The Anger Scintillation Camera Becomes Of Age

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"Scintillation Camera" was the terse title appearing on Hal Anger's 7-page paper published in the January 1958 issue of *The Review of Scientific Instruments* (*1*).

He exhibited the instrument in June 1958 in Los Angeles at the Fifth Annual Meeting of The Society of Nuclear Medicine. He displayed it again a week later in San Francisco at the annual convention of The American Medical Association, and the author was fortunate to have made a photograph then (Fig. 1).

The NaI(Tl) crystal fluor transducer was only 4 inches (10 cm) in diameter and ¼-inch (6 mm) thick. It is held in a hand of the inventor* in Figure 2. This crystal was "viewed" through a liquid light pipe by seven multiplier phototubes, each of 1.5-inch (3.8 cm) diameter. The outputs of these phototubes were combined and adjusted by Anger's ingenious signal matrix circuit, which deflected the beam of an oscilloscope to the same *relative* position, before it unblanked and dumped its load of information in the form of a tiny white dot, recorded on Polaroid film. These white dots successively became merged together to form an image of the *relative* distributions of γ-rays as they "squirted out" of the patient and became projected through the pinhole collimator. The ¼-inch (6 mm) diameter platinum pinhole was mounted in the lead housing, which was 1.5-inch (3.8 cm) thick. The Polaroid camera, which normally was focused on the oscilloscope screen, is shown in Fig. 1 when it happened to be lying on top of the electronic console.

The usefulness of this first scintillation camera in nuclear medicine was illustrated in the initial publication (*1*) by four in vivo images of human thyroid glands. These pictures showed abnormal distributions of iodine-131 within the gland that indicated distortions because of disease. In the article Anger

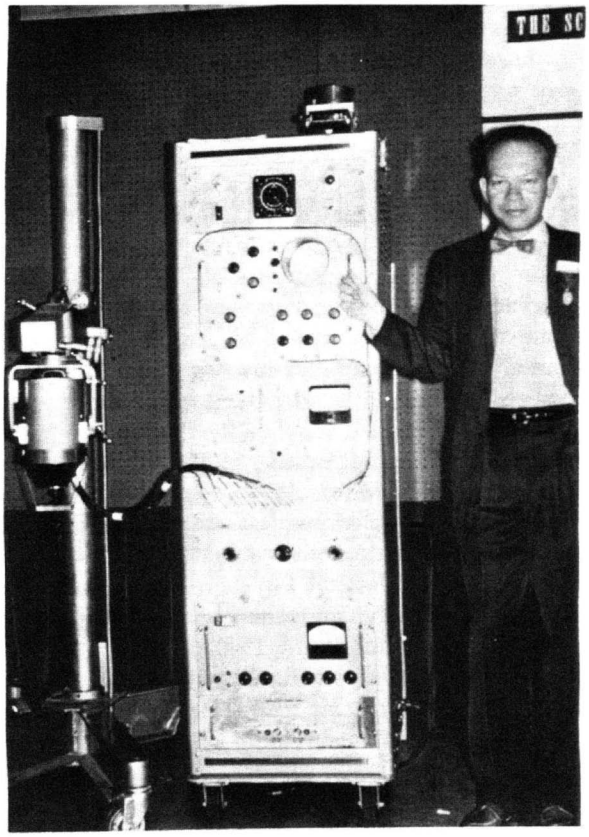

FIG. 1. Hal Anger and his first scintillation camera, which he displayed at the Fifth Annual Meeting of The Society of Nuclear Medicine in June 1958, in Los Angeles.

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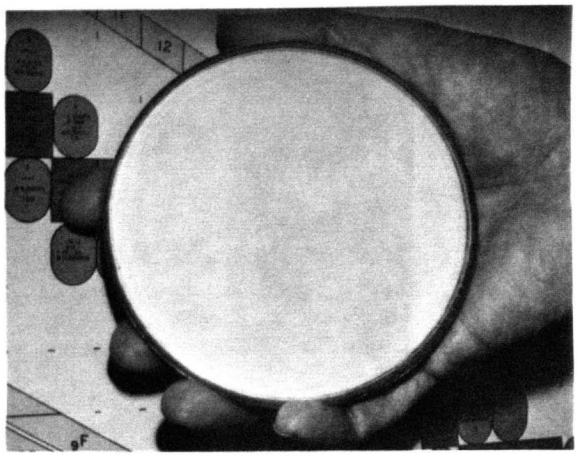

FIG. 2. Four-inch (10 cm) diameter and ¼-inch (6 mm) thick NaI(Tl) crystal used in the first scintillation camera, held in hand of the inventor.

made prophetic projections of ways to improve the performance of his scintillation camera. Those points, which gradually have become incorporated into the evolving scintillation cameras during 21 years, include: (a) thicker scintillator; (b) thicker camera housing to decrease γ-ray penetration and background; (c) phototubes of increased sensitivity; (d) increased numbers of phototubes; (e) persistence screen oscilloscope; and (f) time-lapse motion picture techniques to visualize rapidly changing patterns of distributions of γ-nuclides.

Our efforts during the next year to try to interest several manufacturers of instruments for nuclear medicine to begin production of the Anger scintillation camera were unsuccessful.† Because of our eagerness to exploit advantages of a scintillation camera in our research, Hal Anger generously loaned us the "head" of his first camera in July 1960, since he had an improved version operating by that time. He also supplied the detailed diagrams of his unique signal matrix circuitry, which, together with the additional off-the-shelf components we obtained, enabled us to assemble the first scintillation camera to operate outside of The Donner Laboratory of Medical Physics. This instrument was used in research and teaching at The Ohio State University Hospital during 1960–62.

In the meantime, we finally were successful in May 1960 in contracting with a major manufacturer of nuclear instruments to build an updated counterpart of the scintillation camera then in operation in Anger's laboratory at The University of California, at Berkeley. This first industrially-fabricated scintillation camera was installed in our laboratory at The Ohio State University Hospital in September 1962.

A photograph made at the factory of "Pho/Gamma" No. 1 is shown in Fig. 3. Here one sees the pinhole, the mode in which we used this camera almost exclusively, although a parallel-hole collimator made of lead was supplied also. The NaI(Tl) crystal was 8 inches (20 cm) in diameter and ¼ inch (6 mm) thick. It was "viewed" through a mineral oil light pipe by 19 1.5-inch-diameter multiplier phototubes.

The remarkably good performance of this first instrument enabled us to report briefly (*2*) on our initial applications of a "Scintillation Camera for In Vivo Studies of Dynamic Processes" in Montreal at the Tenth Annual Meeting of The Society of Nuclear Medicine, in June 1963. At the urging of Dr. Paul C. Aebersold, we prepared a more comprehensive report of our early applications in research of this first "commercial" scintillation camera. "Dynamic Studies with a Gamma-Ray Scintillation Camera" was presented (*3*) at the IAEA Symposium on Medical Radioisotope Scanning, held in Athens, Greece in April 1964.‡ Two months later, in June 1964, the manufacturer displayed a greatly improved scintillation camera with NaI(Tl) crystal diameter of almost a foot (30 cm)

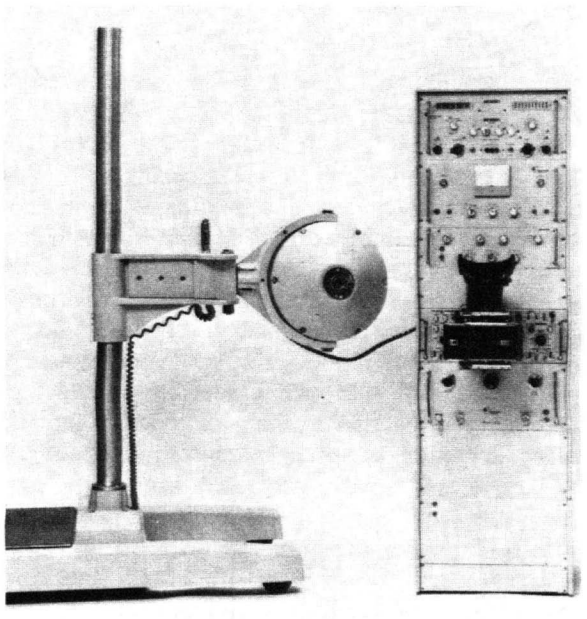

FIG. 3. First industrially-fabricated scintillation camera, photographed at the factory in 1962. One-fourth-inch (6 mm) diameter pinhole is pointed at the viewer. Equipped with 19 1.5-inch (3.8 cm) diameter multiplier phototubes and NaI(Tl) crystal 8 inches (20 cm) in diameter and ¼-inch thick. It was installed in The Ohio State University Hospital in September 1962. Donated to The Smithsonian Institution in Washington in 1971.

and ½-inch (1.3 cm) thick at the 11th Annual Meeting of The Society of Nuclear Medicine, in Berkeley.

Since then, many thousands of scintillation cameras have been installed in hospitals, chiefly, throughout much of the world. These cameras now aid physicians in the diagnostic process for the benefit of many millions of patients annually. The experiences of a physician collaborator in early clinical applications of Hal Anger's scintillation camera moved him to write: "The Anger scintillation camera has revolutionized the practice of clinical nuclear medicine" (*4*).

Only 21 years have passed since Anger described (*1*) his "scintillation camera," and only 17 years have elapsed since the first industrially-fabricated version of it was installed in our laboratory. Historically, no single discovery and invention made during the last two decades has been so pivotal to the emergence of nuclear medicine as a discipline. Anger's instrument was conceived, constructed, and demonstrated only 10 years after Kallmann discovered the scintillation detector in 1947 (*5*) in Germany, and only 9 years following Hofstadter's discovery of the NaI(Tl) scintillator in 1948 (*5*), which became central to the performance of the scintillation camera. As I have previously remarked (*6*), "To me, a fascinating aspect of all his innovation and invention is that Hal Anger so clearly saw *what* needed to be done, and *did* it, long before the medical profession became cognizant of the need. There lies the essence of True Genius!"

ACKNOWLEDGMENTS

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FOOTNOTES

* Photographed by the author on May 11, 1973, when Hal Anger visited our laboratory.

† Since then, three of these companies have become major manufacturers of scintillation cameras.

‡ Subsequently, the pace of improvement became so rapid that, when superior and larger versions became available, the Smithsonian Institution in Washington was pleased with our donation in 1971 of this first "commercial" scintillation camera.

REFERENCES

1. ANGER HO: Scintillation camera. *Rev Scientific Instruments* 29: 27-33, 1958
2. MYERS WG: Scintillation camera for in vivo studies of dynamic processes. *J Nucl Med* 4: 182, 1963
3. MYERS WG: Dynamic studies with a gamma-ray scintillation camera. In *Medical Radioisotope Scanning*, vol 1, Vienna, IAEA, 1964, pp 377-387
4. POWELL MR: In *Nuclear Medicine*, 2nd ed., Blahd WH, ed. New York, McGraw-Hill Book Company, 1971, p 568
5. HINE GJ: The inception of photoelectric scintillation detection commemorated after three decades. *J Nucl Med* 18: 867-871, 1977
6. MYERS WG: From version presented orally of Nuclear Medicine Pioneer Citation—1974, Hal Oscar Anger. *J Nucl Med* 15: 471-473, 1974