

## Recollections of life as a student and a young astronomer in Germany in the 1920s

Hermann A Brück

with an Introduction by

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### Introduction

The author of this essay, Hermann Alexander Brück (Figure 1), Emeritus Professor of Astronomy at the University of Edinburgh and former Astronomer Royal for Scotland, died on 4 March 2000 in his 95th year. He was the last of his generation of astronomers in both Germany and Britain, and among the oldest members, if not the oldest, of the Royal Astronomical Society and of the Astronomische Gesellschaft.

Hermann Brück was born in Berlin in 1905 and, as he recounts below, received his education at the Universities of Kiel, Bonn and Munich in 1924-1928. To the end of his life he looked back on his student days in Munich as the most profitable and exciting he ever experienced. From Munich he began his astronomical career at the Potsdam Astrophysical Observatory. These, too, were happy days, destined, however, to be blighted within a few years by the rise of Nazism.

In 1936 Brück left Germany, and obtained a temporary Research Assistantship at the Vatican Observatory. From there he went a year later to Cambridge, rising to the rank of John Couch Adams Astronomer and Assistant Director of the Observatory. In 1947, in response to an invitation from Eamon de Valera, then Taoiseach (Prime Minister) of Ireland, he moved to Dublin where he undertook the task of re-founding the defunct Dunsink Observatory under the auspices of the Dublin Institute for Advanced Studies. He moved from Dublin to the Royal Observatory Edinburgh in 1957, taking up the combined post of Astronomer Royal for Scotland and Regius Professor of Astronomy in the University of Edinburgh. He retired in 1975 at the age of 70.

Always interested in history, he occupied himself in his retirement with various historical projects. These included writing the histories of the Royal Observatory Edinburgh (*The Story of Astronomy in Edinburgh*, Edinburgh 1983) and of the earlier Dun Echt Observatory in Aberdeenshire (Lord Crawford's Observatory at Dun Echt 1872-1892, *Vistas in Astronomy* 35, 1992) as well as a record of his own years at Dunsink Observatory (in Patrick A Wayman's *Dunsink Observatory 1785-1985*, Dublin 1987). A brief account of his student years in Germany was also published in 1987 (Rajkumari Williamson (ed.) *The Making of Physicists*, Bristol 1987). He also wrote (with M T Brück) a biography of one of his predecessors, Charles Piazzi Smyth, (*The Peripatetic Astronomer*, Bristol 1988) and contributed articles to biographical dictionaries.

This paper is an edited extract from reminiscences which he wrote for his family. I have omitted the more personal parts, leaving the account of his education and early years as an astronomer in Germany, which after an interval of over 70 years is, I believe, already of some historical interest. I have also added some footnotes.

All the photographs in this paper are from H A Brück's collection, and were reproduced by Photo Labs, Royal Observatory Edinburgh.

**Key words:** *Astronomy in the 1920s; Kiel University; Bonn University; Munich University; Potsdam Observatory; Einstein Tower*

## 1 Early Years

I was born in 1905 in Berlin into a military family. My father, a Captain in the XX Corps of the 9th German Army, was killed in action in the first battle of Lodz in the second half of November 1914. I was an only child, and from then brought up by my mother on her own. I have vivid recollections of the hardships of the First World War, and of the Spartacus Revolution in 1919 which I witnessed on the streets of the city.



Figure 1. H A Brück in 1929

My earliest introduction to astronomy came about by chance. Confined to bed with some minor illness, I was given a book to keep me amused. It was J J von Littrow's famous *Wunder des Himmels*, edited and brought up to date by Professor Paul Guthnick of Berlin and published in 1910. I still possess my copy of that book which sparked off my lifelong enthusiasm. Another, much smaller but very charming book by J H Fabre, the great French entomologist, called *Der Sternenhimmel* reinforced my ardour. I later obtained a small telescope, and used to look at the Moon from my window, long after my bedtime.

There was great popular interest in science at that period, thanks to the spread of the ideas of relativity which Einstein himself had first talked about publicly in a lecture he gave in June 1915 at the Popular Observatory at Berlin-Treptow. I began to

read all the scientific books I could find, either purchased or borrowed from the 'Preussische Staatsbibliothek' in Unter den Linden, for which I obtained a Reader's ticket on the recommendation of the Director (Headmaster) of my Gymnasium.

## 2 School

At the age of 14 I started my five-year secondary education at the Kaiserin Augusta Gymnasium in Berlin-Charlottenburg, a Grammar school which, though specializing in the Classics, had also excellent teachers in science. The most outstanding of these was the master who taught both Greek and German to the 'Prima', the final two years at school. He was a firm believer in the unique value of a classical education. We read with him a great deal of Homer, Plato, and Thucydides, and the Greek dramatists Aeschylus, Sophocles, and Euripides whom he placed first among the six greatest poets in history, the other three being Dante, Shakespeare, and Goethe. I am happy to say that I am still able to read my Greek classics with pleasure. The other great teacher whom I was fortunate enough to have at school gave us a four-year course in mathematics and physics. In mathematics he took us up to number theory, analytical and spherical geometry and the calculus, including differential equations. His physics classes gave us a taste of the newly-emerging field of atomic theory.

I left the Gymnasium in March 1924 having done well in my 'Abitur', the German equivalent of the schools final examination, with top marks in mathematics, physics – and 'Turnen' (athletics). My good results dispensed me from oral examinations, and my certificate stated that I was about to enter university to study 'mathematics and science'. The golden gates of a future in astronomy were open!

My mother had long objected to my wanting to pursue astronomy as a career, which seemed to her to offer no firm prospects. By the time I left school, however, she had been persuaded by one of my uncles that I should be allowed to follow my inclination – on condition that if my studies at university did not work out, I would agree to take up a 'more sensible' profession like law or medicine.

This uncle, Karl Kisskalt, a distinguished medical man, had been appointed in 1912 to the Chair of Bacteriology and Public Health in the University of Königsberg, from where he moved to a similar Chair in the University of Kiel five years later. His support had not been given without thought. He considered it wise that my mathematical and scientific ability ought first to be tested properly by a suitable academic in his University. Accordingly, Professor Toeplitz, the distinguished Kiel mathematician, gave me a grilling, and seemed to find me suitable. After this, my uncle arranged for me to visit the University Observatory. I was fortunate to meet there Professor Carl Wirtz, a remarkable scientist, who at that time was engaged in a study of the radial velocities of galaxies which V M Slipher had measured at Lick Observatory. Few though they were, these showed a linear relation between radial velocity and magnitude which indicated an increase of radial velocity with distance. Wirtz attempted to relate his findings to Willem de Sitter's relativistic model of the world, and he presented me with a copy of his paper on the subject in *the Astronomische Nachrichten* which preceded Hubble's work on the same problem by several years<sup>1</sup>. It was my first meeting with a real astronomer, and my first encounter with astronomical research. I still regret that Wirtz's paper, the first astronomical reprint to be given to me, got lost in the course of my later wanderings.

When it came to deciding on a university, the choice was already made. I matriculated in Kiel in May 1924 for the summer semester. In Germany, the academic year is divided into two semesters, not three terms as in Britain. In my time, also, it was not unusual to attend more than one university; in my own case I spent my first three semesters in three different universities – Kiel, Munich, and Bonn, before finally settling for Munich, from where I eventually graduated. I still possess my certificates from all these universities.

### 3 Kiel 1924

I took four courses of study in Kiel – two in mathematics by Professors Toeplich and Hasse; one not very inspiring course in experimental physics by Professor Dieterici who was also Rector of the University; and the fourth in inorganic chemistry by Professor Diels. The last was outstanding and memorable. Diels was to receive the Nobel Prize for Chemistry in 1950. There were also occasional lectures from Professor Wirtz.

It must be admitted that I did not profit much academically from my semester at Kiel. This however was largely my own fault. I had joined the Corps Saxonia, one of the elite student clubs in the University. To belong to the Corps brought considerable prestige but was a huge distraction from studies. The Corps clubhouse became the centre of most of our activities. We met there several times a week at parties where considerable quantities of beer were consumed. Fencing played a leading role in our lives, requiring compulsory training in the early morning, the aim being to qualify to take part in duels ('Mensuren'). I much enjoyed fencing, but did not reach beyond the rank of 'Fuchs' or Junior member before I left the University.

Though life was pleasant, I became concerned at the inordinate amount of time and effort demanded by membership of the Corps and realized that I was in danger of getting away from my original purpose. After a lot of thought I decided at the end of the semester to resign from the Corps, leave Kiel, and get down to some real work at some other university.

### 4 Munich 1924-25

I chose Munich. On the academic side Munich had on its staff the distinguished astronomer, Professor Hugo von Seeliger, internationally known for his work on the structure of the stellar system. Unfortunately he fell ill and died in December 1924 before I had a chance to benefit from his lectures. In that same winter Munich was ravaged by an epidemic of influenza which killed two members of staff in the University's Department of Astronomy. It was not a propitious time for an enthusiastic would-be student of astronomy. As a result I concentrated on mathematics, taking the lectures of Professors Perron and Harthog, the former quite superb. There were also good courses on relativity theory by Professor Graetz and on the history of the determination of time by Professor Zinner, who was to become Germany's leading historian of astronomy.

Outside the University I practised skiing in the Bavarian Alps, and during that semester bought from the famous Sporthaus Schuster a pair of beautiful Norwegian hickory skis which served me well over the years and which now, seventy years later, stand propped against a wall in my home.

### 5 Bonn 1925

In the Spring of 1925 my uncle accepted a newly-established Chair of Bacteriology at the University of Bonn. For family reasons, it was decided that I should join my aunt and uncle there. In fact, I was to spend the remainder of my student days with them, first in Bonn and then in Munich, where my uncle, shortly after taking up the Bonn appointment, was invited to and accepted the prestigious Chair of Bacteriology and Public Health which he was to occupy for the rest of his academic life.

My time at the University of Bonn, though destined to be of only one semester's duration, was rewarding. I enrolled in April 1925 to read mathematics, physics and astronomy. The lectures on mathematics by Professors Beck (theory of functions) and J O Müller (Calculus), turned out to be excellent. Equally profitable was an intensive course on spectroscopy given by Professor H Konen, collaborator with H Kayser in the production of the *Handbuch der Spektroskopie*, that great standard work on the subject. The course included – for the first time in my university experience – a lot of laboratory work, including molecular spectroscopy under Dr Mecke.

Of particular appeal to me at Bonn, with its renowned history in that field, was the astronomy course. This course, on 'The Theory and Practice of Astronomical Instruments', was shared by Professor Küstner and Extraordinarius Professor Mönnichmeyer. Küstner was the undisputed Dean in the field of positional astronomy in Germany at the end of the 19th century. His fame rested on the discovery in 1888 at the Berlin Observatory of the variation in latitude or minute oscillations of the position of the Pole. The possible mobility of the Earth's axis of rotation had been suggested theoretically already in the 18th century by Leonhard Euler, but its very small effect had not been found until Küstner detected it in his meridian circle observations of the latitude of Berlin. Aiming at all times at the highest precision in observations of star positions, Küstner had been able to reduce probable errors from Bessel's value of  $0''.7$  to  $0''.27$ .

These had been remarkable achievements, but by my day as a student, Küstner's eagerly awaited lectures had lost their brilliance. However, it was a privilege to have heard and known him.

On the practical side, we students received excellent instruction from Professor Mönnichmeyer who took us three times a week to Argelander's old observatory and put us through an intensive course in the use of astronomical instruments. The aim was to ascertain what degree of precision could be reached in the case of each of a range of instruments of increasing complexity, starting with portable instruments such as sextants and repeating circles, advancing to transit circles and theodolites, and reaching, finally, the meridian circle. We learned how to determine geographical position by the method of lunar distances – a method, popular with sailors in earlier times, which provided an interesting problem in computation as well as observation.

Among my happy recollections of Bonn in that summer semester of 1925 is the song of the hosts of nightingales on the tree-lined Poppelsdorfer Allee which we heard on our way home from a night's observing at the Old Observatory. A special student friend in the astronomy class was Max Delbrück, son of the famous historian Hans Delbrück, whose home was not far from ours in Berlin-Grünwald, though I had not known him previously. So much were we seen together as we walked to and from the Observatory that we were dubbed 'Delbrück and his echo' – Delbrück and Brück. As recounted in his biography<sup>2</sup>, Delbrück was deeply disappointed with the old classical astronomy he encountered at Bonn, and left in search of the new physics at Göttingen. His subsequent brilliant career in atomic physics, biophysics, and genetics which led to a Nobel Prize in medicine in 1969, is legendary. Our paths, unfortunately, never crossed after we left Bonn.

At the end of the semester, with my uncle and aunt, I returned to Munich.

## 6 MUNICH 1925-28

The time from my matriculation at Munich in the winter semester 1925-26 to my graduation in the summer of 1928 was the most enjoyable and the most fruitful period of my student years. The Chair of Astronomy had been filled by Seeliger's successor, Professor Alexander Wilkens who had come to Munich from the University of Breslau. His field was classical celestial mechanics, in particular the theory of perturbations of planetary orbits. He was a firm believer in the superiority of the French work in that field. His lectures were based on the heavy tomes of F Tisserand's *Mécanique Céleste* and Henri Poincaré's *Methodes Nouvelles*. He despised German textbooks: "Throw the lot out of the window!" – but accepted *Die Mechanik des Himmels* by the Swedish C V L Charlier and F R Moulton's *Periodic Orbits*, published in 1920.

Wilkens' difficult subject did not attract more than a half a dozen students to his lectures, of whom I was one of the most attentive. Thanks to the excellent lectures in mathematics from Professors Caratheodory (analytical mechanics) and Perron

(algebra), I made rapid progress in Wilkens' courses. In fact, I got on so well that he held out the prospect to me of being able to gain an early doctorate with a problem on periodic perturbations of minor planets.

My attitude to astronomy changed dramatically, however, in my second semester (summer 1926) when I experienced the lectures of Professor Arnold Sommerfeld. Sommerfeld (Figure 2) was the most brilliant university teacher I ever met. His lectures were models of clarity, and beautifully delivered. He would fill the two large blackboards in his lovely handwriting with never a mistake. Though I found myself at the wrong end of his 6-semester course on theoretical physics, I was able to keep up quite well with his lectures even in my first semester – partial differential equations of physics – introduced with a discussion of Fourier's work. Sommerfeld himself – and the subject matter of his lectures – aroused my immense enthusiasm and the wish to make theoretical physics rather than astronomy my main field of study. Mathematics and astronomy would then be my secondary subjects.



Figure 2. Arnold Sommerfeld circa 1928

Professor Wilkens, though disappointed with my change of direction, accepted my new views. I continued attending his lectures on celestial mechanics for a full two years, and took part regularly in his astronomical colloquia at the Observatory. I also attended the astrophysics lectures of Professor Zinner, and, in my last semester, listened to a remarkable course on the physics of the Sun by Professor Robert Emden, of 'Gaskugeln' fame. As with astronomy, I kept up my mathematics courses throughout, quite particularly the brilliant lectures of Caratheodory.

In order to learn more about experimental physics, I took the intensive lecture and laboratory course of Professor Wilhelm Wien and his assistants. Wien, famous chiefly for the law of black-body radiation enunciated in 1893 which bears his name, was greatly revered – and not a little feared – by his students. Out of interest I also went from time to time to Munich's Technical University to listen to the entertaining lectures of Sommerfeld's friend J Zenneck, the Professor of Physics there, which were accompanied by demonstrations, including, I recall, the firing of rifles!

As Sommerfeld's course progressed I became particularly intrigued by his lectures on the new quantum and wave mechanics. I exerted myself to the full to be accepted into his seminar (or study group) where the marvellous new developments in physics were kept under constant discussion. It was at Sommerfeld's seminar that Werner Heisenberg, then professor in Leipzig, first spoke about his uncertainty principle (1927), when I was already a member and had the good fortune to be present.

To become a member of the seminar one had to demonstrate one's suitability by giving a critical presentation of a recent scientific paper. The task set for me was to discuss a paper by Erwin Schrödinger with the formidable title 'Quantizierung als Eigenwertproblem, Störungstheorie und Anwendung auf den Starkeffekt der Balmerlinien' which had just appeared in Volume 80 of the *Annalen der Physik*. I was given six weeks to prepare my talk. It is no exaggeration to say that never in all my life did I work as hard day and night as I did on that occasion! However, my talk went well, and I was formally accepted as a member of Sommerfeld's Seminar. Twenty years later, when Professor Schrödinger and I were colleagues at the Dublin Institute for Advanced Studies, we laughed heartily as I recalled my ordeal of 1926.

Having joined the seminar I was taken on by Sommerfeld as a candidate for a doctorate. The first problem proposed to me for research turned out to be incapable of solution. Another was found for me by Sommerfeld, in conjunction with his assistant Albrecht Unsöld, which I was able to solve in due course and which formed the substance of my doctoral thesis. Unsöld, though a few months younger than I, had already obtained his doctorate under Sommerfeld and was now his assistant. He and I became close friends and remained so throughout our lifetimes. Unsöld, recognised as one of the world's leading astrophysicists, moved from Munich a few years later and spent almost his entire academic life thereafter in the University of Kiel<sup>3</sup>.

A delightful aspect of becoming a student of Sommerfeld's was the opportunity of getting to know him on the ski slopes. He was an expert skier, and had a Hutte or cabin in the mountains at Bayerische Zell where his assistants and senior students, as well as occasional foreign visitors – ten or so people altogether – would be invited to spend weekends. Albrecht Unsöld and I were among those thus privileged. Professor Zenneck, Sommerfeld's great friend and fellow ski-ing enthusiast, often came as well. Sommerfeld's technician from his crystallography Department was usually there too: his wife – the only lady in the company – an excellent cook, fed us splendidly in true Bavarian manner. In those days we carried our skis on our shoulders, and trudged all the way up the icy track – a far cry from today's ski-lifts. These weekends in the mountains were among the highlights of my student days.

I myself was also keen on mountaineering, and in summer spent most weekends rock climbing in the mountains of the Wilder Kaiser in the Tirol east of Kufstein, either alone or with the Munich Alpine club.

I completed my thesis – on a problem concerned with the wave-mechanical calculations of the forces which keep ions apart in salt crystals, afterwards published in a paper in *Zeitschrift für Physik* – in good time. The thesis was accepted, and I was put forward for oral examination in theoretical and experimental physics, and in mathematics and astronomy. I had four examiners – Sommerfeld and Wien for physics, Tietze for mathematics, and Wilkens for astronomy. Wien had a reputation as a severe examiner: even Heisenberg's grade had been marred by his questioning. In

my case he was, indeed, the only examiner to prove awkward, with his disconcerting habit of whistling while waiting for answers. However, I survived: I was in fact the very last person to be examined by Wien who died soon afterwards at the early age of 61.

On 24 July 1928 I graduated Doctor of Philosophy 'magna cum laude' at the University of Munich.

On my 85th birthday, in 1990, it gave me great pleasure to receive from the Rector of the University of Munich a duplicate certificate of my D.Phil. degree.

## 7 THE EINSTEIN INSTITUTE

I owe the next step in my career to my Professor, Sommerfeld. Sommerfeld took a great interest in the work of A S Eddington whose *Internal Constitution of the Stars* had appeared in 1926. He suggested that, with my love of astronomy, my path ought to be in this new astrophysics – the path also chosen by Unsöld for his life's work. The leading astronomical institution in Germany was the Astrophysical Observatory in Potsdam where in 1924 an entirely new Department, the Einstein Institute<sup>4</sup>, had been established on forward-looking lines. Sommerfeld considered that this Institute would be a good place for me to work, and upon his recommendation to its Director Erwin Finlay Freundlich<sup>5</sup>, I was awarded a research grant (what one would now call a Research Fellowship) to work there shortly after leaving Munich. Albrecht Unsöld was also to spend some time as a visiting researcher there.

The Astrophysical Observatory at Potsdam had come into being in the 1870s, one of the very first observatories in the world to be devoted specifically to the 'new astronomy' of the time. It acquired under its first Director, H J Vogel, international eminence for work on stellar spectroscopy and the radial velocities of stars. The large site encompassed several buildings and staff residences. The main building was surmounted by three domes housing refractors of modest size. Later in the nineteenth century another separate dome was built for the photographic refractor used for the international Carte du Ciel project. A substantial addition to the Observatory was a 31/20-inch photographic/visual refractor acquired in 1899 and mounted in a huge new separate dome on the south side of the main building (Figure 3). However, by the time this 'Great Potsdam Refractor' was built, the usefulness of large refractors had all but passed. This fact, combined with the instrument's inadequate performance and the poor seeing conditions at the site, prevented this large telescope from being used for any serious programme of research.

It was only in the 1920s that a move was made to up-date the instrumental facilities of the Potsdam Astrophysical Observatory. This was largely thanks to the efforts of Freundlich who had joined the staff in 1920 as an 'Observer', having previously been assistant at the Berlin Observatory at Berlin-Babelsberg. Freundlich's special interest was in the observational tests of Einstein's Theory of Relativity. In the case of the first test – the motion of the perihelion of the orbit of the planet Mercury – Einstein's theory had proved clearly superior to Newton's. The second test involved the redshift of the lines in the spectrum of the Sun caused by the gravitational attraction of the Sun's mass on its light. The third was the deflection by the Sun of the light of stars close to the Sun's limb, an effect observable at times of total solar eclipse.

Karl Schwarzschild, the eminent successor of Vogel as Director of the Potsdam Observatory, had already tried, in 1913, to detect relativistic redshifts in the solar spectrum, but found his equipment inadequate for the task. Freundlich recognized the need, if this observation was to be made, for a telescope of long focal length coupled with a spectrograph of high resolution – along the lines of the large tower telescope at Mount Wilson Observatory in California. Freundlich's project would be costly, but he had the backing of leading scientists such as Planck, Nernst, and von Laue, who were greatly interested in the experiment, since Eddington and his team of English



observers appeared to have successfully demonstrated the deflection of light in accordance with Einstein's predictions at the Sun's limb during the total eclipse of May 1919. Major financial support for Freundlich came from German industrialists, particularly from the concern IG Farben whose President, Carl Bosch, industrial chemist and Nobel Laureate, was prepared to take a close interest in the matter.

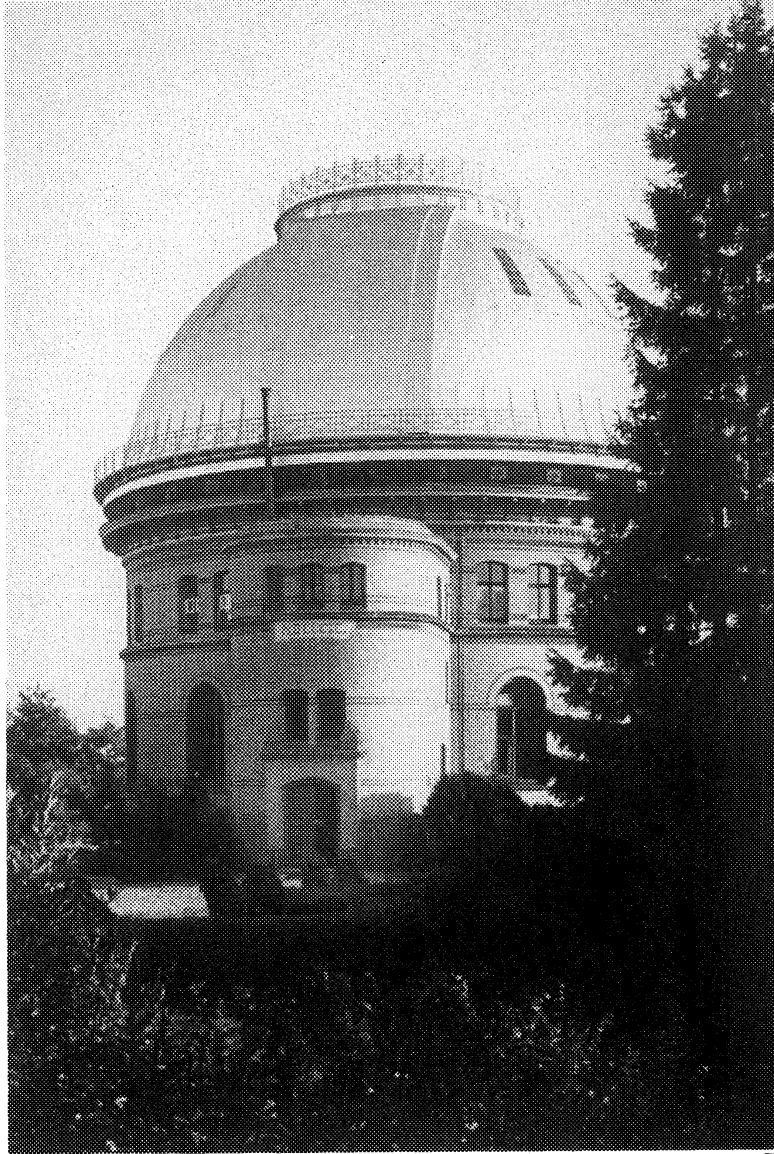


Figure 3. The Great Refractor Building

The actual design of the building, known as the Einstein Turm (or Tower) (Figure 4), on a site to the south of the Great Refractor, was entrusted to the famous modern architect Felix Mendelsohn, who co-operated closely with the firm of Carl Zeiss Jena which was responsible for supplying the optical equipment. The instrument used two mirrors of a coelostat (Figure 5) to send the Sun's light vertically down on to a lens of 60-cm aperture and focal length 14.5 metres. The solar beam, turned into a horizontal direction by an auxiliary mirror, was then thrown into a large prism or grating spectrograph with a collimator of 12 metres focal length (Figure 6). The whole installation was successfully completed at the end of 1924. The Einstein Tower was acclaimed as a truly modern and effective instrument which would lead to significant advances in the field of relativity theory and of solar physics in general.



Figure 4. The Einstein Tower

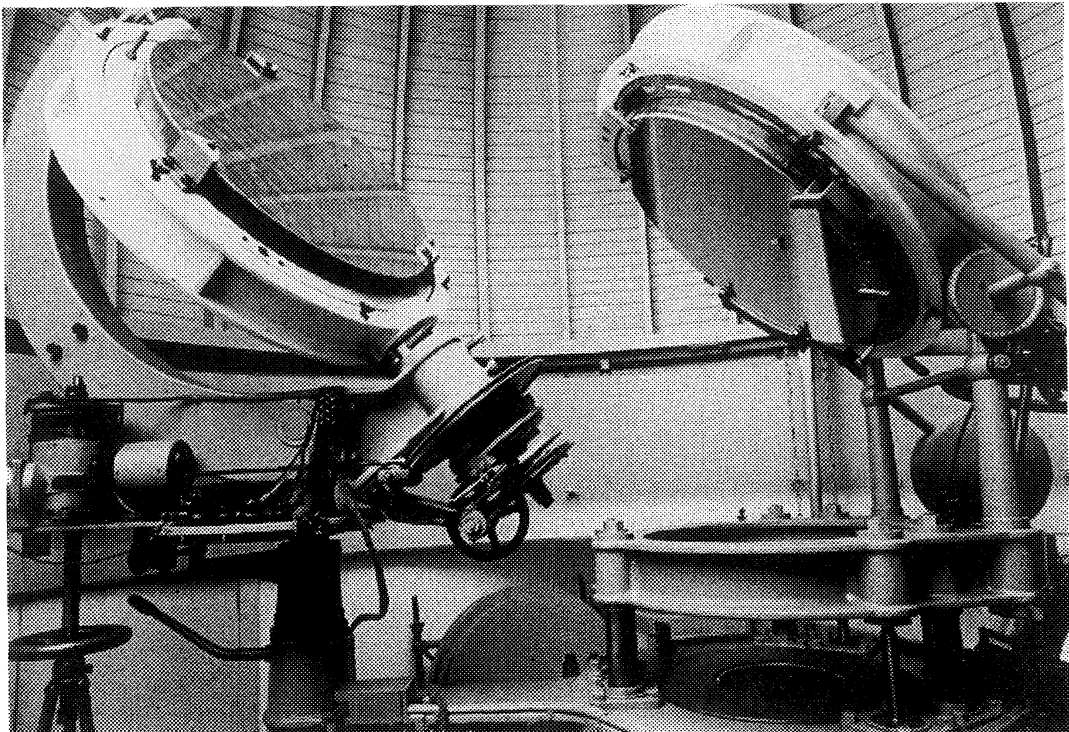


Figure 5. The coelostat at the Einstein Tower

On my arrival in Potsdam I was very kindly received by Professor Freundlich and his scientific staff – Drs Harald von Klüber<sup>6</sup> and Karl Wurm, and his technical assistant Fraulein G. Schröder (see Figure 7). Klüber then introduced me to the Director of the Astrophysical Observatory, Professor Hans Ludendorff. The Einstein Institute was officially a department of the Astrophysical Observatory, in which Freundlich was, formally, no more than one of the Observatory's senior astronomers or 'Hauptobservatoren'. Freundlich, however, had been fairly successful in making himself independent of the Director. I soon became aware that personal relations between him and Ludendorff were cool, and that the Observatory staff, or part of it, was divided into two 'camps', with allegiances to one or other of these men. This feud passed over my head, however, and throughout my years at Potsdam, first at the Einstein Tower and then on the main Observatory staff, I fortunately experienced no friction from that source and was on good terms with astronomers on both sides.



Figure 6. The solar spectrograph at the Einstein Tower

When I first arrived at the Einstein Turm I found Freundlich and Klüber busy preparing for an expedition to Sumatra where they planned to observe the total eclipse of the Sun of 9 May 1929. Freundlich had earlier taken part in an eclipse expedition organized from Hamburg Observatory to the Crimea in 1914, which was hampered by poor weather. On this occasion Freundlich and Klüber's intention was to carry out the relativity test by observing, with new and specially-constructed equipment, the deflection of starlight at the limb of the Sun. Klüber had his hands full, adjusting a double horizontal camera which, fed by a coelostat, was to produce images of the Sun

of 8-cm diameter on a photographic plate. The results of this successful expedition gave a light deflection of  $2''.24$ , appreciably larger, even after doing a new reduction, than the theoretical value of  $1''.75$ . The discussion of what the true value of this quantity ought to be was to preoccupy Freundlich for the rest of his life and put him at odds with mainstream relativists.



Figure 7. Fraulein Schröder, Karl Warm and H A Brück at the Einstein Tower

My first duty at the Einstein Turm was to familiarize myself with the spectroscopic equipment and with the operation of the 'Dreh-system' constructed by C Zeiss which allowed the light of two different regions of the Sun to be thrown simultaneously onto the slit of the spectroscope. The purpose was to search for redshift of lines in the solar spectrum as predicted by the Theory of General Relativity. Analysis of the observations showed that the method was not powerful enough to detect the redshift. However, they showed a change in wavelengths of Fraunhofer lines along a solar radius and established the so-called 'limb effect' for which no theoretical explanation could be found. The results were published in a joint paper with Freundlich and A von Brunn, who had joined us from Danzig (Gdansk). The same unexplained effect was later confirmed by Miss M G Adam at Oxford.

Meantime Wurm, the third member of our team, used the solar spectrograph for laboratory spectroscopy. He had an electric furnace to produce narrow iron comparison lines, and also did some molecular spectroscopy.

In addition to the solar work in the Einstein Turm I had the opportunity of being involved with Professor H. Schüler in laboratory spectroscopic studies of hyperfine structure in spectral lines for the determination of nuclear moments, a field in which he was the leading expert. This resulted in a number of papers in the *Zeitschrift für Physik*. Schüler, who did not belong to the regular Potsdam staff but had a grant from

the Kaiser Wilhelm Institute, had his laboratory in one of the rooms in the Great Refractor building. It was there that I first met Derek Jackson FRS, the Oxford spectroscopist with whom I was to collaborate for a time in the 1950s<sup>7</sup>.

The frequent presence of visiting scientists such as Jackson was one of the attractions of working at Potsdam. Freundlich made a practice of welcoming researchers from abroad as well as from Germany: the British cosmologist E A Milne was one of those whom I got to know in Potsdam, where he spent many months working with Freundlich.

Part of the activity at the Einstein Institute was the excellent colloquia. I heard Jan Oort speak about the rotation of the Galaxy at one of the colloquia. It was there, too, that I met the Danish astronomer Elis Stromgren and his son Bengt, Bart Bok from the Netherlands, and many others.

A regular participant at the colloquia was the spectroscopist Walter Grotrian, who was a member both of the main Astrophysical Observatory and of the Science Faculty at Berlin University. Grotrian introduced me into the illustrious circle of M von Laue's Physics Colloquium at the University in which speakers reported on recent published researches to an audience including no fewer than five Nobel Laureates. I was pleased to be allowed to speak; my topic was a paper by Otto Struve concerning the Stark Effect in stellar spectra. Einstein used to turn up at the Physics Colloquium. As a very junior member, I cannot claim to have known him personally, except in so far as his waving at me from his sailing boat on the lake at Potsdam when I was out in my own little dinghy. Einstein was a member of the Board of the Einstein Institute but rarely took part; in fact I do not recall ever having seen him there.

Klüber and – soon after my arrival – I myself, had the use of simple living-cum-sleeping rooms in the Great Refractor. It meant that I could stay on the Hill during the week, and at weekends go home to Berlin which could be reached easily on the S-Bahn (fast train) which connected the city with Potsdam. There was also in the same building a large room where the younger members of staff and guests could have lunch, brought up in covered metal containers from a restaurant in Potsdam. The communal lunch, eaten under the gaze of a large portrait of Sir William Huggins, provided a pleasant opportunity for conversation and social contact. I recall discussions about French literature with Wurm who was an ardent fan of Balzac and possessed all his works in the original. At lunchtime also, we could enjoy walks in the surrounding forests or play tennis in the Observatory grounds.

## 8 THE ASTROPHYSICAL OBSERVATORY

After two years at the Einstein Turm I was offered a permanent post on the staff of the Astrophysical Observatory, occasioned by the appointment of Friedrich Becker to a Chair at Bonn. The programme which I took over from Becker (who became a very special friend) – and into which he initiated me before he left – was the Potsdam Spektral Durchmusterung, the spectral classification of southern hemisphere stars from objective prism spectra on photographic plates taken at the Potsdam Observatory's station at La Paz, Bolivia. The purpose of the programme was to extend classification to fainter stars than were included in Harvard's Henry Draper Catalogue which reached magnitude 8 or 9. The region of sky involved covered 91 of Kapteyn's Selected Areas, observed with a 30-cm astrograph which operated for this single purpose from 1926 until 1929. Becker had spent a long time in La Paz obtaining these spectra. Rolf Müller, astronomer son of Ludendorff's predecessor, was also absent in South America when I first came to Potsdam.

My work consisted in examining the objective prism spectra, which had a dispersion of 180 Å per mm, in a stereocomparator, assigning to each star a spectral type and measuring the star's position and magnitude from the companion direct vision plate in the comparator. The project was regarded as a major piece of astronomical

research. Visitors to the Observatory were often brought along to watch the work in progress: I remember Herzsprung being surprised at my being able to classify spectra as faint as 13 magnitude. A necessary task was to compare our classification with the Harvard system: they agreed well so that the Potsdam results could be readily converted to the HD system. My share in this enterprise (24 of the Selected Areas) was published by the Astrophysical Observatory in 1935.

A companion Spectraldurchmusterung for the northern sky was being carried out at the Hamburg-Bergedorf Observatory, using plates obtained at that Observatory, under the direction of Arnold Schwassmann, and I travelled to Hamburg more than once to consult with him and to compare and maintain standards. In Hamburg I met, among others, Bernhard Schmidt, the designer of the Schmidt telescope.

Though the spectral classification programme was my principal duty, I was left plenty of time for other research according to my own inclination. I obtained objective prism spectra of very faint objects with the Observatory's 12-inch Schmidt camera – acquired before my time and attached to the old Carte du Ciel refractor – with a prism giving a dispersion of 150 Å per mm. The refractor itself was not in use, but the burdensome work of the international Carte du Ciel programme, initiated in 1887, was still going on under Dr Münch. In fact it was never completed.

My post at the Observatory brought the bonus of very pleasant living quarters, a 'bachelor pad', in the Assistants' house (Figure 8). Herr Strobusch, the head of the Observatory's workshop had an apartment in the same house. My other neighbour was Wilhelm Becker, younger brother of Friedrich, appointed somewhat later.<sup>8</sup>

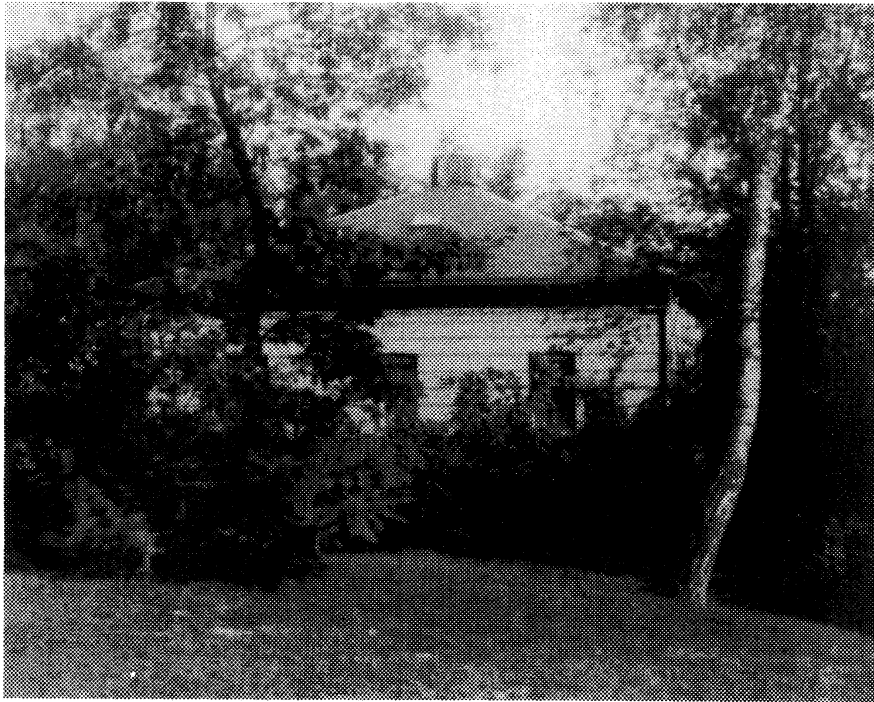


Figure 8. The Assistants' House at the Potsdam Observatory

The senior members of the staff – as in all large observatories in that era – had official residences in the grounds. Professor Ludendorff, his second-in-command Professor Eberhard, and Professor (Baron) von der Pahlen occupied single houses. Drs Grotrian and Hassenstein lived in the large house originally built for Vogel, now divided into two apartments. Including their families, there was therefore quite a sizeable community.

I greatly admired Professor Ludendorff as a scientist. He was also very kind to me on a personal level, and welcomed me into his family for social occasions.<sup>9</sup> I was equally welcome in the home of Baron von der Pahlen where I met many of the Russian emigré circle, and also in the Grotrians'.

Outside Potsdam I met many other astronomers at meetings arranged by Professor Hans Kienle in Göttingen where they were engaged in a pioneering programme in stellar spectrophotometry. I took a great interest in this work which I discussed in a review article in the Supplement Volume of the *Handbuch der Astrophysik*, edited jointly by Ludendorff and Eberhard. I also had an interesting friend in Robert Henseling, a serious amateur astronomer with whom I co-edited the magazine *Die Sterne* (which still flourishes), a most agreeable task.

During my time there were also meetings of the Astronomische Gesellschaft (The German Astronomical Society) which I attended, in Bern and in Göttingen. The latter, in 1933, was the first at which certain members appeared in Nazi uniform.

Up to that time, life as a young astronomer in Germany was idyllic.

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### Notes

- 1 W C Seitter and H W Duerbeck have made a study of Wirtz's work: see references in Freitag, R.S., 2000. Recent publications relating to the history of astronomy. *Journal of Astronomical History and Heritage*, 3:59-85.
- 2 Fisher, E.P. and Lipson, C., 1987. *Thinking about Science*. Norton, New York.
- 3 Albrecht Unsöld (1905-1995) was a welcome visitor in Scotland. He received a D.Sc. degree *honoris causa* from the University of Edinburgh in 1971, and in 1975 delivered an address at a farewell function for H Brück's retirement. He also had links with Professor D Walter Stibbs at the University of St. Andrews.
- 4 The fascinating scientific and human history of the Einstein Turm has been recorded by Professor Klaus Hentschel of the University of Göttingen in: Hentschel, Klaus, 1992. *Der Einstein Turm*. Spektrum Akademischer Verlag Heidelberg; Hentschel, Klaus (tr. Hentschel, Ann M.), 1997. *The Einstein Tower*. Stanford University Press, Stanford.
- 5 E F Freundlich (1855-1964) was obliged to leave Germany in 1933. He was eventually appointed to a Chair of Astronomy in the University of St. Andrews, Scotland.
- 6 H von Klüber (1901-1978) moved to Cambridge in 1949.
- 7 D A Jackson (1906-1982). Obituary: *Biographical Memoirs of Fellows of the Royal Society*, 29:269-296 (1983).
- 8 Steinlin, U., 1982. *Extraprint of the Astronomical Institute of Basel*. This publication records a celebration of Wilhelm Becker's 75th Birthday in July 1982 in Basel, with greetings from former colleagues including his brother Friedrich, A Unsöld, H Brück and others.
- 9 Ludendorff (1873-1941) died during the Second World War. H Brück, then living in Britain, wrote his Obituary Notice in *Monthly Notices of the Royal Astronomical Society*, 102:78-79 (1942).

