THE AMERICAN MINERALOGIST, VOL. 50, MARCH–APRIL, 1965

MEMORIAL OF ISIDOR FANKUCHEN

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On June 28, 1964 in Maimonides Hospital in Brooklyn, I. Fankuchen succumbed to cancer after a fortnight of hospitalization. On that day crystallographers the world over suffered a grievous loss. American crystallography, without "Fan," will never be the same again. American crystallography, without him, would not be what it is today.

Isidor Fankuchen was born in Brooklyn, New York, on July 19, 1905. His parents were of modest means: young Isidor, who had two brothers, Leon and George, cannot be said to have been spoiled! Intelligent and a hard worker, he was admitted to Cooper Union, where he obtained his B.S. in 1926. He attended Cornell University as Hecksher Fellow (1929–33), married Dina Dardick in 1931, and received his Ph.D. under C. C. Murdock in 1933. He went to England for post-doctoral study, as a Fellow of the Schweinburg Foundation. He worked in Manchester (34–36) under Sir Lawrence Bragg, at the Crystallographic Laboratory in Cambridge (36–38) and at Birkbeck College in London (38–39) under Professor J. D. Bernal. Back to U.S.A. he held a National Research Fellowship in protein chemistry at the Massachusetts Institute of Technology (39–41), was associate director of the Anderson Institute for Biological Research in Red Wing, Minnesota (41–42), and joined the faculty of the Polytechnic Institute of Brooklyn in 1942. (That year he was awarded a second Ph.D., from Cambridge University.) At the Institute he became the Head of the Division of Applied Physics in 1946.

First and foremost Fankuchen was a teacher. He taught *all* the time! But what a magnificent teacher he was, what forceful drive, infinite patience, and contagious enthusiasm! He organized a monthly seminar, which he called the "Point Group" in tribute to the English "Space Group" it was to emulate. The Point Group became a thriving institution, which drew its audience not only from Brooklyn and the New York metropolitan area, but from the whole Eastern seaboard. Brooklyn attracted such men as P. P. Ewald (in 1949), R. Brill and David Harker (in 1950); with H. F. Mark already there, it turned into a teeming center of crystallography, where many outstanding crystallographers were trained.

In addition to his regular lectures during the academic year, Fankuchen launched a two-week summer course in x-ray diffraction, aimed primarily at full-fledged technicians and scientists in other disciplines. Research people of all kinds flocked to his laboratory. Professor Fankuchen was a realist: he knew he could not lure outside scientists to

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Brooklyn for more than two weeks, but he also knew just what he could give them in two weeks. The impact of this course on our scientific community has been startling: "Fan's two-week wonders" would return to their respective institutions, with a basic understanding of crystallography and an appreciation of what *x*-ray diffraction can do. One of them —the one who really made his master proud—is a journalist, a well-known science editor, who got enough inspiration out of the course to want to publish a crystal structure (He did!). In 1963 Fankuchen's former students presented him with a *Festschrift*, in the form of special issues of the *Norelco Reporter*.

Among Fankuchen's scientific contributions are many crystal structures. He was especially concerned with macromolecular compounds and with polymers; with low-temperature studies and with instrumentation. With Bernal and co-workers he showed that solutions of tobacco mosaic virus in capillary tubes behave as two-dimensional crystals with nematic structure and that tomato bushy-stunt virus crystals are body-centered cubic, with a large cell, which contracts on drying. In the field of water-soluble proteins, the striking 5°-oscillation pattern of a single crystal of wet chymotrypsin, published in 1938 (with Bernal and Perutz), will long be remembered! The monumental steroid monograph (with Bernal and Dorothy Crowfoot) gives crystal data for over eighty sterol derivatives.

I particularly remember his exquisitely fine work on fibers (natural and synthetic, chain polymers, fibrous proteins, etc.), for which he used a microbeam and devised his *x*-ray microcamera (which I built with his help during the war). Fankuchen was skillful with his hands (a pay-off from the time he put himself through school by working in a radio shop) and loved building all kinds of laboratory gadgets: the "twiddler", the "guillotine", the "heating wire", and others! He was the complete crystallographer, insisting that all available tools must be used to correlate structure, optics and morphology. In instrumentation we owe him the condensing monochromator and a widely used device for taking *x*-ray diffraction patterns at low temperatures. The dental profession can thank him for many investigations of teeth and bones. As mineralogists we will remember his work on the stilpnomelane minerals and his low-angle scattering study of chrysotile.

From 1948 on, Fankuchen served as American editor of *Acta Crystallographica*. He examined about 1500 manuscripts in the last sixteen years, reading every one of them, nearly always submitting his own judgment to his carefully chosen referees while requesting their independent appraisal. Thanks to his keen critical sense and his absolute scientific integrity, he fulfilled his editorial duties with unusual distinction and success.

He did other things for the profession: he created the Polycrystal Book Service, where any crystallographic book can be purchased, and organized an Employment Service, which he ran benevolently for many years.

Fankuchen was a fellow of our society. A charter member of the American Society for *X*-Ray and Electron Diffraction and of the Crystallographic Society of America, he became the first president of the American Crystallographic Association, after the two societies merged in 1950. He was the chairman of the USA National Committee for Crystallography and had been a member of the American delegation to nearly all the international congresses of crystallography. He was invited to spend four months of 1954 at the Weizmann Institute of Science. He was a member of the American Chemical Society and of the Société française de Minéralogie et de Cristallographie; a fellow of the American Physical Society, the Physical Society (of London), the American Association for the Advancement of Science, the New York Academy of Science, and the Harvey Society.

As a man Fankuchen had a warm and outgoing personality. His kindness and helpfulness to all, but especially to students (even high-school kids) and to newcomers in the field, were legendary. Besides his boisterous friendliness, he had other human qualities that endeared him to all: he was a family man, good to his wife and proud of his son Arthur; he loved his work; he was tolerant, yet spoke his mind; and he strove for social justice. During the last three years, his unflinching and smiling courage compelled admiration: aware though he was of his merciless illness, he took his great suffering in stride, never permitting it, till the very end, to alter the course of his life or of his work. "Fan", the good teacher, taught us more than *x*-ray diffraction!

The *Fankuchen Memorial Fellowship in X-ray Crystallography*, established by the contributions of his many friends, will perpetuate his name at the Polytechnic Institute of Brooklyn.

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MEMORIAL OF ARTHUR AUGUST PEGAU

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Arthur August Pegau, former teacher of mineralogy and petrography at the University of Virginia and a member of the Virginia Division of Mineral Resources, formerly Virginia Geological Survey, died in Charlottesville, Virginia on May 26, 1963. Because of ill health, he had been inactive for a number of years, but his sudden passing shocked his many friends.

Arthur Pegau, son of August H. and Lucy McKee Pegau, was born on March 17, 1894, in Port Walthall, Chesterfield County, Virginia. After graduating from high school at Chester in 1915, he entered the University of Virginia and earned the B.A. degree in Natural Sciences in 1919 and the M.A. degree in Chemistry and Geology in 1921. To broaden his background in science he continued as a post-graduate student at the University of Virginia and took special courses in mathematics, physics, physical chemistry, and geology during the 1921–'22 session. At the close of the session he was awarded the Bennett-Green Fellowship for foreign study, with a tenure of four years. However, due to post-war

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conditions, he was unable to study abroad and chose Cornell University to pursue his studies in mineralogy, petrography, economic geology, and physical chemistry. After receiving the Ph.D. in geology from Cornell University in 1924 he was invited to join the teaching staff of the Department of Geology of the University of Virginia—a position he held until 1948.

As a student and as a member of the staff in the Department of Geology he had the distinction of instructing in the laboratories of biology, 1917–'19; chemistry, 1920–'21; and physics, 1943–'45. From 1926 to 1948, Dr. Pegau served on a part-time basis as mineralogist for the Virginia Geological Survey and as a full-time member of the Survey from 1948 to his retirement in 1960. One of his duties, while associated with the Survey over a period of about 35 years, was to examine and report on specimens of minerals, rocks, and ores sent to the offices by residents of the Commonwealth.

Dr. Pegau's field investigations and most of his geological interests were in the Virginia Piedmont. During the early part of his career he made geologic maps of the Chatham and Danville quadrangles, which were incorporated in the 1928 edition of the Geologic Map of Virginia, and made extensive studies of the Petersburg granite and adjoining rocks in the southeastern part of the Piedmont. His interest in pegmatite deposits began in the early twenties and the results of these investigations were described in his dissertation for the Ph.D. in 1924 and in Bulletin 33 of the Virginia Geological Survey.

Dr. Pegau was primarily a teacher and it was to his students, both at the graduate and undergraduate level, that he willingly devoted most of his time and energy. His gentle manner, good humor, and especially his ability to present scientific subject matter in simple terms will long be remembered and appreciated by his students, including the writer.

He was a fellow of the Mineralogical Society of America, of the Geological Society of America, and of the American Association for the Advancement of Science and a member of the Virginia Academy of Science, American Association of University Professors, Sigma Gamma Epsilon, and the Society of the Sigma Xi.

On June 29, 1927, he married Susan Wills, who survives together with their daughter, Lucy Byrd of Farmington, Conn.; two brothers, Dr. Paul M. Pegau and Henry H. Pegau of Woodbury, N. J.; and two sisters, Mrs. Paul Hyman of New Mexico and Miss Edith Pegau of New Jersey.

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MEMORIAL OF CHESTER BAKER SLAWSON

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For nearly forty years one of the most energetic and vital figures in mineralogy at The University of Michigan was Chester Baker Slawson, better known to his friends and colleagues as "Chet". His death on March 12, 1964, at St. Joseph Mercy Hospital in Ann Arbor brought to an end a brilliant career as teacher, counsellor, research scientist, and consultant in industrial diamonds and strategic minerals.

To express adequately what this man meant to so many of us who had been privileged to know him is not only difficult; it is virtually impossible. The incidents which one recalls have such a personal flavor that they belong to those individuals who experienced them. Each of us who was associated with him will remember his boundless energy, his willingness to help those willing to help themselves, his personal interests in his students, his sense of fairness, and his generosity. The number and variety of his friendships were legendary.

In July, 1963, Chet had completed a teaching assignment in the summer session at the University and had gone to his cottage in Leelenau County, near Northport, to relax and make final preparations for his last sabbatical leave from his teaching post at the University. Plans were under way for a trip to South Africa via England; but in August, his health became impaired, and by September, hospitalized in Ann Arbor, he cancelled plans for his trip. Hopefully, he would resume his teaching in the spring; his leave could be rescheduled; but it was not to be.

The esteem with which his former students regarded Professor Slawson was evidenced by the number of them who travelled long distances to attend the memorial services held on March 15, 1964. Scores of letters, telegrams, and cards came both to the Geology and Mineralogy Department and to his widow, Ethel F. Slawson, most containing not only words of sympathy but recollections of pleasure and reminiscences of associations with Professor Slawson.

It is significant that on that Sunday afternoon, following the services, was initiated the plan for a living memorial to Chester B. Slawson by seven of his former students, Ph.D. mineralogists who wished in some material way to help others, particularly mineralogy students of succeeding generations, as Professor Slawson had so many times aided them when they were on campus. Thus it was that on the following Monday morning, arrangements were made to establish the Slawson Memorial Fund at the University. This fund rapidly became a reality as contributions have been received and it was formally set up in May, 1964. The

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main purpose of the fund is to provide assistance in various ways to students, thus perpetuating Professor Slawson's ideals.

Chester Baker Slawson was born in Greenville, Michigan, April 21, 1898. He received all of his academic degrees from The University of Michigan: the B.S. in 1919, the A.M. in 1920, and the Ph.D. in 1925. His dissertation, completed under the direction of Professor Edward H. Kraus, was on the *Thermo-Optical Properties of Heulandite.* He joined the faculty of the Department of Mineralogy of The University of Michigan as an instructor in 1920, leaving in 1921 to serve as a geologist for the Michigan Geological Survey and to work as Michigan high school representative for the American Book Company. In 1925, he rejoined the faculty of the Department of Mineralogy of The University of Michigan as instructor and was promoted to the rank of assistant professor in 1931. In 1939 he became associate professor and in 1946 was advanced to full professorial rank.

His first love in teaching was his course in optical crystallography, which he approached in a very sound and fundamental manner. Close to this was his course in gems and gem materials. In his teaching and in his research he displayed his excellent working knowledge of traditional quantitative chemical analysis. He not only served the University ably as a teacher of mineralogy, crystallography, and petrology, but also as an academic counselor from 1937 through 1946.

Professor Slawson had a deep and abiding interest in the problems of students, not only those he taught, but also those he counseled so ably both formally and informally. For some he arranged financial support that permitted their entering or continuing at the University; for others he solved complex personal problems; for still others he arranged solutions to legal matters. He seemed to know everyone and everything and he enjoyed nothing more than to use his influence and his knowledge to help someone in need. Troubled students or friends could always count on Chet for sympathetic and helpful advice and for tangible assistance if that was needed. Long after the problems had been solved, or even long after the students' graduation, he maintained close, interested, and personal contacts.

As a student Professor Slawson pursued advanced courses in several cognate fields so that he was unusually qualified during World War II when there arose a need in the University for additional instructors in special fields. He was competent to conduct sections in mathematics in both the Literary and Engineering Colleges (1943), and likewise in chemistry in both Colleges (1944–1945).

Professor Slawson was widely known for his intensive researches in all aspects of the mineralogy and crystallography of diamonds. During

World War II, from 1943 to 1945, he served with the National Academy of Science, War Metallurgy Committee and the National Research Council. His efforts during this period were related mainly to the solution of problems of diamond wire die production and the general utilization of industrial diamonds. From 1949 to 1954 he served as a technical adviser for the Diamond Research Laboratory of Johannesburg, Republic of South Africa.

Professor Slawson was employed as a geologist for the Michigan Geological Survey in 1924–1925, with summer appointments from 1926–1928. Since 1951 he was a consulting geologist with the U. S. Bureau of Mines. As a Bureau consultant, his major contribution was the introduction of oriented diamonds in diamond-drill bits, an accomplishment which has not only materially added to the life of diamond-drill bits, but which has resulted in large monetary savings to the petroleum and mining industries. In 1957 he was named chairman of the National Academy of Science—National Research Council's Panel on Industrial Diamonds. In this capacity he directed the preparation of reports on the quality, uses, and properties of the newly developed synthetic diamonds.

Professor Slawson traveled widely in Africa and in South America. During his visit in Africa from 1950 to 1951, he examined the producing diamond mines of both South Africa and South West Africa. He acted as United States representative to Mawadui, Shinyanga Territory, Tanganyika, during the summer of 1952. In 1955 he visited the diamond fields and the gem deposits of the state of Minas Gerais in Brazil, and in 1957 he examined the diamond-producing fields of Sierra Leone, Ghana, and the Congo (Belgian).

Because of his numerous contacts with various governmental agencies and the diamond industry, Professor Slawson was largely responsible for introducing sponsored research to the Department of Mineralogy. As a result of his efforts, the department was able not only to secure funds for modern equipment but also to support numerous graduate students. It is not incorrect to state that his efforts were largely responsible for beginning the modernization of the department and its equipment. Numerous publications from the Department of Mineralogy were a direct result of the research supported by many of the sponsored research grants and contracts which he was able to procure.

He was co-author of a highly successful book entitled *Gems and Gem Materials*, now in its fifth edition. His published scientific papers deal with, among other topics, descriptive mineralogy, mineral synthesis, the dispersion of Michigan glacial drift, the geology of Michigan salt beds, optical mineralogy and crystallography, the vectorial properties of crystals, crystal hardness variations, and piezobirefringence. In addition

to his publications, he was author and co-author of numerous unpublished scientific reports, both to industry and to several government agencies.

He was active during the organization and formative years of The University of Michigan Science Research Club, serving as its secretary, treasurer, vice-president, and president. He also served as secretary to the Research Club from 1942 to 1945. He was one of the founding members of the Michigan Chapter of the honorary fraternity for geology students, Sigma Gamma Epsilon, and also was active in the affairs of Gamma Alpha, the graduate scientific fraternity. He was one of the founding members of the Mineralogical Society of America in 1919 and later was elected to Fellowship in this Society. He served this Society as a member of its council from 1956 to 1959. Informally, he gave additional important service to this Society as an active member of its Committee for One Hundred, which concerned itself with increasing the endowment of the Society. He was a Fellow of the Geological Society of America, a charter member of the Geochemical Society, and was honorary vice-president of the Gemmological Association of Australia. Other memberships he held were in Phi Beta Kappa, Phi Kappa Phi, and Sigma Xi. He was an Honorary Member of the Michigan Mineralogical Society. For many years he was associated in various capacities with the Gemological Institute of America, serving as a member of its certification board beginning in 1934. Since 1933 he was a trustee of the Cranbrook Institute of Science of Bloomfield Hills, Michigan.

In Professor Slawson's active career in teaching, counseling, and research, he always found time to discuss scientific problems with his colleagues, and to offer helpful suggestions regarding their research. He was very much interested in the growth of the department and was instrumental in effecting the merger, in 1961, of the Department of Mineralogy with the Department of Geology. He was elected a member of the first Executive Committee of the combined department.

Professor Erich Walter, at the memorial service, stated that Chet always looked like a man who knew where he was going. He was able to look squarely at life with great understanding. He recognized things as they are, not necessarily approving all, but without the ardor of the reformer, or the cynicism of the skeptic.

He was scientifically honest beyond reproach, and he never succumbed to the practice of compromising his principles, though temptations were by no means absent. During his work which led to the publication in 1953 of "Synthesis of Graphite at Room Temperature," he obtained in the diffraction pattern of the reaction products, the stronger diamond lines. Since he was unable to duplicate the results, and since he was well aware

that his research assistants had a sense of humor, the result was never reported. None of the very able students of that time has ever confessed to the suspected deed.

An account of Chet's varied interests and activities would be incomplete without mentioning his prowess in swimming, an ability that gave him great satisfaction. Until recent years, he still prided himself on his form and speed in the University pool. For years he was an active member of the University Faculty Men's Club, almost daily joining friends from other departments and colleges for lunch and bridge. He also liked to demonstrate his mechanical ability in constructing devices useful at "the farm," as he called his beautiful summer place on Lake Michigan. It was the writer's pleasure to help with the design and construction of a water wheel used for pumping water at "the farm." One of his pleasures was in sharing with his friends the facilities at the Lake Michigan home. Were it possible to confer with others of Professor Slawson's friends, the list of stories beginning "I remember when" would extend through countless pages.

He is survived by his wife, the former Ethel Fralick, at home in Ann Arbor; a son, William F. Slawson, Professor of Geophysics at The University of British Columbia, Vancouver; and a daughter, Mary E. (Mrs. Donald H. Duff) of Hinsdale, Illinois.

Chester Baker Slawson's influence as a teacher will be long felt in the field of mineralogy. He is mourned and will be missed by all who knew him. The world cannot but be a little better for his having been here.

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THE AMERICAN MINERALOGIST, VOL. 50, MARCH–APRIL, 1965

MEMORIAL OF HERMAN YAGODA

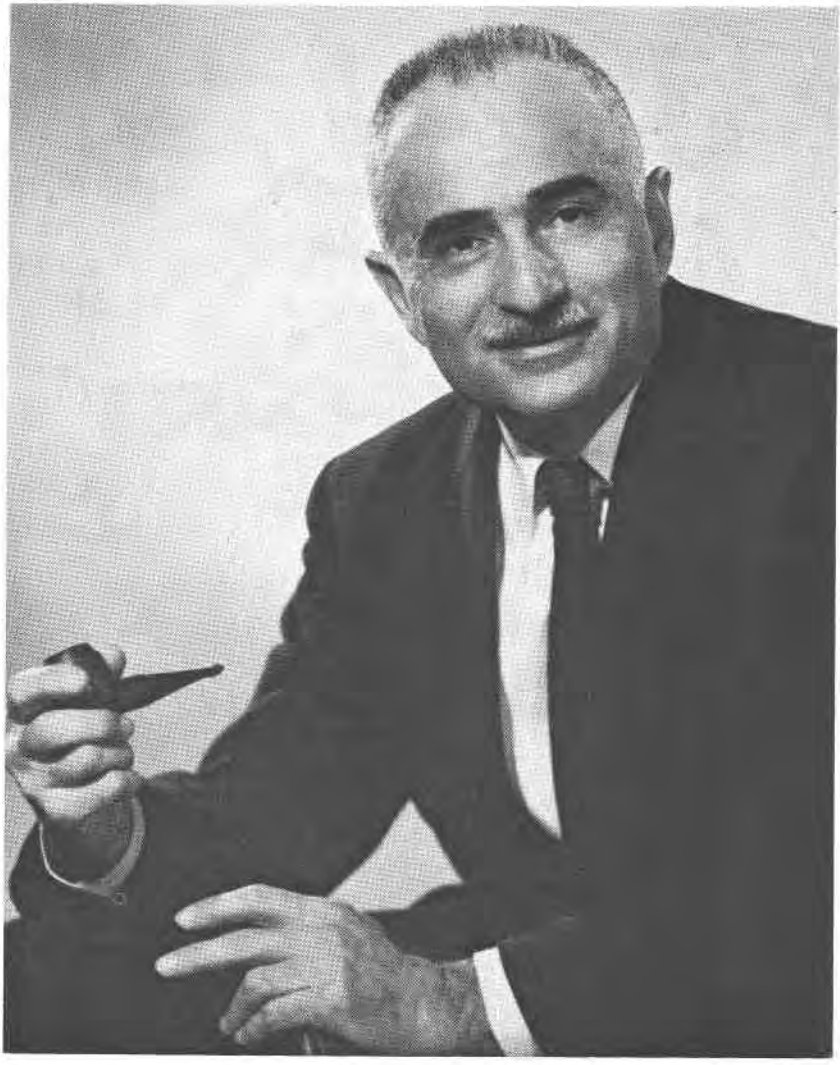
MICHAEL FLEISCHER, *U. S. Geological Survey, Washingtno, D. C.*

Herman Yagoda, a member of this Society since 1946 and a fellow since 1949, was killed in an automobile accident on June 13, 1964, a few days before his 56th birthday. His many friends mourn the tragic loss of this brilliant and versatile chemist, who contributed notably to analytical chemistry, mineralogy, toxicology, and physics, including radioactivity and cosmic radiation.

Yagoda was born in Zambrowa, Poland, June 19, 1908, but was brought to this country by his parents at the age of three. He was educated in the public schools of New York City, at Cooper Union, where he was graduated *cum laude* in 1929 with the degree of B.S. in chemical engineering, at New York University where he was awarded the M.S. degree in 1931, and at Columbia University, where he held the Baker Fellowship in Analytical Chemistry in 1935–36. He was an instructor in chemistry at New York University 1929–31, chemist with the Fales Chemical Co., 1931–35, chemist with the U. S. Customs Laboratory in New York, 1936–41, associate chemist to senior physical chemist at the National Institutes of Health, Bethesda, Md., 1942–58, and physicist, Air Force Research Laboratory, Bedford, Mass., 1958–64.

Yagoda was a creative and imaginative scientist, as attested by some eighty scientific papers, a selection of which is appended. It happened that he had to spend a considerable part of his career on what would generally be considered to be "routine" analytical work. During this period he not only contributed many new methods of analysis for both inorganic and organic materials, but worked in his own laboratory at home developing microchemical techniques, especially for the localization of chemical elements and radioactive materials. The papers that resulted were sometimes referred to jocularly as products of the "Yagoda Institute." He had long been interested in mineralogy, an interest that was encouraged by the well-known mineral collector, O. Ivan Lee, who loaned him many specimens for study by Yagoda's new techniques.

An interesting example of this "spare-time work" was his 1945 paper on the localization of silver and copper sulfide minerals in polished section. This was the result of a specific request by the U. S. Geological Survey, which was studying drill core samples from the San Manuel deposit, Arizona. These were known to contain pyrite and copper, the latter in the form of malachite and chrysocolla, but by the available techniques it could not be definitely established whether any copper



HERMAN YAGODA

sulfides were present. Yagoda was able to devise a simple and elegant method, which proved that copper sulfides were present.

Yagoda's work on localization of radioactive elements by means of nuclear emulsions led to his book on the subject (1949), which was the standard reference in this field for many years. He went on to work on cosmic rays, and most of his studies after 1950 dealt with the study of tracks in nuclear emulsions that had been carried on rockets and satellites.

Yagoda's skill in the laboratory was admired and envied by those who worked with him. He was thorough, meticulous, and incredibly patient, except with the suggestion that the standards he set for himself might not be reasonable for others who did not possess his gifted hands. He was also an excellent speaker, whose lectures were marked by their beautiful organization, his mastery of the subject (he spoke without a written text and with few notes), and his dry humor.

He was a fellow of the American Physical Society and a member of the American Meteorological Society, the American Rocket Society, the American Geophysical Union, and the Washington Philosophical Society.

He is survived by his widow, Mrs. Dorothy Yagoda, and by two daughters.

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