Biographical Encyclopedia of Astronomers

Robertson, Howard Percy

Born Hoquiam, Washington, USA, January 27, 1903

Died Pasadena, California, USA, August 26, 1961

American mathematical physicist Howard ("H.P.") Robertson is honored by the names of the Poynting-Robertson effect (of light on small dust particles) and the Robertson-Walker metric, which describes the curvature of spacetime within the framework of general relativity. He was the eldest of five children from a family of modest means, whose father died when he was 15. Nonetheless, all the children attended the University of Washington, where Robertson earned a bachelor's (1922) and a master's (1923) degree.

At the University of Washington, Robertson came under the tutelage of the famous mathematician and relativist, Eric Temple Bell. They had a tempestuous and engaging intellectual relationship, which they both valued highly over the years

Two years later, Robertson obtained his Ph.D. from the California Institute of Technology (Caltech). His thesis was entitled "On Dynamic Space-times which contain a Conformal Euclidean 3-space," and ran to 38 pages. While at Caltech, he interacted with the mathematical physicists Paul S. Epstein and Harry F. Bateman.

The next two years were spent studying in Göttingen and Munich, Germany as a National Research Fellow. Robertson returned to

He joined Caltech as an assistant professor in 1927. From 1929 to 1947 he was at Princeton University, returning to Caltech as a professor in 1947. From 1940 to 1943, Robertson served with the National Defense Research Council, and from 1943 to 1946 with the London Mission of the Office of Scientific Research and Development. From 1944 to 1947, he was an expert consultant to the Office of the Secretary of War. He was awarded the United States Medal of Merit in recognition of his wartime services to his country

After World War II, Robertson was a much-sought-after scientific advisor to numerous branches of government and industry, and he was very effective in applying science to military strategy and tactics. In this capacity, he was the chief scientific advisor to General M. Gruenther, then the Supreme Allied Commander in Europe (1954–1956). From 1956 to 1960, Robertson was a member of the Defense Science Board. He was also the chief science advisor to the second and third directors of the Central Intelligence Agency, Admiral Sidney W. Souers and General Hoyt S. Vandenberg. Robertson was a trustee of the Systems Development Corporation, the Institute for Defense Analysis, and the Carnegie Endowment for International Peace. He was also a director of the Northrop Aviation Corporation

Robertson was endowed with exceptional mathematical powers coupled with a deep insight into physical processes. His early scientific efforts were concerned with the study of differential geometry, in which he was strongly influenced by the work of Bell, Luther Eisenhart, Oswald

Veblen, and Herman Weyl. In 1931, for example, he translated Weyl's classic tome, *The Theory of Groups and Quantum Mechanics*, into English. He also published works on quantum mechanics, notably a short paper in *The Physical Review* pointing out the connection between uncertainty in the simultaneous measurement of two noncanonical variables and the commutation properties of their associated operators (1929). He also made a seminal contribution (1940) to T. von Karman and L. Howarth's theory of isotropic turbulence by applying invariant theory to the categorization of the velocity correlation tensors that feature prominently in their equations

Robertson's best-known contributions were in the theory of relativity and its applications to cosmology. He developed the theory of uniform cosmological spaces, i.e., spaces with spatial isotropy and homogeneity, and deduced the form of the line element common to all these spaces (1929). These have subsequently been called Robertson-Walker spaces. Robertson was deeply intrigued by the consequences of the observed red shift-distance relationship, which led to an extensive and long-lasting working association with Edwin Hubble, Milton Humason, and Richard Tolman

Robertson is also well known for his work on the absorption and re-emission of light by a particle revolving around the Sun (1937). His fully relativistic treatment of the problem superseded John Poynting's (1903) classical formulation and, in fact, led to a significant quantitative correction to the classical result. Robertson's calculations indicated the presence of a tangential drag that reduces the angular momentum of the body, causing it to spiral toward the Sun. This effect is important for small dust particles and implies that the immediate neighborhood of the Sun should be cleared of these particles on astrophysically interesting timescales. This process is commonly referred to as the Poynting-Robertson effect.

Robertson had a long-standing fascination with sports cars and was well known for his fast driving on the Caltech campus and in the surrounding area. In early August of 1961, he was involved in a high-speed automobile accident. He died from a pulmonary embolism brought on by the injuries sustained in the accident.

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