David E. Kuhl (1929–2017)

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The invention of tomographic imaging has many fathers* but David Kuhl, MD is the undisputed grandfather of tomographic imaging. Although Godfrey Hounsfield was the recipient of the 1979 Nobel Prize for X-ray computed tomography, the first successful application of rotational tomography was achieved by David Kuhl and reported in his 1958 article in Radiology entitled ''Rotational scanning of the liver.''[1] Working with his colleague engineer Roy Edwards, he made many advances in the concept of ''rotational scanning''. During the period, 1959–1976, approaches to acquire, reconstruct, and display data from multidetector devices were prototypes of the first single photon and positron tomographic imaging devices. The first device was a simple analog instrument. Reconstruction of transverse sections was performed using optical back projection without the aid of computer.[1] Subsequent prototypes became more sophisticated, with multiple detectors and computer-filtered backprojection reconstruction software. The first successful brain and body imaging in a patient was performed in 1964. Current radionuclide tomographic imaging devices are based on concepts developed by Dr. Kuhl.

David Kuhl was born on October 27, 1929 in St. Louis, MO. He grew up in Berwick, PA, where his father was an engineer with the Berwick American Car and Foundry Company, a manufacturer of passenger cars for railroads and trolleys. As a high school student, David had a strong interest in science. As a 6th grader, he organized a science club to share experiments with chemistry sets. In the late 1940s, he was captivated by news reports that thyroid cancer could be treated with radioactive iodine. He decided he would become a physician-scientist in radiotracer research.

In 1947, he won a Westinghouse Talent Search Scholarship. He attended Temple University and graduated in 1951 with a BS in physics. During the period, 1951–1955, he attended the University of Pennsylvania, School of Medicine. As a third-year medical student, he took a summer fellowship in the Radiology Department of the Hospital of the University of Pennsylvania to work with a rectilinear scanner. The standard technique of recording radioactivity with this scanner was mechanically printing dots on paper. David Kuhl thought of a better method. He proposed using a light that flashed with the increasing intensity as the count rate increased, exposing photographic film, resulting in a display of levels of radioactivity as shades of gray. Kuhl's photo recording method became the standard method of displaying images recorded with the rectilinear scanner.

After medical school, internships, and residency (1955–1958), David started a fellowship in Radiology at the Hospital of the University of Pennsylvania (1958–1962). Dr. Kuhl recognized that the two-dimensional projections recorded with the rectilinear scanner superimposed overlying and underlying radioactivity in the patient.

The Members of the History Corner Collaborators members are listed in the Acknowledgement section.

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* Fathers of SPECT: David Kuhl, Roy Edwards, John Mallard, Paul Harper, Gerd Muehllehner, Tom Budinger, Ron Jaszczak, John Keyes, Stig Larsson, Bertrand Brill and probably others.

This realization motivated him to investigate alternative imaging approaches.[2] In 1931, the Dutch radiologist Bernard Ziedses des Plantes (1902–1993) had invented and clinically validated X-ray ''planigraphy'' (i.e., tomography). By moving the X-ray tube and X-ray film in opposite directions, one plane (the fulcrum of rotation) remained in focus, whereas other planes were blurred. As a first-year radiology resident, Kuhl explored whether principles of X-ray tomography may be applied to radionuclide emission imaging.

In 1959, working with Roy Q. Edwards of the Radiology Engineering Department, David designed and built the first experimental transverse section emission tomography instrument. The instrument comprised a single collimated 3-inch NaI scintillation detector, a milling machine to move the detector tangentially, and a turntable to rotate a water-filled cylindrical phantom with a 131-Iodine source.

On August 21, 1959, Kuhl and Edwards successfully reconstructed a transverse section image of the radioactive source.[1]

In 1962, Kuhl completed his radiology fellowship. In 1963, he was appointed the Chief of Nuclear Medicine and Associate in Radiology in the Department of Radiology, University of Pennsylvania. He rose quickly through the faculty ranks and became an Associate Professor in 1967 and a Professor of Radiology in 1970. In 1974, he also became Professor of Bioengineering, in the School of Electrical Engineering of the University of Pennsylvania.

After the successful experiments in 1959, Kuhl and Edwards continued to design and build improved versions of tomographic scanners, the Mark II(1964), Mark III(1970), and Mark IV (1976). The later scanners had multiple detectors, were computerized with sophisticated reconstruction software. These instruments were the forerunners of present SPECT, PET, and CT imaging devices.

Dr. Kuhl's ultimate research goal was to perform functional tomographic imaging of the living brain. In 1972, the group successfully calculated the blood volume of the human brain using Tc-99m-labeled red cells and the tomographic scanner.[3] Dr. Kuhl started collaborating with Dr. Louis Sokoloff of the National Institute of Mental Health in Bethesda and Dr. Alfred Wolf of the Brookhaven National Laboratory to study brain physiology with F18-fluorodeoxyglucose (FDG). The first FDG brain scan of a human subject was recorded with a single photon tomographic scanner at the University of Pennsylvania. To have access to a cyclotron and expert chemistry, David Kuhl moved to the University of California at Los Angeles (1976–1986) where he worked with Michael E Phelps, and later to the University of Michigan, Ann Arbor, MI (1986–2011).

Dr. Kuhl had the hope and expectation that noninvasive molecular imaging would be key to the development of new drugs and personalized treatment of patients.

In 2009, the University of Michigan established the David E. Kuhl Collegiate Professorship of Nuclear Medicine in Radiology.

Dr. David Kuhl published 244 scientific publications, 102 book chapters, and 2 books. He was consistently funded as the principal investigator on NIH grants. He was a founding member of the American Board of Nuclear Medicine (1969).

During his career Dr. Kuhl received many honors and awards. He received the Nuclear Medicine Pioneer Citation, Society of Nuclear Medicine (1976), the Ernst Jung Prize for Medicine, Jung Foundation, Hamburg (1981), the Louise and Lionel Berman Foundation Award for Peaceful Uses of Atomic Energy (1985), was Elected to the Institute of Medicine of the National Academy of Sciences (1989), the Javits Neuroscience Investigator Award, National Institutes of Health (1989), the Georg Charles de Hevesy Nuclear Medicine Pioneer Award, Society of Nuclear Medicine (1995), the Benedict Cassen Prize for Research Leading to a Major Advance in Nuclear Medicine Science, Society of Nuclear Medicine (1996), Outstanding Researcher Award, Radiological Society of North America (1996), the Charles F. Kettering Prize for Outstanding Contribution to the Diagnosis and Treatment of Cancer, General Motors Cancer Research Foundation (2001), the Japan Prize of the Science and Technology Foundation (2009), David E. Kuhl Professorship, University of Michigan (2009).

Dr. David Kuhl retired as the Professor Emeritus in June 2011.

On May 28, 2017, he died peacefully in his home at the age of 87 years.

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