

# John H Hubbell

In the references at the end of Chapter 15 (Interaction of Photons and Charged Particles with Matter) in the 4th edition of [Intermediate Physics for Medicine and Biology](#), you will find a string of publications authored by [John H. Hubbell](#) (1925-2007), covering a 27-year period from 1969 until 1996. Data from his publications are plotted in Fig. 15.2 (Total cross section for the interactions of photons with carbon vs. photon energy), Fig. 15.3 (Cross sections for the photoelectric effect and incoherent and coherent scattering from lead), Fig. 15.8 (The coherent and incoherent differential cross sections as a function of angle for 100-keV photons scattering from carbon, calcium, and lead), Fig. 15.14 (Fluorescence yields from K-, L-, and M-shell vacancies as a function of atomic number Z), and Fig. 15.16 (Coherent and incoherent attenuation coefficients and the mass energy absorption coefficient for water).

Hubbell's 1982 paper "[Photon mass attenuation and energy-absorption coefficients from 1 keV to 20 MeV](#)" ([International Journal of Applied Radiation and Isotopes](#), volume 33, pages 1269-1290) has been cited 976 times according to the [Web of Science](#). In fact, it has been cited so many times that it was selected as a [citation classic](#), and Hubbell was invited to write a [one-page reminiscence about the paper](#). It began modestly

"Some papers become highly cited due to the creativity, genius, and vision of the authors, presenting seminal work stimulating and opening up new and multiplicative lines of research. Another, more pedestrian class of papers is 'house-by-the-side-of-the-road' works, highly cited simply because these papers provide tools required by a substantial number of researchers in a single discipline or perhaps in several diverse disciplines, as is here the case."

At the time of his death, the International Radiation Physics Society Bulletin published the following [obituary](#):

"The [International Radiation Physics Society](#) (IRPS) lost one of its major founding members, and the field of radiation physics one of its advocates and contributors of greatest impact, with the death this spring of John Hubbell.

John was born in Michigan in 1925, served in Europe in World War II [he received a [bronze star](#)], and graduated from the University of Michigan with a BSE (physics) in 1949 and MS (physics) in 1950. He then joined the National Bureau of Standards (NBS), later [NIST](#), where he worked during his entire career. He married Jean Norford in 1955, and they had three children. He became best known and cited for National Standards Reference Data Series Report 29 (1969), "Photon Cross Sections, Attenuation Coefficients, and Energy Absorption Coefficients from 10 keV to 100 GeV". He was one of the two leading founding members of the International Radiation Physics Society in 1985, and he served as its President 1994-97. While he retired from NIST in 1988, he remained active there and in the affairs of IRPS, until the stroke that led to his death this year."

Learn more about John Hubbell [here](#) and [here](#).

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## In Memoriam: John Howard Hubbell

1926–2007

by Kathryn H. Pryor, CHP



John Howard Hubbell passed away on 31 March 2007 at the age of 81. He was born in Ann Arbor, Michigan. John earned a bachelor of science degree from the University of Michigan in 1949 and a master's degree in physics in 1950. He served in the Army in Europe during World War II and was awarded a Bronze Star Medal in 1984.

John had a long and distinguished career at the National Bureau of Standards (now known as the National Institute of Standards and Technology [NIST]), spanning the years from 1950 to 1988, and continued as a consultant after his retirement. He began his career in the X-Ray Crystal Diffraction Group and directed the NBS/NIST X-Ray and Ionizing Radiation Data Center from 1963 to 1981. His early work dealt with measurements and theoretical analysis of gamma-ray backscattering and unfolding of the

energy response of sodium iodide detectors. His collection and critical evaluation of experimental and theoretical photon cross-section data resulted in the development of tables of attenuation and energy-absorption coefficients, as well as related quantities such as atomic form factors, incoherent scattering functions, atomic photoeffect, and pair and triplet production cross sections. John's most widely known work is National Standard Reference Data Series Report 29: "Photon Cross Sections, Attenuation Coefficients, and Energy Absorption Coefficients from 10 keV to 100 GeV." His database has been used by many scientists, both throughout the United States and abroad. One of the pieces of work in which he took great pride was the first analytical solution to the Rectangular Source problem, now called the Hubbell Rectangular Source Integral, published in the *Journal of Research of the National Bureau of Standards* in 1960.

John's international work included serving as the NIST principal investigator for the Special Foreign Currency Program India-U.S. Joint X-Ray Data Projects and as chair of a committee on Food Safety Aspects of Cargo Surveillance Using Megavoltage X-Rays for the World Health Organization and the International Atomic Energy Agency. He was a member of the International Higher Education Academy of Sciences in Moscow and a consultant to the Lawrence Berkeley National Laboratory/CERN Particle Properties Group. He also served as a consultant to the International Commission on Radiation Units and Measurements, as well as the secretary to the Task Group on X-Ray Absorption Coefficients of the International Union of Crystallography.

John was active in many professional societies and was a Fellow of the Health Physics Society (HPS), the American Nuclear Society (ANS), and the American Physical Society. He was a founding member, Fellow, and past president of the International Radiation Physics Society (1994-1997). He served for six years as the chair of the General Radiation Protection Section of the HPS Standards Committee and was a member of the Department of Energy Cross Section Evaluation Working Group since 1965. He served on the ANS Isotopes and Radiation Division Committee on Radiography and Gauging and as acting chair of the Nuclear, Atomic, and Radiation Data Committee.

John was awarded the HPS Distinguished Scientific Achievement Award in 2001, the Faculty Medal from the Technical University of Prague in 1982, the Society of Nuclear Medicine Paul C. Aebersold Award in 1985, and the ANS Radiation Industry Award in 1985. In 1995, he received the Outstanding Alumnus Award from the University of Michigan Department of Nuclear Engineering and a Doctor Honoris Causa from the University of Cordoba, Argentina, Faculty of Mathematics, Astronomy, and Physics in 1996.

John published over 120 papers in the area of radiation physics during his long and distinguished career. Three of his publications were named Citation Classics by the Institute for Scientific Information. He was also editor in chief of the journal *Radiation Physics and Chemistry*.

John traveled extensively, both in a professional capacity and to pursue his interest in astronomy and solar-eclipse photography. In February of 1979, he departed by automobile for Manitoba, Canada, during the worst winter storm that the region had seen in 50 years, in order to view a total solar eclipse. He and his wife Jean followed up that feat with a trip to view a total solar eclipse in Surabaya, Indonesia, on their wedding anniversary in 1983, another in Baja California Sur, Mexico, in 1991, and one in the Libyan Sahara in 2006. John was an accomplished harmonica player, entertaining many a colleague, friend, and stranger with his harmonica during his travels.

John is survived by his wife of 51 years, Jean Norford Hubbell of Gaithersburg, Maryland; three children, Anne Cooper of Moorpark, California, Wendy Carballo of Colesville, Maryland, and Shelton Hubbell of Dhahran, Saudi Arabia; and nine grandchildren.