Robert Julius Trumpler and the Cosmos: The Contributions of a Swiss American Astronomer

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Swiss American scientists have made many valuable contributions to a more precise understanding of the universe. Among the most influential of these was the astronomer, Robert Julius Trumpler, who did much to advance our knowledge of the Pleiades star cluster, the planet Mars, globular clusters, and the theories of his fellow Swiss American, Albert Einstein. Trumpler made his contributions at an important time in the development of astronomical theories that more accurately explained the nature of the universe, and his advances are still important today. He is also fondly remembered as one of the most significant astronomers of his generation. The purpose of this article is to outline Trumpler’s life and to explain the nature of his contributions.

Robert Julius Trümpler was born on October 2, 1886 in Zurich, Switzerland. He was the third of ten children to come to the industrialist, Wilhelm Ernst Trümpler, and his wife, Louise Hurter Trümpler. Robert described his early childhood in a large family as a very happy one, and he said his life at that time was cheerful and gay. He especially enjoyed the summer months at the nearby town of Uster, Switzerland, where his

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father owned a cotton mill. The area was picturesque and ideal for many outdoor activities. This experience helped Robert have a love of nature which he retained his entire life.

When Robert was six, he attended school in Zurich. As a precocious child, he could already read and write, and he knew much of the materials presented, so he found most of the course of study to be dull. Yet when he took the competitive entrance exam to attend a school for advanced secondary education (Gymnasium) at age twelve, his scores were the highest in his class. He had high praise for the instruction he received in the secondary school, and he stated he was indebted “to the excellent schooling received during the six and a half years of the Gymnasium.” He said his instructors were, “true educators, inspiring interest in, and devotion to, learning, and a broad-minded approach to life.” When one of his classmates gave a presentation of the Kant-Laplace theory (nebular hypothesis) on the development of the solar system, Trümpler was very interested, and he began to read astronomical books. His love for nature and learning led him to a life-long fascination for astronomy.2

Trümpler was also interested in art and literature, but he realized he was not imaginative enough to make contributions in painting or creative writing. However, he developed a skill for photography which later helped him take pictures of celestial objects. After Robert graduated first in his class at the Gymnasium, he followed his family’s wishes and took a job in a bank. This was a poor career choice, and a year later

2 Weaver and Weaver, “Trümpler,” pp. 304-5. Harold F. Weaver was Trümpler’s friend, college, and collaborator.
in 1906, Robert entered the University of Zurich to study physics, mathematics, and astronomy. In 1908, Trümpler transferred to the University of Göttingen in Germany. Among his distinguished professors were the physicist, Woldemar Voigt; the mathematician, David Hilbert; and the astronomer, Karl Schwarzschild. Trümpler’s Ph.D. dissertation was an impressive work on the photographically recording of the meridian transit of stars (Eine Methode zur photographischen Bestimmung von Meridian-durchgängen). Trümpler graduated magna cum laude (with great praise) from Göttingen in November 1910.3

In 1911, the young prodigy joined the Swiss Geodetic Commission. As part of his work, he measured the difference in longitude between the important Swiss observatories, determined star positions, and devised plans to track the motions of the principal stars in the Pleiades star cluster. The question of the nature of star clusters was to intrigue him for many years. At a meeting of the Astronomical Society (Astronomische Gesellschaft)4 in Hamburg in 1913, Trümpler met Frank Schlesinger, the American astronomer, and the two men discussed the plan to track the motion of stars. Schlesinger was so impressed with the young man that a few months later he invited him to come to the Allegheny Observatory at the University of Pittsburgh in Pennsylvania as an assistant to continue his study of the Pleiades.5

The young astronomer was pleased to accept the position, but his plans were interrupted when the First World War broke out in August 1914. The Swiss government, fearing that the nation might be dragged into the war, immediately mobilized the Swiss Militia, and Trümpler, as a first lieutenant in the Swiss Army, was activated. He was stationed in the Alps. In the spring of 1915, Schlesinger wrote that he could not hold the position open indefinitely, and Trümpler appealed to his superiors that he be allowed to come to the United States. By that time, the fear of being dragged into a war was much reduced, and the young astronomer was given permission to leave. He arrived at the Allegheny Observatory in May 1915 but returned to Switzerland in 1916 to marry his sweet-

4 For more information on the society, see Felix Schmeidler, Die Geschichte der Astronomischen Gesellschaft: Jubiläumsband 125 Jahre Astronomische Gesellschaft (Hamburg: sn, 1988).
heart, Augusta de la Harpe. The newlyweds went to the United States that same year traveling in a military convoy. The couple later had five children: three daughters and two sons.  

In 1918, William Wallace Campbell recognized Trümpler’s excellent work and offered him a position at the Lick Observatory operated by the University of California. He was advanced to the position of assistant astronomer in 1920. Realizing that he had a great future in the United States, Trümpler became a naturalized citizen in 1921. He also dropped the umlaut from the spelling of his name and became known most commonly as Robert J. Trümpler.

One of the most intriguing astronomical issues of the time was Albert Einstein’s general theory of relativity which stated in part that gravity was actually a warp in space-time. This meant that the warp around a massive object, such as the sun, should bend the trajectory of light passing near it. However, the brightness of the sun precluded a measurement of the effect unless the observation was taken during a solar eclipse. The data acquired during the eclipse of May 29, 1919 seemed to verify Einstein’s predictions, but skeptics questioned the accuracy of the measurements, and additional observations were necessary to satisfy all the critics.

Campbell chose to take Trümpler with him when he went to Wal­lal, on the northwest coast of Australia, to take additional measurements during the total eclipse of September 21, 1922. Trümpler’s measurements were the most precise to date. He stated that the deflection of light on the edge of the sun was 1.75” (1.75 arcsecond) plus or minus .09 seconds of arc. Einstein had predicted that the deflection would be 1.745 arcsecond. These observations were so accurate that they are still quoted by many astronomers.

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6 Weaver and Weaver, p. 306; Weaver, p. 281; and Dieke, “Trümpler,” p. 474.  
7 Weaver, p. 281.  
One of the most perplexing questions in astronomy at that time was the nature of the surface of Mars. The Italian astronomer, Giovanni Schiaparelli, stated that he had seen “canali” or channels on the Red Planet. In his book “Life on Mars” (La Vita sul pianeta Marte) Schiaparelli argued that the channels brought water from long distances. The American astronomer, Percival Lowell, believed that there were canals on Mars that were constructed by an ancient civilization, and the planet supported intelligent life.¹⁰

Many astronomers were long skeptical of such claims, but there was no way to prove the assertions one way or another because even the best photographs of Mars were too unclear for precise analysis. Lowell had used a twenty-four inch refracting telescope for his observations, but Trumpler used the much larger thirty-six inch refracting telescope at the Lick Observatory when Mars came in to favorable opposition in 1924. He was surprised to note that the dark markings identified by Schiaparelli were authentic, but they were not as sharp, straight, or as narrow as Lowell had stated.

As a perfectionist, Trumpler approached the study of Mars with his usual attention to detail. He took roughly 1,700 photographs of the Red

Planet, and he made a careful analysis of about 150 of them that had the best resolution. These photographs provided reference points that helped demonstrate the flattening of Mars at the poles. An additional 228 markings were analyzed, and Trumpler came up with some unsuspected conclusions. Trumpler thought that the features in question were some sort of natural phenomenon and were probably volcanic faults. His ideas were at least partially confirmed when the Mariner 9 space probe went into orbit around Mars in 1972 and sent back thousands of images of the Red Planet.

The most significant contribution Trumpler made dealt with star clusters especially their distances, distributions, and location in space. He argued that the types of stars in star clusters were noticeably different. Some of them had many large blue stars in them, but they had no yellow stars or red giants. Conversely, many of the star clusters had many yellow stars or red giants, but they had no large blue stars. These observations helped other researchers develop widely-accepted theories on how stars evolve over time.

Trumpler analyzed data he received from the examination of 334 globular clusters. His conclusions were extraordinary and based on an immense amount of work. He argued that the distances to these objects had been overestimated because astronomers had not taken into account some kind of material or haze in interstellar space. Many astronomers believed that no such material existed, and they completely ignored all possible effects from it. Trumpler argued that these elements were absorbing starlight and reducing the magnitude or brightness of stars within the galactic plane of the Milky Way. He further maintained that starlight was dimmed on the average 0.67 magnitudes of brightness for every kiloparsec (one thousand parsecs or 3,262 light years) of distance to the star being examined. Since estimates of distances to stars were partially based on a measurement of their absolute brightness, the size of the Milky Way had been approximated improperly, and many astronomers believed the center of the galaxy was farther away than it actually was. Trumpler’s observations have allowed astronomers to understand

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globular clusters better and to present a more accurate estimate of the size of the Milky Way.

The Trumpler family lived for years on Mount Hamilton where the Lick Observatory was located. They lived in a small community of other astronomers and their families, comprising only about fifty people. Since many of the men worked nights, the children were taught to play quietly, and no dogs were allowed, so the astronomers could sleep in the daytime. The children went to school in a one-room school house, but they could not attend beyond the eighth grade. Robert had traded assignments with a few professors at the university at Berkeley one semester at a time over the years. When these Berkeley professors did research at Mount Hamilton, Trumpler taught classes for them at the university. He did not want to see his children leave home to go to high school, and his family liked Berkeley. Robert also enjoyed teaching, so
he took a permanent position at the university in 1938, but he kept his home at Mount Hamilton where the family spent their summers.\textsuperscript{14}

Trumpler was an excellent instructor. He taught simplistic introductory courses for non-majors without complaint, and he was an enthusiastic teacher. He improved the upper division courses, and he developed a class for graduate students in his specialty, statistical astronomy. His classes were popular, and many students approached him to be their thesis advisor. At the same time, he continued to work on improving instruments to make more precise photographic plates.\textsuperscript{15}

Professor Trumpler genuinely liked young people, and many astronomers in the next generation were proud to say they were one of his students. For many years, he worked as the adviser for the Astronomical Department, and he guided students in their choice of classes. Many students responded to his concern and kindness by asking him for advice on a variety of issues, some of which had little to do with astronomy. Additionally, he often invited students to his home where they continued to enjoy his company.\textsuperscript{16}

During his summer at the Lick Observatory in 1939, Trumpler suffered an accident which had long-term consequences. At that time, astronomers had to have the ability to manipulate and manage heavy and often unwieldy instruments. The 36-inch telescope was a huge device, and it weighed several tons. One evening Trumpler needed to move the instrument from one side of the pier, which held up the telescope, to the other side. The movements had to be precise or the eyepiece could hit the floor and damage any equipment in use. When he moved the telescope, Trumpler lost control of it, and the instrument headed for the floor. In his attempt to stop its motion, the astronomer got into an awkward position, and the telescope hit his knee, crushing his heel against the floor. The instrument was not damaged, but Trumpler was badly hurt, and he had to have his leg in a cast for a long time.\textsuperscript{17}

When Trumpler was recovering, his doctor told him that he should walk on sand to strengthen his leg, so Robert and Augusta often went to Santa Cruz and Rio del Mar to walk on the beach near the ocean. Shortly after the Japanese attack on Pearl Harbor in December 1941, they were told that a house on a cliff overlooking the beach had just been put on sale at a very modest price because the owner was afraid of a Japanese inva-

\textsuperscript{14}Weaver, pp. 291-2.
\textsuperscript{15}Ibid., p. 292.
\textsuperscript{16}Weaver and Weaver, p. 307.
\textsuperscript{17}Weaver, p. 295.
sion of the coast. They took advantage of the situation, and the Trumplers bought the house as soon as they saw it. Robert and Augusta lived in the house for many years, and they enjoyed it a great deal.\footnote{Ibid., p. 293.}

Trumpler retired in 1951 after a long and fruitful career in which he had achieved many honors. In 1932, he was elected to the National Academy of Sciences, and he was made president of the Astronomic Society of the Pacific both in 1932 and 1949. Trumpler was also a fellow of the American Academy of Arts and Sciences. He was a very prolific author, and he published at least nine academic articles and sixty-five research reports. After retirement, Trumpler continued to write, and he published the book \textit{Statistical Astronomy} in 1953, an outgrowth of his fifteen years of teaching graduate courses in astronomy.\footnote{Robert J. Trumpler and Harold F. Weaver, \textit{Statistical Astronomy} (Berkeley: University of California Press, 1953).} The work received high praise from the academic community when it was published, as one reviewer stated, “The book and 1953, its date, will doubtless be known, and justly, as a great achievement in astronomy and in the other physical sciences.”\footnote{W. Edwards Deming, review of \textit{Statistical Astronomy} by Robert J. Trumpler and Harold F. Weaver, \textit{Journal of the American Statistical Association} 50, no. 270 (June 1955): pp. 615-17.} The book was reprinted in 1962, showing that the work had not gone out-of-date and was still relevant to the study of astronomy.

Even in retirement, when Robert and Augusta lived in their home on the beach, Trumpler continued his study of his radial velocity data, but his work was cut short by his severe illness. Trumpler was diagnosed with leukemia, and his health soon began to fail. When he was taken into a hospital he suffered a rapid decline, and he died unexpectedly on September 10, 1956 just shy of his seventieth birthday. In 1974, the Astronomical Society of the Pacific created the Trumpler Prize for the best Ph.D. dissertation in astronomy to be awarded every year. This award clearly honored Trumpler as an outstanding educator who directed many doctoral theses and helped inspire a new generation of astronomers.\footnote{Weaver, p. 294.} Trumpler’s contributions were impressive, and he made significant advances in science that set the stage for further progress in astronomy.

\textit{~ Provo, Utah}