NUCLEAR MEDICINE PIONEER CITATION—1975

GEORGE V. TAPLIN, M.D.

By Henry N. Wagner, Jr.

Over two generations ago, the distinguished American thinker Josiah Royce wrote: "You philosophize when you reflect critically upon what you are doing in your world. And what you are doing, of course, is living. And living involves passions, faith, doubts and courage." I shall try to convey the life and times of George V. Taplin, much loved and admired by his friends and colleagues, both at home and abroad, a great innovator who very early saw the potential applications of radioactive tracers in medicine and who has devoted nearly three decades to the invention and development of new radiopharmaceuticals and procedures in nuclear medicine.

Tappy was born in Rochester, N.Y., in 1910, 3 years before Fritz Paneth and George V. Hevesy submitted two papers to the Vienna Academy of Sciences on the use of radioelements as indicators in analytical chemistry. Hevesy had been given the task of separating radioactive lead from stable lead, an impossible assignment that he parlayed into the Nobel Prize by inventing the tracer concept. Tappy's father was a Canadian physician descended from one of the sons of Colonel Rufus Taplin of the Massachusetts militia. During the American revolution several of the Colonel's 21 children left for Canada, while others remained with the colonists. After graduating from McGill Medical School, Tappy's father moved to Rochester, N.Y. Unfortunately he died when Tappy was 3 years old.

Tappy began thinking about being a doctor when he was 12. He was influenced greatly by his dentist uncle, Harold Bowman, who had been like a father to him, and by his father's partner, a surgeon named Thomas Jamison. Tappy did not make up his mind until he was 17, and it was not an easy decision. Music has always played an important part in his life. He studied violin and viola for 5 years at the Eastman School of Music in Rochester and has played the trumpet since he was 14 years old. He remains a card-carrying member of the Rochester Musicians Union, which he joined in high school in order to play in dance bands. He worked his way through high school, college, and medical school by playing the trumpet. To him music was an avocation and a means toward his vocation as a physician. He ended his career as a professional musician when he became an intern at the University of Rochester, although he picked up his trumpet again in the Army during World War II. Today he plays the trumpet once a month as a charter member of a Dixieland band made up of eight friends who have played together for over 15 years. Their high point each

year is when they perform for the Wives Club of the UCLA Medical School faculty at the Bel Air Country Club.

Tappy's mother was a schoolteacher who grew up on a farm. She was a religious person and a disciplinarian. Although Tappy himself is not formally religious, having dissociated himself from his strict Presbyterian upbringing when he left high school, the ethical standards ingrained in him by his mother have stayed with him throughout his life. From his uncle and his father's physician friends, Tappy developed his love of independence; from his mother he learned perseverance and determination to achieve his full potential.

Tappy decided to become a doctor in 1927, the year Lindberg flew from New York to Paris. It was also the year in which Blumgart and Weiss first performed their studies of the velocity of the circulation with radon solutions, the first radioactive studies in man, preceding by over a decade the use of radioactive tracers in the study of the human thyroid and by 7 years the discovery of artificial radioactivity.

Tappy attended Union College in Schenectady, N.Y., an excellent college known especially for its superior program in engineering. History and English were his favorite subjects there, although he also liked chemistry, biology, and comparative anatomy. In his own words, he was not a "super student," but liked to figure things out for himself. Surprisingly, his worst subject was bacteriology, a discipline that was to lead him into a lifetime of biomedical research.

Tappy remembers well his chemistry teacher in college, a Dr. Ellery, who influenced many of his students to become doctors. After graduating from Union, Tappy went to the University of Rochester School of Medicine, where he came under the influence of George Berry, then Professor of Bacteriology at Rochester and later Dean at Harvard, William McCann, Professor of Medicine, and George Whipple, the Nobel Laureate who was then Dean of the Medical School at Rochester. McCann was interested primarily in renovascular hypertension, which started the fermentation in Tappy's mind that led to his subsequent pioneering development of Hippuran renography.

As early as his residency at Strong Memorial Hospital in Rochester we can see characteristics that have persisted throughout his career. He concentrates on applied rather than basic research. Stimulated by giants such as George Whipple and George Berry, he attacked the number one disease of the time, pneumococcal pneumonia, which was, to quote Tappy, "captain of the men of death." In those days, pneumonia was as serious a problem as heart disease and cancer are today. The mortality from pneumonia was 40% in general and 80% in the ward population of Strong Memorial Hospital, and the wards were full of these patients. A new treatment—specific antisera—had been introduced just as he was starting his internship. It required isolation of the infecting organism and determination of which of 32 possible serologic types was present. This required hours of laborious observation of swelling of the pneumococcal capsule. Tappy set out to speed up the process. By concentration techniques, he was able to reduce the procedure to 20 minutes and, again to quote him, "to see before my eyes the mortality fall to 5%." On January 12, 1939, he was given a prize by the Rochester Academy of Medicine for his medical thesis entitled, "Revised Technique for the Laboratory Diagnosis and Control of Serum Therapy in Pneumonia."

This pattern has been repeated often throughout his career: selection of a major problem, dissatisfaction with existing methods, creative insight into a possible solution, laborious efforts, and finally recognition of his success. He was so successful that as an assistant resident in medicine he was placed in charge of the infectious disease ward and the bacteriology department at Strong Memorial Hospital. An article in the Rochester newspaper of January 22, 1941, stated: "The bright hope of further reduction in deaths from pneumonia in 1941 shone before Rochester residents today. Physicians held out that hope last night at a Pneumonia Institute at the Academy of Medicine . . . Dr. George V. Taplin pointed out that gains were particularly impressive in treatment of children and infants suffering from the disease . . . Dr. Taplin explained that the physician has two strings to his bow." He was referring to serum and the other new approach, sulfaniliamide treatment.

For 3 years after medical school Tappy spent much of his time in pneumonia research at Strong Memorial Hospital; he then decided to go into practice. His first day in practice he was referred 15 patients with pneumonia because of his reputation as *the* expert in the treatment of pneumococcal pneumonia. He practiced for 3 years as a consultant in internal medicine while retaining a part-time faculty position at the University of Rochester. In 1942, he joined the United States Army. Because of his extensive background in infectious diseases, he was sent to Michigan to learn about malaria. He thought that he was headed for the Pacific theater but was shocked to find himself on a boat headed for England. A typical snafu, he thought, a term widely used during World

War II, but when he got to England he met troops returning from the North African Theater of Operations, where malaria was frequent and severe. Tappy was attached to the 115th Station Hospital of the 29th Division, one of the most illustrious in the history of the U.S. Army and from Maryland. While in England, he continued his research on pneumonia.

It is interesting that many practical and even fundamental contributions to medical knowledge have been made by talented, well-trained individuals under the most adverse circumstances, illustrating that "the nature of the cage need not determine the song of the bird."

On January 15, 1944, Colonel William S. Middleton, Chief Consultant in Medicine of the European Theater of Operations, wrote to Tappy's commanding officer, Lt. Col. Fourrier: "The meeting was a very stimulating one. I particularly enjoyed the scholarly presentation of penicillin therapy . . . the performance of Captain Taplin was most heartening. He handled a very difficult subject in a masterly fashion and lived up to my earlier estimates of his capacity."

World War II meant many things to Tappy—a 30-month separation from his family and repeated danger going through mined harbors to meet the wounded troops arriving in Falmouth, England, and being exposed to sniper fire in Frankfurt, Germany, in 1945. But it also was the period in which he exhibited a trait conspicuous in all great investigators. As Sir Michael Foster, in writing of Claude Bernard, expressed it, "His instinct guided him to leave the road at the right turning, and follow a by-path which brought him to a great result."

As is so often the case, wartime research was to result in one of the greatest achievements of all time, the development of penicillin. We can picture the excitement of the times: Fleming as chairman of the Penicillin Trials Committee of the British Research Council directing the broad application of this wonder drug to the treatment of pneumonia, wound infections, diphtheria, and venereal and other diseases.

After Tappy returned to Rochester, he became interested in administering penicillin by aerosol. He collaborated with an engineer, Fred Bryan, an internist with the newly formed U.S. Atomic Energy Commission. It was Fred who persuaded Tappy to join Dean Stafford Warren at the new medical school at UCLA. Warren had gone to UCLA in 1947 to found the medical school, which 28 freshmen entered in the fall of 1951. After only 4 years in California, Tappy was at it again—getting awards for his research. In the November 12, 1951, edition of *Fortnight* magazine, Tappy was elected one of California's Top Performers of 1951. The citation read:

> Dr. George V. Taplin, experimenting with rabbits at the UCLA Medical School Atomic Energy Project, showed that the normal mechanisms of lung clearance give a seven or eight to one "safety factor" for persons exposed to radioactivity. Obtaining an "artificial atomic dust" composed of particles of the only dangerous size, Dr. Taplin found all particles were removed rapidly from the upper respiratory passages and all but 15% to 20% were removed from the lungs proper within 72 hours after 30-minute exposure.

Medical rather than public health problems attracted Tappy, however, and he continued to work on the development of aerosolized penicillin-lactose. He points out the difference between the rapid development of this agent to the point of commercial availability and nationwide distribution within 1 year, and the present situation where it has taken him a year to get ^{99m}Tc-labeled tin-lactose aerosol past the University human investigations committee.

Tappy has been with the Atomic Energy unit at UCLA since he went there as an Associate Professor of Medicine in 1947. The UCLA Atomic Energy Project was upgraded in 1958 by Joe Ross, who succeeded Stafford Warren as its director and greatly influenced the further development of Tappy's work. Dr. Andrew Dowdy had been appointed Chairman of the Department of Radiology, and in 1958 Tappy entered radiology as a full Professor. He began an association with Bob Bennett that has continued ever since. The two fair-haired boys—Taplin of Warren and Bennett of Dowdy—were to make UCLA a fountainhead of nuclear medicine. Typically, just as the field was about to blossom, the Department of Internal Medicine decided that atomic medicine should be divorced from the Department of Medicine. Fortunately, radiology awaited with open arms. The research accomplishments of George V. Taplin in the field of nuclear medicine, as it has come to be known, are familiar to all of you. He began his modern period with studies of the blood clearance of intravenously injected colloids. He invented the radioiodinated rose bengal test for liver function using external gamma ray scintillation counting. He invented the radioisotope renogram as a test for individual renal function. In my opinion, Tappy deserves the title of Father of Dynamic Function Tests in Nuclear Medicine.

He admits that he originally did not think much of scanning. When his colleague at UCLA, Benedict Cassen, invented the first scintillation scanner in 1950, Tappy did not think that it was "worth a damn," although he himself used it in the study of

the tracheal distribution of radioiodinated bacteria the same year it was invented.

Tappy soon changed his opinion and in 1964 reported the use of suspensions of radioalbumin aggregates for photoscanning the liver, spleen, lung, and other organs. In 1966 Tappy returned to his first love, inhalation of aerosols, and reported the use of radioaerosol inhalation in lung scanning. He has continued to make important research and clinical contributions, primarily in the field of lung, liver, and kidney, his most recent contribution being a comparison of the relative roles of inhalation, xenon, and perfusion lung imaging.

I shall not dwell on these, since they are all well known. I would rather ask: What makes Tappy tick? How has he been able to accomplish so much? These are difficult questions to answer, but it is fun to try. Clearly he fits the model of the explorer-adventurer-pioneer-researcher. He is resourceful: for example, he used a bicycle pump to aerosolize particles and a kitchen microwave oven to aggregate albumin particles. He is unwilling to be satisfied with the status quo: he did not like sitting up all night typing pneumococci. He is willing to take risks: he went to the new medical school at UCLA 4 years before the first students arrived. He loves freedom: he works primarily in a research institute, but makes certain that patients are always available, at both Harbor General and University Hospitals of UCLA. He reserves enough time for carrying out his research, limiting his administrative duties even now to 25% of his time. He accepts responsibility toward his field: during his Presidency of the Society of Nuclear Medicine he achieved major gains in smoothing the transfer of regulatory control from the AEC to the FDA. He is rich in ideas, considerate of his students, friends, and colleagues, and versatile in bridging many disciplines, from infectious diseases to nuclear physics. He is always humble. Curiosity, inventiveness, dissatisfaction with present technology, and dedication to work have been his major characteristics. He has lived up to his New England forebears in declaring: "I want to know. I want to improve. I want to help." Instead of accepting things as they are, he gets to work to improve them. He has worked steadily to realize his idea that technology can help sick people. He shares the qualities of all great scientists and inventors, with poets and artists, who exercise gifts of penetrating insight and ingenuity. Much of his productivity in research has been due to his variety of experience. He loves to travel, another manifestation of his curiosity and friendliness. He has friends and admirers all over the world.

For all these reasons, Tappy has been chosen to receive the Nuclear Medicine Pioneer Citation of the Society of Nuclear Medicine for 1975.