TRUE TALES OF MEDICAL PHYSICS: INSIGHTS INTO A LIFE-SAVING SPECIALTY

By JACOB VAN DYK

Geoffrey S. Ibbott [1,2]

[1] Professor and Chair Emeritus, UT MD Anderson Cancer Center, Houston, Texas, USA.
[2] Associate Executive Director, American Board of Radiology, Tucson, Arizona, USA.

I. BOOK DETAILS

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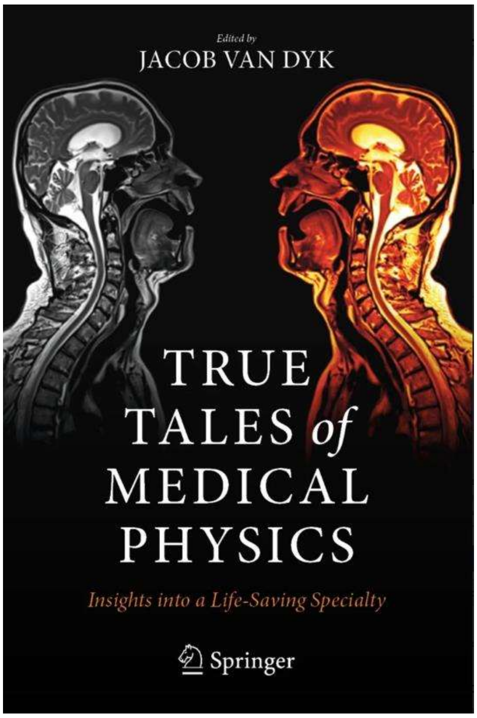

II. REVIEW

Many of us equate the origins of medical physics with the discovery of x rays by Wilhelm Conrad Roentgen in 1895. Indeed, we might think of Roentgen as the first medical physicist, as Juan del Regato clearly did in his book *Radiological Physicists*. [1] Roentgen is the subject of the first chapter, with Marie Curie, Max Planck and Ernest Rutherford following in the second through fourth chapters, respectively.

But in fact, the first person whose job title was "medical physicist" was none of these admittedly legendary pioneers, but a French physician called Jean-Noel Hallé (1754-1822). He was appointed the first Professor of Medical Physics and Hygiene at the Paris École de Santé (School of Health) in 1794, more than 100 years before Roentgen's report of his discovery. The term "medical physics" itself had been coined long before that, in 1719, and appeared in print as the title of a journal: Les Mémoires de Médicine et de Physique Médicale, in 1779. The journal published accounts of general physics in medicine, including reports of the use of electricity and magnetism. The founder of the journal, Félix Vicq d'Azyr, was instrumental in reforming French medical education, including the teaching of general physics and medical physics as one of the important basic sciences. The reform, and Hallé's appointment, led to the recruitment of physicists to teach in medical schools, and the publication in the early 1800s of textbooks containing "medical physics" in the titles. Hallé developed a curriculum that included general physics with applications in medicine, including temperature, light, electricity, and magnetism.

I learned this fascinating history of our profession from one of the first chapters in this new book by Professor Jacob van Dyke of Western University in London, Ontario, Canada. The chapter was written by Professor David Thwaites and is spellbinding in its description of the applications of physics in medicine, going back to the earliest recorded history of medicine itself. This chapter is representative of the remainder of the book. Each chapter is written by a medical physicist of note who, in one way or another, answers the question we've all been asked: "what is a medical physicist?"

Professor van Dyk tells us that the contributors to the book are all award-winning medical physicists whose recollections will give the reader an unusual insight into the field. As such, the book, while educational and entertaining for practicing medical physicists, also will be of value to people who have a passing acquaintance with the field, such as the friends and relatives of medical physicists. It also will be enlightening for members of the public, particularly those who anticipate undergoing a medical procedure such as diagnostic imaging or radiation therapy, or perhaps have recently done so. By reading about the work of the medical physicist, as told by those physicists themselves, they will gain an appreciation and a personalization of the field, rendering it far less opaque than it probably seems to many of them.

Some of the contributors used this opportunity to describe their own entry into the field. For example, I learned that while in high school, Marcel van Herk built a working computer based on a recycled Intel 8080 chip and programmed it to solve chess problems. He would have entered a computer science program in college, had it been available in Amsterdam, but instead studied physics because, as he explains "physics is such a wide field … it teaches problem solving more than specific topics". At an early point in graduate school, van Herk investigated research options and chose to work with a medical physicist at the Netherlands Cancer Institute who was building an electronic x-ray imager. The project allowed van Herk to combine his interests in physics and computer science and clearly led to the work in imaging and treatment planning for which he is known. By the way, van Herk's high-school computer is still functional, having been upgraded numerous times with parts acquired from flea markets and cast-offs from various sources.

Other contributors take a different approach, such as Arthur Boyer, who described a typical day in life, his life, as a medical physicist. He relates a representative day early in his career, driving to work in San Antonio, reviewing the class he would be teaching to the radiology residents later that day. After arriving at work, he finalized some shielding calculations he had prepared for a proposed addition to the cancer center, requiring occupied space to be constructed over the linac vaults. He attended his regular weekly meeting with the medical director of the cancer center, who was Boyer's boss, to discuss minor staffing issues and also a new project; the replacement of one of the institute's cobalt units with a linear accelerator. This presented another shielding problem. He also spent part of that day with a colleague, refining their development of the superposition convolution algorithm in dose calculations. Boyer credits his introduction to, and consequent familiarity with this algorithm to his education in fast Fourier transforms while a graduate student at Rice University in Houston.

Cari Borras recalls a day in her professional life that was anything but typical and describes it as "the scariest day of my life." She explains how, in 1989, early in her career with the Pan American Health Organization, she was assigned to travel to El Salvador as part of a PAHO mission to investigate a radiation accident at an industrial irradiator. The fact that the unfamiliar device was not a medical irradiator was just the beginning of a series of rather terrifying events; amplified by the uncertainty arising from a decrepit and unsafe facility, and the lack of security associated to a visit to a country in the 10th year of a bloody civil war. Her investigation of the accident involved interviewing several of the operators who had received high doses and had been evacuated to a hospital in Mexico. She describes driving through San Salvador in a taxi whose driver had to change directions frequently to avoid the sounds of gunfire. She arrived at the airport early in the morning, as advised by the airline, only to find the doors locked and to hear the sounds of approaching troops. Scary indeed!

It might be interesting to determine how many medical physicists have performed some sort of public service, as medical physics, like all of medicine, is a "giving" profession. Stephen Thomas is certainly an example, having served in the Peace Corps while taking a sabbatical from graduate school. Dr. Thomas writes that he spent two years in Ghana, Africa, teaching physics in one of the secondary schools in the capital, Accra. A section of Thomas's chapter is devoted to his volunteer experiences, which were mostly very positive, and his time immersed in a country embroiled in unrest leading to a military coup, from which he emerged unscathed but educated to life in a country far from his home.

In his own chapter, van Dyk describes a laundry cart that played a critical role in the construction of the first cobalt unit to deliver patient treatments, and another laundry cart that was employed to measure tissue-air ratios in large field sizes from one of the subsequent clinical cobalt units. These measurements were needed for calculations of dose to patients receiving hemi-body or total-body therapy. Once completed, the measurements were used to extend the TAR data in tables published in supplements of the British Journal of Radiology. The BJR supplements were relied upon widely by medical physicists for treatment planning calculations as, at the time, scanning water phantoms were expensive and uncommon. While all of this seems improbable, I leave it to the reader to learn just how a lowly piece of hospital hardware could have figured so significantly in the early days of megavoltage radiation therapy.

The book is loosely organized by topic, with chapters covering similar aspects appearing in appropriately-named sections, although there is naturally some overlap and random assortment of discussions. For example, the chapters by both Thwaites and van Dyk appear in a section called "Medical Physics: More than History". The chapter by Boyer is grouped with several others in a section called "Medical Physics: More than Clinical Service, while those by Thomas and van Herk are grouped under "Medical Physics: More than Research" and Boras's chapter is one of several in "Medical Physics: More than Protection of the Public".

The remaining sections are called "More than Teaching" and "More than Commercial Developments". The authors not mentioned above include Peter R. Almond, Gary T. Barnes, James A. Purdy, John W. Wong, Paul L. Carson, C. Clifton Ling, Terry M. Peters, Carlos E. de Almeida, Arun Chougule, Jerry J Basttista, Thomas Kron, Martin Yaffe, Aaron Fenster, Maryellen L. Geiger, Thomas "Rock" Mackie, and Radhe Mohan.

The book can be read cover-to-cover, but of course one can jump from one author to another, as each chapter stands on its own. Each contributor describes both the scientific aspects of note that defined his or her career, the principles that guided their work, and the seemingly random and often surprising events that led to their entry into the field. This glimpse into the personal lives of some of our senior colleagues is fascinating, and learning how they navigated the events, sometimes challenges, of their early careers offers a window into their personalities that most of us might never experience otherwise. This book is highly entertaining and recommended reading for those interested in learning a little about medical physics and what medical physicists do, as well as for those who have spent their careers in the field.

III. REFERENCE

Radiological Physicists, by Juan A. del Regato, MD. American Institute of Physics, New York, NY. 1985.

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