POINT/COUNTERPOINT

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Physicists are better educated for a career in medical physics if they graduate from a specialized medical physics graduate program rather than from a more traditional physics graduate program

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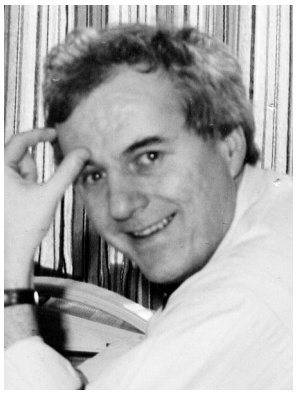
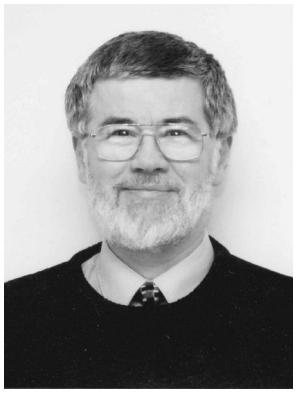
OVERVIEW

Persons entering the practice of medical physics today are more likely to have graduated from a graduate program in medical physics than from a traditional physics graduate program. Some might say this is a good trend because entering physicists have a greater knowledge of the practice of medical physics. Others might say that to be a good medical physicist, one must first be a good physicist, and a graduate degree in traditional physics helps ensure the latter. They would claim that knowledge about the practice of medical physics can be acquired during postgraduate residency training. These opposing points of view are debated in this month's Point Counterpoint.



Arguing for the Proposition is Ervin B. Podgorsak, Ph.D. Dr. Podgorsak graduated in physics from the University of Ljubljana in Slovenia in 1968 and then obtained his M.Sc. and Ph.D. degrees in Physics from the University of Wisconsin in Madison. During 1973–74 he held a postdoctoral fellowship at the Ontario Cancer Institute in Toronto. Since 1975 he has been employed at McGill University in Montreal, where he currently holds positions of Professor of Medical Physics, Director of the Medical Physics Unit in the Faculty of Medicine, and Director of the Medical Physics Department at the McGill University Health Centre. He is board certified by the CCPM and the ABMP.



Arguing against the Proposition is David W. O. Rogers, Ph.D. Dr. Rogers has just taken up the Canada Research Chair in Medical Physics in the Physics Department of Carleton University. He has been part of the graduate program in Medical Physics at Carleton since 1986. Previously he worked at the National Research Council of Canada where he headed the Ionizing Radiation Standards group since 1985. His research is centered around radiation dosimetry-related measurement standards, clinical dosimetry protocols and the development and application of Monte Carlo techniques to medical physics problems.

FOR THE PROPOSITION: Ervin Podgorsak, Ph.D.

Opening Statement

During the past two decades medical physics has undergone a tremendous evolution, progressing from a branch of science on the fringes of physics into an important mainstream discipline that can now be placed on an equal footing with other more traditional branches of physics. To be productive in any of the traditional specialties of modern physics, physicists must not only possess a solid knowledge of general physics and science, but also a rigorous didactic graduate training in the specialty.

Many believe that medical physics is exempt from the requirement of didactic M.Sc. or Ph.D. training in medical physics, and prefer a model in which physicists with a graduate degree in a ''straight'' physics discipline can become a

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medical physicist through on-the-job academic and clinical training in medical physics. For practical reasons, this approach was historically the standard path to entering the medical physics profession. Now, however, this entry model should be discouraged in favor of a model that provides a well-defined and rigorous four-step progression to becoming a qualified medical physicist. The four steps are:

(1) Undergraduate degree in physics.
(2) Graduate degree in medical physics from a Commission on Accreditation of Medical Physics Educational Programs (CAMPEP)-accredited program.
(3) Residency in one of the medical physics specialties (e.g., radiotherapy physics, diagnostic radiology physics, etc.) at a CAMPEP-accredited institution.
(4) Certification in the particular medical physics specialty by an appropriate certification body (e.g., American Board of Radiology (ABR), American Board of Medical Physics (ABMP), Canadian College of Physicists in Medicine (CCPM)).

The sophistication of modern medical physics, as well as the complexity of the technologies applied to diagnosis and treatment of human disease by radiation, demand this stringent approach to becoming a member of the medical physics profession. On-the-job training simply does not provide, with the same degree of efficiency and quality, the depth and breadth of knowledge required of physicists entering the medical physics profession today.

Pioneers and early workers in medical physics came from traditional branches of physics such as nuclear physics, high-energy physics, solid-state physics, etc. By chance they ended up working in nuclear medicine, radiology or radiotherapy, and developed the necessary skills and knowledge through on-the-job training. In addition to clinical work, they also promoted medical physics as a science as well as a profession, and developed graduate medical physics educational programs, first through special medical physics courses offered as electives in physics departments, and later through independent, well-structured medical physics programs that lead directly to graduate degrees in medical physics.

Many graduate programs are now available to an aspiring medical physicist and progression through the four steps is feasible, albeit still somewhat difficult because of the relatively low number of accredited academic and residency programs in medical physics. The number of these programs is growing, however. We are now in a transition period and, within a decade, progression through the four steps will become mandatory for physicists entering the medical physics profession. The sooner broad-based didactic training through graduate programs in medical physics becomes the norm, the better it will be for the medical physics profession and for the patients the profession serves.

Rebuttal

''What does being educated for a career in medical physics mean?,'' asks Dr. Rogers, and answers with two essential elements: a physicist's approach to problem solving and having research experience. He then points out that these two elements can be obtained by progressing through a B.Sc. degree in physics to a graduate degree in any traditional physics discipline. However, Dr. Rogers ignores one additional essential element of medical physics education: having the basic knowledge of all aspects of medical physics and a rudimentary knowledge of fields related to medicine such as anatomy and biology. Today, this knowledge is best attained from a well-structured academic graduate program in medical physics, rather than from on the job experience while working as a medical physicist.

Dr. Rogers points out that AAPM awards generally go to those who have come into medical physics from other branches of physics. This, of course, does not prove that coming into medical physics from elsewhere is better or even equivalent to coming from a graduate program in medical physics. It only highlights the fact that the award recipients are senior medical physicists who entered medical physics years ago from other branches of physics. In the past, didactic medical physics programs did not exist and medical physics and technology were far less sophisticated than today. I predict that AAPM awards in the not-too-distant future will start shifting to medical physicists educated in dedicated medical physics graduate programs.

Organizations offering medical physics certifications already recognize the importance of academic as well as clinical training in medical physics by insisting on a broad basic knowledge of medical physics during various components of the examination process. This basic knowledge is difficult, although, as Dr. Rogers points out, not impossible, to attain on the job where one is heavily involved with acquiring clinical experience and providing service to patients. Of course, a physicist trained in another branch of physics can become a medical physicist; the transition is not trivial, however, and is far less efficient than coming from an accredited graduate program in medical physics, cross-fertilization and diversity of backgrounds notwithstanding.

Another option, not debated here yet of some relevance to the debate, is entry into medical physics through an undergraduate B.Sc. program in medical physics. While in principle this may give the student an advantage in a subsequent medical physics graduate program, the early undergraduate concentration on medical physics occurs at the expense of general undergraduate physics as well as mathematics courses. This concentration adversely affects the students' subsequent graduate career in medical physics.

While other options remain open, presently the most efficient path to a career in medical physics is through the well-defined and rigorous four-step progression: (i) B.Sc. in physics; (ii) graduate degree in medical physics; (iii) residency; and (iv) certification.

AGAINST THE PROPOSITION: David Rogers, Ph.D.

Opening Statement

I have been involved with Carleton University's graduate program in medical physics since 1986. I feel strongly that

good graduate education in medical physics is valuable. I am also one of a large number of medical physicists who joined the profession via other graduate degrees in physics, in my case nuclear physics. When my friend Ervin Podgorsak and I were approached to take part in this ''debate,'' the original wording was ''Medical physicists are better trained if...'' rather than ''educated.'' I would not debate the earlier proposition, which is obviously true. What we are actually debating in this Point/Counterpoint is the difference between ''educated'' and ''trained.''

What does being educated for a career in medical physics mean? It involves two essential elements. The first is having a physicist's approach to problem solving. The second involves having research experience to gain the ability to tackle new problems in a systematic way, beyond solving problems in a course or textbook.

Having a physicist's approach to problem solving is a characteristic learned in any good undergraduate physics education. A colleague who runs a large molecular biology laboratory with a half-dozen physicists and a dozen biologists makes the point that the physicists and biologists attack problems in completely different ways. We all recognize this fundamental aspect of our undergraduate education as physicists.

What we learn in graduate school is how to work independently on a problem. The question is, are we better educated if the problem is related to medical physics? There is no evidence that this is the case. In fact, I believe that medical physics is well served by physicists from other areas of physics joining the profession, because the variety of backgrounds is valuable. This diversity leads to strength and robustness in the profession. Those with other physics backgrounds must be properly trained before they work independently in a clinic, but we are debating education, not training. Medical physics is such a broad field that even someone with a graduate degree in the field must still learn most of the necessary specific knowledge and skills by working or training in a clinic.

At the AAPM awards ceremony every year, most of those receiving honors and awards have come from other branches of physics. These backgrounds can lead to very productive careers in medical physics. This is not just a generational issue which is now different for the younger generation. There are outstanding contributions to our field by those who were trained in other branches of physics in the last ten years.

Note that I am not arguing that physicists from other disciplines are better educated, only that they are equally well educated. I also recognize that a graduate degree in medical physics may be the most efficient path for someone to enter the field, but it is not the only path. Our field is well served by the breadth and diversity of the physics backgrounds of those entering the field. The fact that individuals with nonmedical physics degrees will take longer to become fully qualified to practice clinical physics should be seen as one of their personal contributions to medical physics. This diversity of backgrounds adds a distinct strength to the field, and I would argue strongly against restricting our discipline to those graduating from medical physics graduate programs.

Rebuttal

I concur with much of what Professor Podgorsak has written and certainly agree that the most efficient route for entering the profession is via a graduate program in medical physics (I will even agree it should be accredited once Carleton's program attains that status!). But I disagree that a well educated physicist from any subdiscipline is limited to the field of their degree. Given time, a well-educated physicist can pick up the specific skills required to work in most other sub-fields, so long as individual talents are respected (i.e., most theorists are incapable of becoming experimentalists and vice versa). Making the switch may be inefficient for the individual involved, but all branches of physics benefit from cross fertilization. For that reason I reject the notion that a degree from an accredited program is an essential step to becoming a certified medical physicist. Such a step would limit the breadth of experience of physicists entering the profession. The examination process for certification must be adequate to assess that an individual has attained the necessary knowledge in medical physics. That said, I certainly agree that the easiest and fastest way to enter the profession is via a graduate education in medical physics.