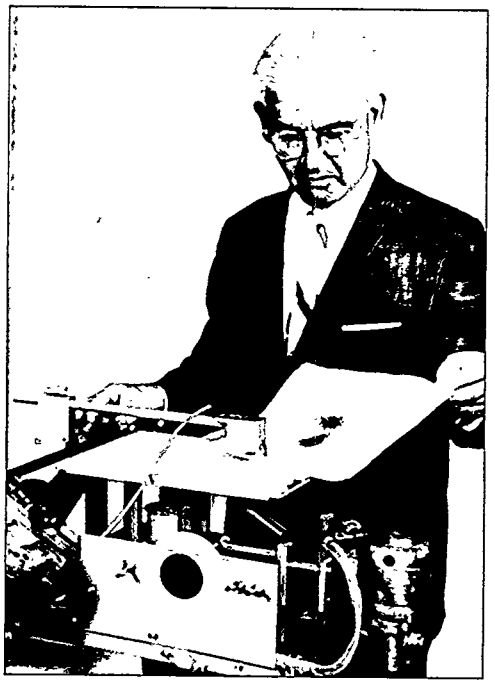
1951 Benedict Cassen and his colleagues developed an automated "rectilinear scanner" to image the distribution of radioiodine in the thyroid gland. This followed on Cassen's construction of the first medical scintillation detector in 1949. The rectilinear scanner would become the workhorse of nuclear medicine for more than two decades.

1951 Iodine-131 became the first radiopharmaceutical approved by the Food and Drug Administration for routine human use.

1951 Frank R. Wrenn, Jr., an AEC Fellow at Duke University, published the results of a positron-counting study that used copper-64 placed within a brain preserved inside its skull—the first study suggesting the medical possibilities of positron emitters.

1952 John H. Lawrence and Cornelius Tobias used a helium-ion beam from Berkeley's 184-inch cyclotron to treat human patients suffering from pituitary tumors. Using particle beams for medical therapy had first been proposed by Robert Wilson in 1946.



GETTING THE INSIDE STORY Benedict Cassen (left) at UCLA and Hal Anger at Berkeley's Radiation Laboratory took major strides in diagnostic imaging by providing practical means for visualizing the distribution of radioactive tracers in the body. Descendants of Anger's camera remain the standard imaging tool of nuclear medicine around the world.

human physiology presupposes a way of observing the invisible emanations of the radioactive tracers. In the experiments of the thirties and forties, primitive by today's standards, the flow of a radionuclide through the body could only be monitored by Geiger counters or similar devices. A true image of the tracer's distribution was only a dream.

In the fifties, however, a new era was ushered in, first by the development of the rectilinear scanner by Benedict Cassen at UCLA, and then by Hal Anger's invention of the stationary scintillation camera at the Radiation Laboratory in Berkeley. Both of these instruments not only detected the gamma-rays (high-energy x-rays) emitted by radioactive tracers, but also precisely identified their origins in the body. Cassen's innovation was the mechanization of the earliest, point-by-point manual scanning techniques. Using his motorized raster-style scanner, Cassen and his UCLA colleagues performed diagnostic imaging studies of the thyroid using iodine-131, as well as some of the earliest scans to look for brain tumors. Anger's more revolutionary step was to build a stationary, cameralike system to do the same job much more quickly. Many of the most commonly used radiotracers, including thallium-201 and technetium-99m, owe their current utility to today's generation of Anger cameras; roughly a quarter of all patients in U.S. hospitals undergo tests using these devices.

The next step was an extension to three dimensions—a step that demanded a practical way of visually reconstructing "slices," or transverse sections, of the body, which might then be "stacked" together to produce a 3-D picture of internal structures. In the end, several contributions, in both instrumentation and computation, converged in what we now know as computed tomography, or CT. One of the earliest contributors was David Kuhl, working in part with AEC and ERDA support at the University of Pennsylvania. In 1959 Kuhl constructed a device that embodied many of the principles of today's single-photon emission computed tomography, or SPECT, instruments. With it,