The James A. Van Allen Papers

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The University of Iowa's Department of Physics and Astronomy is home to Iowa's most famous scientist, Dr. James A. Van Allen. The University of Iowa Archives, a division of the Special Collections Department in the University Libraries, has recently received the processed working papers of Dr. Van Allen, a pioneering space scientist and discoverer of the earth's radiation belts named in his honor. This important collection, entitled the James A. Van Allen Papers, marks a significant addition to the library's holdings, representing the first substantial collection of scientific material received by the University Archives. These papers present a uniquely diverse and replete record of America's post World War II advance into the space age and document the infancy and evolution of space science.

Formal processing of this collection began in January 1986. As a physics and astronomy major, I was hired by Dr. Van Allen to process these papers under the guidance of both the University of Iowa Archives and the Smithsonian Institution. Martin Collins and Allan Needell of the Smithsonian's National Air and Space Museum formulated the processing strategy and provided expert advice throughout this project. The Department of Physics and Astronomy plus Earl M. Rogers of the University Archives also supported this project. In addition, Evelyn Robison's innumerable hours of hard work during her twenty-eight year (and still counting) tenure as Dr. Van Allen's secretary were valuable to the project. However, it is Dr. Van Allen's support and unique input that have helped to make this endeavor such a success. A formal guide to this collection will be published once all material has been processed. Further papers from Dr. Van Allen's continuing research will be added to the collection at a later date.

James A. Van Allen in his study.

Dr. Van Allen was born and raised in Mount Pleasant, Iowa. His father, also born in Mount Pleasant, attended Iowa Wesleyan College (IWC) and later received a law degree from The University of Iowa in 1894. His mother grew up near Eddyville, Iowa, and also attended IWC for two years. Following in his family's footsteps, James A. Van Allen, the second of four boys, entered IWC in 1931 where he pursued his primary interests in physics, chemistry, and mathematics.

Physics professor Thomas Poulter and chemistry professor Delbert Wobbe were Van Allen's principal inspirations at IWC.[1] Van Allen's major field of study wavered between physics and chemistry, but Dr. Poulter offered the young scientist a part-time physics assistantship which he readily accepted. This marked the first formal step of his long and productive career in physics. Van Allen also obtained valuable research experience working for Dr. Poulter, chief scientist on the second Byrd Antarctic Expedition. In 1935, Van Allen graduated summa cum laude from IWC and immediately began graduate study at The University of Iowa, where he received his M.S. in 1936 and Ph.D. in 1939, the latter under the guidance of Professor Alexander Ellett.

Dr. Van Allen's future in the rapidly growing field of nuclear physics was secure by virtue of his Ph.D. in that field, the department's research strength. However, exposure to geophysics during a Research Fellow's appointment at the Carnegie Institution's Department of Terrestrial Magnetism (DTM) from 1939 to 1940 shifted Dr. Van Allen's interest away from low-energy nuclear physics. He resolved to make "geomagnetism, cosmic rays, and solar-terrestrial physics his fields of research - - at some unidentified future date."[2]

In the summer of 1940, Dr. Van Allen obtained a staff position at DTM researching ways to make useful proximity fuzes for military purposes. He continued proximity fuze research at the Johns Hopkins Applied Physics Laboratory

[1] James A. Van Allen, "What Is a Space Scientist? An Autobiographical Example," *Annual Review of Earth and Planetary Sciences*. Forthcoming.
[2] Ibid.

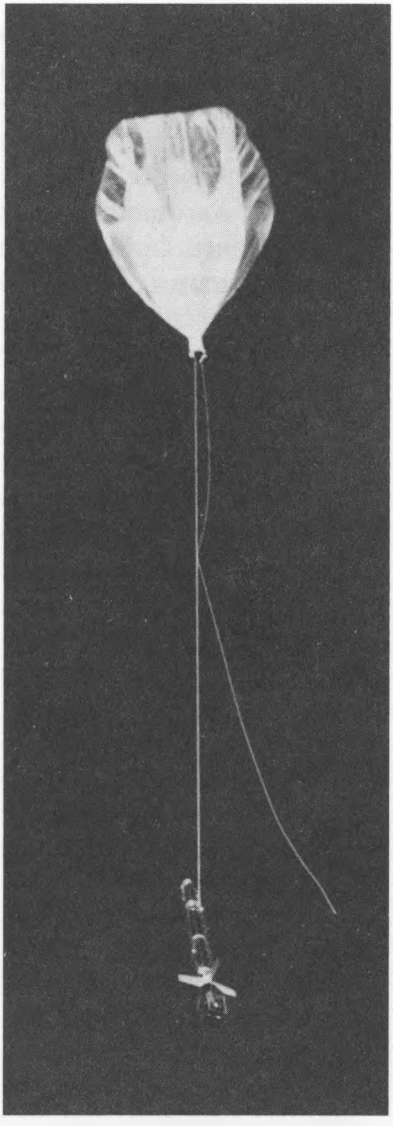
beginning in 1942. In November 1942 he was one of three physicists commissioned by the Navy to instruct gunnery officers in the use of the newly developed radio proximity fuzes for large anti-aircraft guns. This required two eight-month tours of duty with the Pacific Fleet. Van Allen's proximity fuze research and field experience continued until after the end of the war. This naval service began a research partnership which continues today through an annual Office of Naval Research contract. Dr. Van Allen has personally retained many papers documenting his naval participation in World War II.

In 1946, Dr. Van Allen returned to the Applied Physics Laboratory, where he organized a small cadre of scientists to conduct high altitude (or upper atmosphere) experiments using captured German V-2 rockets. The small group of scientists and kindred groups at other laboratories became known as the V-2 Rocket Panel, later renamed the Upper Atmosphere Rocket Research Panel. These men determined the direction of space physics research for more than a decade. In 1946 Dr. Van Allen initiated and supervised the development of the Aerobee sounding rocket, used to investigate his principal areas of interest, cosmic rays and geomagnetism. This collection documents Dr. Van Allen's work at DTM and APL. However, much of Dr. Van Allen's work was classified and some material has been retained by these institutions.

In 1951, Dr. Van Allen returned to his native Iowa to head The University of Iowa's Department of Physics (renamed Physics and Astronomy in 1969). His entrepreneurial character combined with the increased availability of research funds resulted in an enhanced departmental budget. In 1952 he received substantial funding from the Office of Naval Research to develop "Rockoons" for use in upper atmosphere research. A Rockoon consists of a rocket attached to a balloon. The balloon lifts to a predetermined height. The rocket is then fired and reaches an altitude of over sixty miles. Dr. Van Allen used these funds to purchase equipment and recruit graduate students and faculty. The department grew as the space physics research program evolved. Rockoons were used to survey

cosmic rays and auroral radiations at previously invisible geomagnetic locations, including the Arctic and Antarctic. Satellite research of the near earth environment became a natural extension of his upper atmosphere research program. In fact several colleagues were at a dinner party hosted by Dr. and Mrs. Van Allen when plans for the 1957-1958 International Geophysical Year were formalized.

In January 1958, American satellite research became reality with the successful launching of Explorer I, the United States' answer to the Russian Sputnik. Explorer I contained a single Geiger tube apparatus built at The University of Iowa. This instrument discovered the earth's radiation belts, which contain enormous numbers of protons and electrons trapped in the earth's magnetic field. The success of Explorer I led to further satellite research. Correspondence, memorandums, holograph notes, data, and graphs all document Dr. Van Allen's historic participation in Explorer I.



A rockoon in fight. Official U.S. Navy photograph.

The University of Iowa also built instrumentation for Explorers II-VII, some of which were launch failures. Further extensive post-Explorer satellite research performed by Dr. Van Allen is well documented in this collection. By 1960, Dr. Van Allen had secured additional research contracts from the Office of Naval Research, the Atomic Energy Commission, and the National Aeronautics and Space Administration (NASA). Correspondence, holograph notes, reports, data, and engineering papers document the evolution of space science during the period.

Every space flight mission has either a principal investigator (PI) or a team of principal investigators. Dr. Van Allen has been the PI on twenty-four missions. The successes have been numerous and varied. Dr. Van Allen had charged particle detectors on Pioneers 3 and 4 launched for lunar impact. Although these spacecraft did not impact the moon, the instrumentation recorded the structure of the earth's magnetosphere until it merged with interplanetary space. Further University achievements include the Injun series of six spacecraft. These spacecraft were the first to be constructed entirely at a university facility. The launching of Iowa detectors on Mariner II (sent to Venus) expanded Dr. Van Allen's research into the solar system. He has been the Principal Investigator for instrumentation sent to Mars, Venus, Jupiter, and Saturn. Information on these flights can be found in the mission files.

In addition to documenting events, these papers record changes in the conduct and organization of scientific research after World War II, when government established itself as an active partner in sponsoring university-based research. The new technologies of rockets and later satellites were expensive and required a complex supporting infrastructure. The military provided much of the financial sponsorship until the establishment of NASA in 1958 spawned a complex set of relationships between scientists and government. Van Allen's professional career offers important insight into the changing roles assumed by scientists as science intersected politics and government bureaucracy. This intersection led to further bureaucratic re-

sponsibilities for scientists including: policy-making and advising presidents, Congress, and NASA; participation in numerous advisory boards and professional organizations; and the intricacies of the federal contract process. The papers document Dr. Van Allen's increasing participation in both government and private advisory committees.

This collection also records the evolution of space science research from semi-independent work performed under military contract with minimal accounting requirements, to research conducted primarily under NASA auspices with strict accounting procedures. As research evolved, scientists and engineers assumed increasingly specialized roles in project management, design and fabrication, systems integration and testing, launch, operations, and data analysis. Project management and organization became as important to the success of a mission as the engineering.

In addition to the James A. Van Allen Papers, three distinct but related collections have also been processed. The first collection, Department of Physics and Astronomy Records under James A. Van Allen, chronicles the daily administration and operations of the department from 1951 to 1985. This collection reflects daily correspondence, personnel decisions, facility expansion, budgetary concerns, and the evolving University bureaucracy. The second collection, entitled Project Manager Mission Records, documents the administrative responsibilities of the Project Manager position first implemented in 1963 for Injun IV. A Project Manager works directly with the PI and mission engineers supervising scheduling, finance, and engineering matters. The third collection, entitled Mission Engineering Records, entails the technical aspects of building spacecraft instrumentation. Engineering specifications, correspondence, blueprints, integration, and test forms all reflect stages required in building instrumentation. Together these collections (240 linear feet) provide a complete overview of Dr. Van Allen's research; his pedagogical and professional activi-

ties; his tenure as Head of the Department of Physics and Astronomy; and his leadership of a large management and engineering staff.

In addition to many historical records, the James A. Van Allen Papers house unusual items including a large data set reflecting instrumentation on twenty-four missions as well as artifacts. Dr. Van Allen still uses a substantial amount of data and other documentation which will be received at a later date. Retirement from administrative and teaching duties allows him to concentrate solely on his research. Some of the artifacts, comprised mostly of flight hardware, will be stored by the University Archives or other museums.

Dr. Van Allen has received many honors and awards. He values the Gold Medal from the Royal Astronomical Society, the National Medal of Science conferred by President Reagan in 1987, and the Crafoord Prize recently awarded by the Royal Swedish Academy of Science most. The Crafoord Prize, created in the early 1980s, gives international recognition for achievements in fields not covered by guidelines set forth in Alfred Nobel's will, which established the Nobel Prize. These fields include astronomy, geoscience, mathematics, and the biosciences. Dr. Van Allen received the award from the King of Sweden at a ceremony held in Stockholm September 27, 1989.

Dr. Van Allen's extremely productive research career has resulted in numerous articles and speeches which are contained in this collection. A bibliography of this material is included with these papers. He has also edited or written three books entitled *Scientific Uses of Earth Satellites* (1956), *Pioneer: First to Jupiter, Saturn and Beyond* (1980), and *The Origins of Magnetospheric Physics* (1983). In addition to a productive research career, Dr. Van Allen has had a very successful teaching career. As director of graduate student research, he has supervised thirty-four successful Ph.D. students and forty-five M.S. students in space physics. This represents a significant percentage of the advanced space physics degrees conferred between

1951 and 1985. He greatly enjoyed teaching and always had time for students no matter how busy he was with research and administrative details.

However, not all is research and pedagogy. In an anecdote often told to the undergraduate general astronomy class which he taught for seventeen years, Van Allen relates the story of removing his white gloves in the Pioneer 10 clean room and placing his fingerprint on the spacecraft. That fingerprint is now many millions of miles from earth.