

## MEMORIAL OF HARRY BERMAN

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On August 27, 1944, Harry Berman was killed when his transatlantic plane crashed in attempting to land at Prestwick, Scotland. His untimely death at the age of forty-two has cut short a career that gave promise of being one of the most outstanding in American mineralogy.

Berman was born in Boston, Massachusetts on February 16, 1902, the son of Robert and Rebecca Berman. When he was seven years old, his father, a merchant, moved to Johnstown, Pennsylvania, where Berman completed public grade and high schools. He then attended Carnegie Institute of Technology with interest in mathematics and engineering, but for financial reasons was forced to abandon college work at the end of one year. In 1922 he became an assistant in the mineralogical section of the U. S. National Museum, where he acquired his intense and lasting interest in minerals. In 1924 he came to Harvard as museum assistant to Professor Charles Palache, then active as Professor of Mineralogy and Curator of the Mineralogical Museum. Here he began the life of research and study which occupied him until the outbreak of the war. Realizing the necessity of additional formal education, he took courses at Harvard and attended evening classes at the Lowell Institute in Boston. Thus, over a six-year period he completed college requirements and was granted by Harvard the degree of Adjunct of Arts in 1931. During the academic year 1932-33 he was awarded a scholarship for foreign travel, which he utilized in studying with J. D. Bernal at Cambridge, England, and with V. M. Goldschmidt in Göttingen, Germany. On returning to Harvard, he continued his program of part-time work and study. In 1935 he received the degree of Master of Arts, and in 1936 the degree of Doctor of Philosophy. From 1936 to 1940 he continued as Museum Assistant and was also Research Associate in Mineralogy. In 1940 he was appointed Associate Professor of Mineralogy and Curator of the Mineralogical Museum at Harvard University. He was on leave from these positions at the time of his death.

During the period of his employment in the Museum and his part-time study leading to his degree, Berman was actively engaged in research. He published his first paper in 1925 and since then has been author or joint author of thirty-six other papers. An examination of his bibliography will show the wide variety of mineralogical subjects in which he took an active interest.



HARRY BERMAN  
1902-1944

Under the guidance of Professor Esper S. Larsen, Berman early became skilled in the methods for the optical determination of nonopaque minerals and assisted so ably in the revision of Larsen's "Microscopic Determination of the Nonopaque Minerals" that the second edition appeared under their joint authorship.

Berman early recognized the importance of  $x$ -rays as a tool for the study and determination of minerals and set about to obtain  $x$ -ray equipment for the Harvard mineralogical laboratory. Many obstacles attended this project, for funds were inadequate and equipment poor. His first installation was a Coolidge-type tube powered by a cast-off transformer from a dental  $x$ -ray unit. The cameras used with it were borrowed. Several tubes burned out in quick succession—a disheartening procedure with such limited resources. He then changed to a gas tube, which proved to be more successful, although not without its attendant difficulties. It was not until after he had assembled it with his own hands that others were sufficiently trained to help with its maintenance and with the taking of  $x$ -ray photographs. From the beginning of the  $x$ -ray laboratory useful data were obtained and there gradually accumulated over a ten-year period structural details on several hundred mineral species. During this same time many hundred powder pictures were taken so that at present there exists through Berman's efforts a standard collection of powder photographs of a large percentage of the mineral species. To improve and extend the facilities of this laboratory was one of Berman's cherished ambitions.

Berman was always on the watch for new techniques that could be applied to mineralogical investigation. Thus one of the first Frantz isodynamic separators for the magnetic separation of mineral grains was brought to Harvard. At his suggestion and with his counsel, Dr. Cutler West developed the high index phosphorus liquids. Berman's own contribution was the development of the Berman microbalance. He recognized the necessity of accurately obtaining the specific gravity of small mineral particles so that a correlation could be made with structural data. After a prolonged search with many trials that ended in failure, he was able to adapt to this purpose a torsion balance sufficiently sensitive to give an accurate specific gravity determination on a grain weighing as little as 5 milligrams.

A logical classification of minerals based on their structure was one of Berman's consuming interests. His doctoral thesis on the *Constitution and Classification of the Natural Silicates* was based on the meager structural data available in the early thirties. A large percentage of the silicates studied since that time have been found to fall in the exact place

in the classification in which he placed them, thus showing his vision and proving that the system was well grounded.

Of all Berman's contributions to the science of mineralogy, by far his greatest was in connection with the preparation of the seventh edition of Dana's *System of Mineralogy*. From 1936 until the outbreak of the war, this project consumed most of his time. He not only gathered existing data but also did much original research, the results of which appear for the first time in the *System*. The first volume of this work, by Palache, Berman and Frondel, came off the press less than a month before Berman's death so that he saw the first fruits of a project to which he had devoted so much labor, thought and energy.

At the outbreak of the war Berman's patriotism led him to eagerly apply his knowledge of minerals and his scientific skill to the several war projects for which he acted as consultant. His first such assignment was to search for optical calcite. He combed the domestic localities and eventually located a hitherto unsuspected source of optical calcite from which many tons of high-grade material were later removed. He also visited many fluorite localities and was instrumental in locating an adequate source of that mineral to be used for optical purposes.

In September 1942 he became associated with the Reeves Sound Laboratories of New York City, when that company was beginning the manufacture of quartz crystal oscillators. Although his initial capacity was that of crystallographer, he soon turned his attention to the many other problems connected with production and was conspicuously successful in developing laboratory techniques into manufacturing processes. The enviable record made by the Reeves Sound Laboratories and the affiliated Hudson American Corporation has been due in large part to Berman's ability to solve new problems as they arose, many of which were remote from crystallography. It was while on a trip to England as a consultant in similar work sponsored by the British Government that he lost his life.

Berman did little formal teaching at Harvard but his scientific approach to problems and his research enthusiasm attracted advanced students. They found him helpful, kindly, and patient in explanation. His advice was much sought and during the past ten years the published papers and theses of students reflect his influence. Berman's death has led to a flood of letters from former Harvard students, which show how highly they regarded him as a scientist and how much they loved him as a man. A spontaneous movement to commemorate his memory is now forming among these scientists and among his associates in the war-induced mineral industries. A memorial in the form of a modern well-

equipped x-ray laboratory may result. His Harvard colleagues falter in attempting to assess their loss. His intellectual gifts were great and his scientific promise seemed unlimited. We who are left regret the loss of a great scientist and will miss Berman's stimulating and vigorous discussion of scientific problems, his skillful and ready help, his modest friendliness.

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