Jacob Karl Ernst Halm (1865-1944)

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Abstract: J.K.E. Halm was Chief Assistant at the Royal Observatory, Cape of Good Hope, from 1907 to 1927. Though barely remembered today, he made several contributions to the advance of astrophysics. Of the staff at the time, he was the most conversant with contemporary trends and the most capable as a theoretician. In what follows, an outline is given of his life and work.

Introduction

Jakob Karl Ernst Halm was born in Bingen am Rhein, Grand Duchy of Hesse, on 30 Nov 1866, the son of Carl Karl Joseph Halm and Sabine Dietrich. He went to school in Bingen and studied afterwards for four years at Giessen (1884-85), Berlin (to 1887) and Kiel (to 1889). He obtained his PhD at Kiel (Halm, 1890) for work on linear differential equations.

Among other interests, Halm was an accomplished amateur violinist and this brought him into close contact with Karl N.A. Krüger, the director of Kiel Observatory. Under him, he became Assistant Editor of the journal *Astronomische Nachrichten*.

Strassburg

In 1889 Halm was appointed an Assistant at the University Observatory in Strassburg, at that time in Germany, though now part of France. Here he worked with the Meridian Circle and the heliometer. He made over one third of the observations for the Strassburg AG Zone (i.e., part of the original Astronomische Gesellshaft Katalog).

On 7 August 1894 he married in Basel Johanna Bader (born 23 Aug 1865) of that city.

Edinburgh

In 1895 Halm was invited by the Astronomer Royal for Scotland, Ralph Copeland, to become a First-Class Assistant at the newly constructed Royal Observatory in Edinburgh at a salary of £300 per annum and the right to an official residence.

At first he was involved in setting up the new instruments of the Observatory. Later he made micrometrical observations of comets and double stars with the 15-inch refractor in order to determine their orbits. He also made meridian observations of zodiacal stars. However, his papers from around 1900 show a growing interest in solar theory.

One of his most important contributions was to use the heliometer (split-lens telescope) to feed a spectrograph with sunlight from both sides of the solar disc simultaneously, at different solar latitudes. With this he studied the differential rotation of Sun between 1901 and 1906 (see Halm, 1904) and was awarded the Brisbane medal of the Royal Society of Edinburgh. His work was criticized by W. Adams of Mt Wilson Observatory but he was able to defend himself successfully (Halm 1905). In the course of his measurements he found a displacement of certain spectral lines near the edge of the solar disc, not due to rotation or other obvious effects (see Halm 1907). This was later confirmed by others including Adams, though Halm's suggestion that it was a pressure effect was not sustained. It does not seem to be explained satisfactorily even now.

The director of the Observatory, Ralph Copeland, was ill for much of the time that Halm spent at Edinburgh (he died in 1905), so that much administrative work fell on his shoulders. He also had to take over Copeland's professorial duties at the University of Edinburgh.

In order to become a civil servant, Halm had to become a naturalized British citizen. On 3 June 1901 he applied to C. T. Ritchie, one of His Majesty's Principal Secretaries of State. He swore an Oath of Allegiance on 7 June 1901 and registered at the Home Office on 11 June 1901. Unfortunately, due to Copeland's illness, the process of becoming a civil servant was never completed and this ultimately led to a lower final pension than he should have got.

Royal Observatory, Cape of Good Hope

On the recommendation of Sir David Gill (just then retiring) and F.W. Dyson, then Astronomer Royal for Scotland, Halm was appointed Chief Assistant of the Royal Observatory under Sydney Samuel Hough and arrived the Cape on 30 June 1907.

At that time, the first glimmerings that eventually led to the discovery of the structure of the Milky Way galaxy were becoming apparent. Gill's collaboration with Kapteyn on the *Cape Photographic Durchmusterung (CPD)* and subsequent repeat observations had led to the discovery of two "star streams", or preferential groups of proper motions, shared by certain stars [now known to be a reflection of halo and disc populations or old and young stars]. Halm worked with Hough on studying the properties of these streams using radial velocities in addition to the proper motions. He (Halm, 1911) identified a third stream associated with "Orion"-type stars.

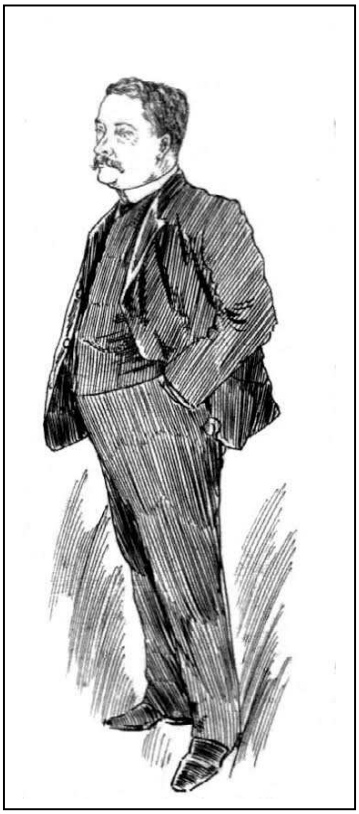

Figure 1. This cartoon of Halm is from the Cape Times of 19 September 1908, by "MAC" (Herbert Wood MacKinney)

Halm's most interesting and prescient paper, "Further considerations relating to the systematic motions of the Stars" was published in 1909. According to him, stars appeared to obey a Maxwellian distribution, or equipartition of energy, so that the less massive stars moved more rapidly than the massive ones. This conclusion was based on the then limited knowledge of stellar masses derived from a number of binaries.

The other important and more famous conclusion of this paper is that there is a distinct relation between spectral type and mass for stars. This was the first indication of the *mass-luminosity relation*, later elaborated by others.

Eddington, in his book *Stellar Movements and the Structure of the Universe,* (1914) was obviously taken by the Maxwellian idea but showed that the stars could not interact sufficiently to lead to equipartition of energy and that, therefore, Halm's theory was incorrect. Nevertheless, his remarks and his ideas were milestones along the road to understanding stellar evolution.

In 1915 Halm published an important paper concerning reciprocity failure in photographic emulsions (i.e., the deviation of the image density from a linear response to the amount of light it is exposed to) and derived what is now known as the Kron-Halm catenary equation.

Left: Visit by British astronomers to the Royal Observatory, Cape, in August 1914. Halm is in the middle of the back row. In the front row are Dyson, Hough and Eddington. On the ground is a Krooman from west Africa.

In 1917 Halm was the first person to make an estimate of "total to selective extinction" of starlight. He determined that

the interstellar extinction in magnitudes is a factor of 1.22 times greater in the blue (i.e. the wavelengths to which old photographic plates were sensitive) than in the visible.

In 1919 he was able to arrive at a figure of 2.1 mag, based on star counts, for the maximum extinction per kiloparsec due to dust in the interstellar medium. His interest had arisen from efforts around this time made to calibrate the photometry of stars in the CPD and the Cape Astrographic Zone catalogues.

Hough became ill with cancer and left for England in March 1923. He died the following July and was replaced by Harold Spencer Jones, who had been Chief Assistant at the Royal Greenwich Observatory. During Hough's illness and on other occasions when he had been on leave, Halm took over the running of the Observatory. From their correspondence during these periods, it is clear that Halm discussed his ideas with Hough on a regular basis. His loss must have been a blow.

After the arrival of H.S. Jones as HM Astronomer at the Cape, Halm worked with him on determining the solar parallax (distance of the Sun) through observations of Mars.

Halm reached the retirement age of 60 on November 30 1926 but was allowed to stay on until April 25 1927 in order to complete 20 years of service. He was unable to have his service at Edinburgh recognized as pensionable. His pension amounted to £251-7-8 per annum and he received an "additional allowance" of £643-6-3, presumably once-off.

According to Anon (1944), ASSA presented him with a set of astronomical drawing instruments as a retirement gift.

Private life in Cape Town

Halm played viola with the Chamber Music Union, a small group of musicians who gave concerts of chamber music before the Cape Town Orchestra was founded. According to Jones (1945) he was equally at home playing his much-treasured Amati violin.

He is also known to have played bowls.

During the First World War, jingoistic feelings ran high at the Royal Observatory and Halm was subject to much unpleasantness from two of the staff members, Joseph Lunt and John Power. Though conscription did not apply in South Africa, ten sons of Observatory staff members had served in the War. Halm's son did not do so and this was a cause of resentment, especially after Power's son was killed. During his absences Hough put Halm, as Chief Assistant, in charge of the Observatory and this was resented by these individuals, who conducted a campaign against this arrangement, even involving J.W. Jagger, a prominent politician at the time. Hough did not hesitate to confirm Halm's loyalty and deny some of the wilder accusations that had been made. The relevant correspondence can be found in the SAAO Archives volumes (see references below). Curiously, at the start of section B2 of the latter, somebody has written "Correspondence previous to April 16, 1919 was destroyed accidentally or otherwise"!

According to Jones (1945) his entire sympathies were with the British cause.

The Halm's children were Eric Adolphus Halm (born Strassburg 25 May 1895; who married Grace Lydia Dyer and had two daughters as well as a son who died as a baby), Florence Stella (Born in Edinburgh 15 May 1897) and Violet Jessie (married Parker), born in Edinburgh 6 April 1902. His present-day descendants include members of the Davies and Burgers families. E.A. Halm went to school at SACS and later studied at the

University of Cape Town, where he held a Minor Bursary. Later in life he became a headmaster in Ladysmith, Natal. He was also Deputy Director of Education in Natal (retired 1955).

Sundials

Halm designed a universal sundial and ASSA published a booklet on it.

At the National Botanic Garden of Kirstenbosch there is a sundial presented by him. The following rather exaggerated account was found on the SANBI website:

“The Kirstenbosch sundial is reputed to be the most accurate sundial in the southern hemisphere. It was constructed by J.R. Miller at the Royal Observatory in Cape Town and presented to Kirstenbosch in 1920 by Dr. J.K. Halm, a scientist at the Royal Observatory. Dr. Halm's daughter was employed as a plant recorder at Kirstenbosch. It bears the inscription HORAS SIGNO UMBRA MOVENTE FLORES GIGNO LUCE FOVENTE, 'I show the hours by moving shadow, I bring forth flowers by sunlight nurtured.' It is orientated to the latitude of Kirstenbosch: 33° 59` south. Its limitation is that the sun disappears behind the mountain in the late afternoon.”

Stellenbosch

After his retirement in1927 Halm moved to Stellenbosch. In a letter written shortly afterwards to Jones from an address in Ida’s Valley he mentioned that he was about to be offered a lectureship at the University and had bought a Whippet car (then a popular brand made by Willys). He had already found congenial musical and artistic company.

One of his students was Arthur Bleksley, later a well-known science populariser, who did research on pulsating variables.

In 1935 Halm gave a Presidential Address to ASSA that received widespread attention. He believed that many features of the earth could

be explained by an ongoing expansion. However, since the advent of plate tectonic theory, the expansion hypothesis is no longer considered plausible.

Honours etc

Halm was the first president of the Cape Astronomical Association (1912). He was president of the Astronomical Society of South(ern) Africa 1924-25 and 1934-35. He was a Fellow of the Royal Astronomical Society 1906-1940.

Halm died 17 July 1944 and was buried in the Champagne graveyard, Wellington, Western Cape.

Tributes

[The following letter was among memorabilia shown to me by a member of the family. Theo Russo was a "Higher Observatory Officer" at the Royal Observatory when I first worked there at the end of 1971.]

Theo Russo to Mr E. Halm, 18 Nov 1970 "… As a young lad from school in January 1925 I first entered service at the Royal Observatory, and your father was then Chief Assistant. I remember him very well, and had a great regard and affection for him. He took an extremely kindly interest in the four juniors then employed here, and gave much of his free time after hours to give us tuition in Astronomy and Spherical Trigonometry…"

Obituaries were written by Anon (1944), Bleksley (1944), Jones (1945) and Pilling (1944).

Acknowledgment

I thank Halm's Davies descendants for some of the information used in the preparation of this article.

References:

Notes: (1) The correspondence referred to in the body of the paper can be found in SAAO Archives volumes "A Establishment External 1915 – 1927 (? last figure obliterated)" and "B Establishment External 1910-1920".

(2) Some forty papers by Halm are listed by the NASA-ADS Data Service but some early papers published in the Transactions and Proceedings of the Royal Society of Edinburgh and elsewhere are not included. See also Poggendorff, J.C., (various dates*), Biographisch-Literarisches Handwörterbuch*, Leipzig, Barth, entries concerning Halm.

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