of Virginia	Graduate Studies in Radiological Physics	Radiological Physics Div. Box 375 Univ. of Virginia Hosp. Charlottesville, VA 22908	Suresh K. Agarwal (804)924-5421	2	2	1
University of Washington	Radiological Sci.	Medical Radiation Physics Univ. Hosp. RC08 Seattle, WA 98195	Peter Wootton (206)543-8897	4	1	2
Washington University	Clinical Physics Postdoctoral Training	School of Medicine Mallinckrodt Institute of Radiology Physics Section, Box 8131 510 So. Kingshighway Blvd. St. Louis, MO 63110	James A. Purdy (314)454-3099			
University of Wisconsin	Radiological Sciences	Department of Radiology Medical Physics Division University of Wisconsin Madison, WI 53706	John R. Cameron (608)262-2170	9	19	1

Table 2
Sponsoring Institution and Areas of Training

Institution	Sponsoring Organization	MS Training	Emphasis	Areas of Ph.D. Research	Areas of Postdoctoral Research	Clinical Experience
Univ. of California Berkeley	Dept. of Biophysics	Biophysics & Research Bioradiology	R _x , D _x , NM, Biophysics Medical Phys.	R _x , NM, Biophysics	Flexible to fit needs and desires of students	
Univ. of California Los Angeles	Medical School	R _x , D _x , NM, US Service Hyperthermia Research	R _x , D _x , NM	R _x , D _x , NM, US	1 quarter in each of D _x , R _x , NM clinics. Optional R _x Radiation Experience	
Univ. of California San Francisco	Radiation Oncology Dept.	None	R _x	R _x	4 months	
Univ. of Chicago	Radiology Dept.	R _x , D _x , NM Research	Research	R _x , D _x , NM	Assorted Elective Exercises	
Chicago Medical Schl.	School of Graduate and Postdoctoral Studies	R _x	Research General Radiological Physics	R _x	6-9 months of clinical rotations	
Univ. of Cincinnati	Radiology Dept.	R _x , D _x , NM Service Research	Service Research	R _x , D _x , NM	Quality Assurance in all area. Conferences Clinical Research	
Univ. of Colorado	Medical School	R _x , D _x , NM, US MS-Serv. Ph.D.-Rsch. PD-Rsch.	R _x , D _x , NM, US	R _x , D _x , NM, US	Multiweek Rotation Through Several Clinical Areas. Assignments Consistent with AAPM Newsletter 3, #2 MAR/APR, 1978.	
Univ. of Florida	Engineering Dept.	R _x , D _x , NM Research	R _x , D _x , NM Biophysics	None	Presently limited - 1 year program being developed	
Emory University	Medical School	R _x , D _x , NM Radiation Safety	Service None	None	Dx 200 Hrs, R _x 200 Hrs. NM 200 Hrs., Rad Safety 200 Hrs. + additional 400 hours in any of the above	

Institution	Sponsoring Organization	Areas of MS Training	Emphasis Service	Areas of Ph.D. Research	Areas of Postdoctoral Research	Clinical Experience
Georgia Inst. of Technology *Emory Univ. Clinic	Engineering Dept.	R _x	R _x , D _x	Research R _x , D _x , NM	-----	One Quarter at R Dept. in future 6 mth-year clinical internship
Harvard-MIT	Engineering Dept. Schl. of Public Hlth.	R _x , D _x , NM	Research	R _x , D _x , NM	R _x , NM	Clinical tutorials Brief rotations through clinical physics groups
Johns Hopkins	Medical School Hospital School of Hygiene and Public Health	R _x , D _x , NM	Service 30% Research 70%	D _x , NM, Bioengineering	NM	Daily Nucl Med. Conf. 8 credits of pathophysiology, 2 credits - intro to Med. Sciences
Thomas Jefferson University	Hospital	None	Clinical Physics	---	R _x	Most of 2 years includes clinical work - 2/3 R _x
Univ. of Kansas	Medical School	R _x	Service	R _x , Biophysics	None	1 year at medical center- 50% clinical
Univ. of Kentucky	Medical School	R _x	Service	None	R _x	4-1/2-6 months in R _x Dept
Massachusetts General Hosp.	Radiology Dept.	None	Research	None	D _x , NM Bioengineering	-----
Memorial Sloan-Kettering Cancer Cntr.	Graduate School Hospital	R _x , D _x , NM	MS-Serv. Ph.D.- Research PD-Serv.	Biophysics	R _x , D _x , NM	One year fulltime all programs additional 6 mths for postdocs
Univ. of Missouri-Columbia	Engineering, Physics, Radiology Depts.	R _x , D _x , NM	MS-Serv. Ph.D.- Research Research	Bioengineering Nucl. Eng. and Physics	R _x , D _x , NM	10 hours/week for 1 year
MIT	Engineering Dept. Schl. of Public Health	R _x , D _x , NM	Service & Research	R _x , D _x , NM Research	R _x , NM	Clinical tutorials Brief rotations through clinical physics groups
Univ. of North Carolina	Engineering Dept.	R _x , D _x , NM	Service & Research	R _x , D _x , NM	None	5 hrs/wk for 12 weeks
Northwestern	Engineering Dept.	R _x	Service & Research	R _x , NM	R _x	1 quarter equiv. R _x in hospital

Institution	Sponsoring Organization	MS Training	Emphasis	Areas of Ph.D. Research	Areas of Postdoctoral Research	Clinical Experience
Univ. of Oklahoma	Medical School	R _x , D _x , NM Radiation Safety	Service Research Teaching	R _x , D _x , NM	Possibly R _x , D _x , NM Radiation Safety	3 hr. courses and labs in D _x , R _x , NM-1/2 time employment in Radiation Safety
Univ. of Pittsburgh	Graduate School of Public Health	R _x , D _x , Health Phys.	Research	R _x , D _x , Health Phys.	D _x	yes
Rush Presbyterian- St. Luke's	Hospital	R _x , D _x , NM	Service	None	R _x , D _x , NM	1st year - 3 mths. in each of R _x , D _x , NM. 2nd year in each of chosen specialties
Univ. of Texas Houston	Graduate School of Biomedical Sciences	R _x , D _x , NM Biophysics	Service & Research	Biophysics Radiological Physics	R _x , D _x , NM Biophysics	2 months R _x dosimetry 1 month clinical isotope Lab
Texas A & M	Engineering Dept.	Radiation Safety	Research	Bioengineering Radiation Safety	None	Elective 3-12 months at a hospital
Univ. of Texas UTMSCD	Radiology Physics Dept.	R _x , D _x , NM	Research	D _x , NM, US Biophysics	None	one summer - 1/2 time
Tufts	Hospital	None	Research & Service	None	R _x , D _x , NM, US	1/2 time
Vanderbilt	Radiology Dept. Physics Dept.	-----	Research	R _x , D _x , NM Biophysics Bioengineering	NM	Collaboration with physicians in common projects
Univ. of Virginia	Graduate School of Engineering	R _x , D _x , NM	Service	R _x , D _x , NM Bio- medical Engin. Radiobiology & Biophysics	R _x , D _x	Work during 3 semesters with clinical physicists 3 week summer internship in each of NM, R _x and D _x and Radiation safety.

<u>Institution</u>	<u>Sponsoring Organization</u>	<u>Areas of MS Training</u>	<u>Emphasis</u>	<u>Areas of Ph.D. Research</u>	<u>Areas of Postdoctoral Research</u>	<u>Clinical Experience</u>
Univ. of Washington	Graduate School	R _x , D _x	MS-Serv. Ph.D. - Research PD-Rsch	R _x	R _x , D _x	Minimum of 6 cr. hours for 2 qtrs. in treatment planning and related activities. Weekly conferences summer med. student lectures in R _x
Washington Univ.	Medical School	None	Clinical Physics	-----	R _x	4 weeks in clinical section, 12 weeks in dosimetry/treatment group
Univ. of Wisconsin	Medical School	R _x , D _x , NM, US	MS-Serv. Ph.D. - Research	R _x , D _x , NM, US Bioengineering	R _x , D _x , NM, US	10-16 week rotation thru R _x , D _x , NM, US - Summer employment

Table 3

Entrance Requirements and Financial Considerations

Institution	AAPM Entrance Guidelines		Time Required		Tuition* (\$K)		Funding Status	Funding Methods
	MS	Ph.D.	MS	Ph.D.	MS	Ph.D.		
Univ. of California - Berkeley	2	5	2	1.56	3.9	0	B	A, C, B
Univ. of California - Los Angeles	2	5	2	1.5	3.75	None	B	A, B, C
Univ. of California - San Francisco	-	-	2	-	---	None	A	A
Univ. of Chicago	2	4	2	12.6	17.3	None	B	D, A, C
Chicago Medical School - Hines Hospital	2	5	1-2	6	15	None	B	A, D
Univ. of Cincinnati	1-2	-	1	2-4	---	None	B	Tuition Scholarships and D
Univ. of Colorado	2	5	2	2.2	3.5	None	A, B	A Postdoc B, C, D MS-Ph.D.
Emory University	5	-	-	6000	---	---	D	D and Loans
Univ. of Florida	1.5-2	3-4	-	1.1/yr	1.2/yr	---	A	C, D, B, A
Georgia Institute of Technology * Emory Univ. Clinic	1	3-4	-	++	++	++	A	A, C
Harvard - MIT	2	4	2	9	22	None	C	A, C, D,
	2	5	-	10	30	None	B	A, C, B

+ - Additional Reqs: Statistics Phys. Chem. or Thermodynamics, Biol. or Anatomy & Physiol.

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Institution	Entrance Guidelines	Time Required		Tuition (\$K)		Funding Status	Funding Method		
		MS	Ph.D.	MS	Ph.D.				
Johns Hopkins	Students with varied backgrounds accepted	2	3-5	2	7	12	-	A postdoc D other	A postdoc D other
Thomas Jefferson	Yes	-	-	2	-	-	None	A	A
Univ. of Kansas	Yes	BS+2	BS+3+	-	2	4	---	B	D,B
Univ. of Kentucky	Yes-also students with varied backgrounds considered	2	-	2	1.5	-	None	D	B,A
Massachusetts General Hospital	Yes	-	-	2	-	-	None	A	A
Memorial Sloan Kettering	Yes	2	4	2	11	12.6	---	A	A
Univ. of Missouri	Yes	1.5-2	-	-	2.2- 2.9	---	---	B	C,A,B
MIT-Harvard	Yes	2	5	2	10	30	None	B	A,C,B
Univ. of North Carolina	Yes	2	4	2	9	22	None	C	A,C,D
Northwestern Univ.	Yes	2	5	2	6	15	None	B	A,D,C
Univ. of Oklahoma	Yes	2	4,5	-	1.94	5.5	-	B,C	D,A,C
Univ. of Pittsburgh	Yes	1	4	2	.66	1.86	-	B	A,C,D
Rush Presbyterian-St. Luke's	---	-	-	2	5,0-2.5	20-10	-	B	B,A
Univ. of Texas-Houston	Yes	2	4	1-2	2.56 .53	5.1 1.06	None	part-time work available	
Texas A & M	Yes	2	4	-	1	2	-	A	C,B
UTHSO-Univ. of Texas	Yes	2	4,5	-	2.9 .3	6.5 .75	-	A	B,C,D

Institution	AAPM Entrance Guidelines	Time Required			Tuition* (\$K)			Funding Status	Funding Method
		MS	Ph.D.	Postdoc	MS	Ph.D.	Postdoc		
Tufts	-	-	-	2	-	-	None	A	A
Vanderbilt	Yes	-	5	1-2	-	20	-	B	B,C
Univ. of Virginia	Yes	2	4-5	2	3.2	6.6	None	D	D
Univ. of Washington	Yes	2	4	2	++	++	++	D	Loans + D
Washington Univ.	Yes	--	--	2	-	-	None	A	A,D
Univ. of Wisconsin	Yes	2	4-6	2	2	2	None	A	C,B,A,D

*When two tuition figures are given, the smaller is for residents, the larger for nonresidents. In many cases nonresidents qualify for resident status after the first year or two. Amounts listed are in thousands of dollars

++ estimate not available