

Arthur Strong Wightman (1922–2013)



Arthur Wightman, a founding father of modern mathematical physics, passed away on January 13, 2013 at the age of 90. His own scientific work had an enormous impact in clarifying the compatibility of relativity with quantum theory in the framework of quantum field theory. But his stature and influence was linked with an enormous cadre of students, scientific collaborators, and friends whose careers shaped fields both in mathematics and theoretical physics.

Princeton has a long tradition in mathematical physics, with university faculty from Sir James Jeans through H.P. Robertson, Hermann Weyl, John von Neumann, Eugene Wigner, and Valentine Bargmann, as well as a long history of close collaborations with colleagues at the Institute for Advanced Study. Princeton became a mecca for quantum field theorists as well as other mathematical physicists during the Wightman era. Ever since the advent of “axiomatic quantum field theory”, many researchers flocked to cross the threshold of his open office door—both in Palmer and later in Jadwin—for Arthur was renowned for his generosity in sharing ideas and research directions. In fact, some students wondered whether Arthur might be too generous with his time helping others, to the extent that it took time away from his own research.

Arthur had voracious intellectual appetites and breadth of interests. Through his interactions with others and his guidance of students and postdocs, he had profound impact not only on axiomatic and constructive quantum field theory but on the development of the mathematical approaches to statistical mechanics, classical mechanics, dynamical systems, transport theory, non-relativistic quantum mechanics, scattering theory, perturbation of eigenvalues, perturbative renormalization theory, algebraic quantum field theory, representations of C^* -algebras, classification of von Neumann algebras, and higher spin equations.

Wightman was known for his honesty and his adherence to the highest scientific standards, attributes that he tried to communicate to whoever crossed his path. His lectures in Princeton were legendary for their careful planning and for content that included constant attempts to integrate the latest research directions into his courses. Behind the scenes, Wightman worked tirelessly to encourage Princeton to accept the most talented undergraduates, to improve and to preserve Princeton's famous library of mathematics and physics, and to create a research atmosphere in the department that stimulated outstanding work.

Arthur Wightman also helped shape the future far beyond Princeton. His summer school lectures in Varenna, Les Houches, and Cargèse consolidated or opened up new directions in mathematical physics. During the 1963–64 academic year, Arthur joined Hans Borchers, Harry Lehmann, Henri Epstein, and Jurko Glaser to help the IHES founder Leon Motchane and Louis Michel establish a program in mathematical physics. (The IHES had just moved from Paris to Bures-sur-Yvette.) In 1973, Giorgio Velo and Arthur Wightman began their own series of productive summer schools in Erice.

Arthur encouraged the founding and later served as an associate editor of *Communications in Mathematical Physics*, as well as editing book series for Benjamin and for Princeton Press. Arthur had a compelling interest in the history of science as seen, for example, in the long introduction to Robert Israel's book on the history of convexity in physics. As a member of the board of Princeton Press, he was a key earlier supporter in getting the Einstein Papers project under way. Arthur was the editor of Wigner's complete works published by Springer.

Arthur was born in Rochester, New York on March 30, 1922 and served in the US Navy after graduation from Yale in 1942. He then started graduate school in physics at Princeton intending to work with Eugene Wigner, but since Wigner was spending most of his time then at Oak Ridge, Wightman wrote a Ph.D. thesis on *The Moderation and Absorption of Negative Pions in Hydrogen* under John Wheeler, also with input from his old mentor, Robert Marshak in Rochester. Arthur spent the rest of his academic career at Princeton, eventually as Thomas D. Jones Professor of Mathematical Physics jointly in Mathematics and Physics. During 1951–52 and 1956–57 he visited Copenhagen, where he interacted strongly with scientists in nearby Lund, especially with Gunnar Källén in physics and with Lars Gårding in mathematics. With the latter, he framed the mathematical foundations for the quantum field theory axioms that bear their names.

Arthur's honors include the 1969 Heineman Prize for Mathematical Physics, 1970 election to the US National Academy of Sciences, 1976 Gibbs Lectureship, and a 1997 Poincaré Prize.

Arthur married Anna-Greta Larsson, who was a talented artist and photographer. Anna-Greta, as well as their daughter Robin, died from cancer at a young age. Arthur's second wife of thirty-five years, Ludmilla Popova Wightman, translates poetry from Bulgarian to English. She and his stepson, Todor Todorov, survive him.

Arthur was a pivotal figure in the emergence of modern mathematical physics in the 50's and 60's. In order to mark his passing, the flag of Princeton University flew at half mast for three days.

This (certainly incomplete) list of Arthur Wightman's students is a compilation from several sources, though it relies heavily on the mathematics genealogy web site:

Silvan Samuel Schweber 1952	Jerrold Marsden 1968
Richard Ferrell 1952	Gerald Goldin 1969
Douglas Hall 1957	Eugene Speer 1969
Oscar W. Greenberg 1957	George Svetlichny 1969
Huzihiro Araki 1960	Barry Simon 1970
John S. Lew 1960	Charles Newman 1971
William Stanley Brown 1961	Stephen Fulling 1972
James McKenna 1961	Robert Baumel 1979
Peter Nicholas Burgoyne 1961	Alan Sokal 1981
John Dollard 1963	Vincent Rivasseau 1982
Eduard Prugovecki 1964	Rafael de la Llave Canosa 1983
Arthur Jaffe 1966	Steven Bottone 1984
Oscar Lanford, III 1966	Thea Pignataro 1984
Anton Capri 1967	Jan Segert 1987
Robert Powers 1967	Jay Epperson 1988
Lawrence Schulman 1967	Marek Radzikowski 1992
Christian Gruber 1968	Jan Westerholm 1996

Note: A website has been set up at Princeton:

<https://www.princeton.edu/physics/arthur-wightman>.

for reminiscences of Arthur. Contributions for this site can be sent to Regina Savadge, rsavadge@princeton.edu.

Arthur Jaffe and Barry Simon