Cometography

A Catalog of Comets
Volume 3: 1900–1932

Cometography is a multi-volume catalog of every comet observed throughout history. This volume provides a complete discussion of every comet seen during the first part of the twentieth century. *Cometography* uses the most reliable orbits known to determine the distances from the Earth and Sun at the time a comet was discovered and last observed, as well as the largest and smallest angular distance to the Sun, most northerly and southerly declination, closest distance to the Earth, and other details to enable the reader to understand the physical appearance of each well-observed comet. The book also provides non-technical details to help the reader better appreciate how the comet may have influenced various cultures at the time of its appearance. *Cometography* will be valuable to historians of science as well as providing amateur and professional astronomers with a definitive reference on comets through the ages.

Gary Kronk has held a life-long passion for astronomy, and has been researching historical information on comets since sighting Comet Kohoutek in 1973/74. His work has been published in numerous magazines and in his books previous to *Cometography – Comets: A Descriptive Catalog* (1984), *Meteor Showers: A Descriptive Catalog* (1988). Kronk holds positions in various astronomical societies, including those of Coordinator of the Comet Section of the Association of Lunar and Planetary Observers, and Consultant for the American Meteor Society.

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VOLUME 3: 1900–1932

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This book is dedicated to my wife, Kathy.
Her love, encouragement, and gorgeous smile have been
an inspiration to me as I continue my work on *Cometography*
and other astronomical pursuits.

Contents

Introduction

The first 33 years of the twentieth century brought forth several improvements in the study of comets, which led to more discoveries and longer periods of visibility. Although the greatest advances came in photography, the more efficient dissemination of comet news certainly helped to increase the overall number of observations.

Comet discoveries

The USA continued their dominance in discovering comets during the period 1900–1932, with amateur and professional astronomers being given official credit for 31 discoveries. Following the USA were South Africa, with 19 discoveries, France, with 18 discoveries, and Germany, with 12 discoveries.

One major difference between the discoveries during this period and those in previous volumes of *Cometography* is that about one-fourth of the comets discovered were actually found by photography and most of those were as a result of surveys looking for minor planets. When exclusively looking at the photographic discovery statistics, the breakdown by country becomes very different. Germany led the way with nine photographic discoveries. They were followed by the USA, with seven discoveries, and the Ukraine, with five discoveries.

For visual discoveries, the race was actually somewhat close. The USA still led with 24 discoveries, but South Africa and France followed with 19 and 18 discoveries, respectively.

An interesting fact is that Frenchmen were the top discoverers in the first two volumes of *Cometography*, with C. Messier and J. L. Pons leading in volumes 1 and 2, respectively. The French also had the number one discoverer during the period covered by volume 3, with M. Giacobini being credited with nine discoveries. He was followed by W. Reid (South Africa) with six discoveries. There was a five-way tie for third place with A. L. N. Borrelly (France), W. R. Brooks (USA), J. H. Metcalf (USA), J. E. Mellish (USA), and J. F. Skjellerup (South Africa and Australia) each being credited with five discoveries.

Comet observations

Several very active comet observers from the nineteenth century continued to observe well into the period covered by this volume. The most notable include J. Holetschek, A. A. Nijland, and A. Abetti. The most notable observers to make their first appearance during these years were

H. M. Jeffers, G. van Biesbroeck, and M. Beyer. Each of these astronomers would provide a large number of comet observations for well over 50 years.

Visual observations were still the most common type, with observers providing estimates of the total magnitude, coma diameter, and tail length. Throughout this volume there are magnitude estimates of the "nucleus." These magnitude estimates can vary widely from one observer to the next and this is because the astronomers were not observing the true nucleus. Instead, they were observing a compact condensation, with the compactness varying according to the telescope type, telescope size, and magnification being used.

Although the telescope of choice was still the refractor, the reflector was becoming more important in the arsenal of observatory telescopes. The 102-cm Yerkes refractor would remain the upper limit for refractors in the world, but there was a size explosion for reflectors. Several new reflectors would nearly equal or surpass the Yerkes refractor in size during the early twentieth century, including the 152-cm reflector at Mt. Wilson (California, USA) in 1908, the 100-cm reflector at Hamburg Observatory (Bergedorf, Germany) in 1911, the 254-cm reflector at Mt. Wilson in 1917, and the 125-cm reflector at Berlin Observatory (Babelsberg, Germany) in 1924. All of these were primarily used for photographic purposes and were only occasionally used to observe comets.

What would later become known as the Bobrovnikoff method of estimating comet magnitudes came into greater prominence during this period, but it was used with a wide variety of observing instruments. For some bright comets, observers were using this method with binoculars, while others were using it with small and large telescopes. Resulting brightness estimates sometimes varied by 3–4 magnitudes, with the binocular users obtaining the brighter values.

Observations of comet C/1908 R1 (Morehouse) led A. Eddington to introduce the "fountain theory" of particule ejection in a 1910 issue of the *Monthly Notices of the Royal Astronomical Society*. Building upon a 1900 paper by S. A. Arrhenius that introduced radiation pressure from the sun as responsible for the creation of comet tails, Eddington showed that when particles were emitted from the sunlit side of a comet nucleus, this pressure diverted them so that they ultimately were moving away from the sun. The result was the appearance of a distinct parabolic envelope, the sides of which would form the boundaries of the dust tail.

Astronomical periodicals

The most dominant astronomical periodicals during the period covered by this volume were the *Astronomische Nachrichten*, the *Monthly Notices of the Royal Astronomical Society*, and the *Astronomical Journal*. Each published articles and papers concerning comets in nearly every issue.

News concerning comet discoveries was still being published by the *Astronomische Nachrichten*, although in 1919 an offshoot publication called the *Beobachtungs-Zirkulare der Astronomische Nachrichten* began to be issued. This was a 1–4 page publication that came out irregularly as needed to quickly spread the news about comets and minor planets. In 1922, a telegram service was started by the International Astronomical Union which was operated out of Copenhagen, Denmark. It was called the *Bureau Central Astronomique Circulaire* with the publishing body simply being referred to as the "Central Bureau." By 1932, the Central Bureau had become the clearing house for the dissemination of information announcing the discoveries of comets, minor planets, and novae, as well as publishing follow-up observations.

The most interesting comets of the early twentieth century

The most observed comet during the first 33 years of the twentieth century was 1P/Halley. Its return in 1910 was eagerly awaited. P. H. Cowell and A. C. D. Crommelin began publishing a series of papers during 1907 and 1908 that investigated the entire orbital history of this comet and prepared a prediction for the return. Although the prediction of Cowell and Crommelin was used to search for the comet, another prediction was provided by A. A. Ivanov slightly before the comet was recovered. Where the prediction of Cowell and Crommelin proved about 12 days too early, Ivanov's prediction proved less than 3 days late. The comet subsequently made a very close approach to Earth and exhibited one of the longer tails observed in recorded history. The comet was followed for 21 months before fading back into the blackness of space.

Interestingly, just a few months before comet 1P/Halley was at its brightest, a brilliant comet was spotted in the Southern Hemisphere. Simply referred to as the "Great January Comet," this comet was discovered by numerous people on the mornings of 1910 January 13, 14, and 15. On January 18, 19, and 20, the comet was visible around the world during daylight as a small, elongated, whitish object a few degrees from the sun. During the final days of January and the first days of February, many observers reported a tail 40–50° long.

Another incredibly bright comet was discovered by dozens of people during the last days of November and during early December of 1927. Now known as comet C/1927 X1 (Skjellerup–Maristany), it was quickly realized that the comet was heading toward the sun. The comet was a naked-eye daylight object for the period December 15–18 and was still observable with a telescope in daylight for a couple of days after that. During the last days of December, the tail was frequently noted as 30–35° long.

Although there were other notable bright comets, there were some interesting faint comets. The comet with the shortest known period, 2P/Encke, became the first comet to be seen near the aphelion point of its orbit during 1913 September, when it was found on a 3.5-hour exposure obtained with the 152-cm reflector at Mt. Wilson.

Another very interesting periodic comet was 29P/Schwassmann–Wachmann 1, which was found on 1927 November 15 by F. C. A. Schwassmann and A. A. Wachmann (Hamburg Observatory, Bergedorf, Germany). This comet baffled astronomers by fading much more rapidly than its orbit predicted and it was soon realized that the comet was found because of an outburst in brightness. As it turned out, the comet was observable every year, primarily because of the brightness outbursts of 5 or more magnitudes that it experienced at least once a year. During the times of normal activity, the comet frequently remained invisible to telescopes, even when photography was utilized.

Celestial mechanics

As the twentieth century began, the most common methods of calculating comet orbits were still those created by C. F. Gauss and H. W. M. Olbers. Gauss' method, with modifications by J. F. Encke, was used to determine general orbits, while Olbers' method was exclusively used to determine parabolic orbits.

A. O. Leuschner developed the "short method" of calculating orbits. Although formally published in 1913, it had been used by astronomers at the University of California for several years before that. The method was based on that of P. S. Laplace, who described his technique around the beginning of the nineteenth century. Leuschner basically took three observations made at short intervals to calculate an orbit that did not require an assumption as to its eccentricity. Leuschner said it was possible to calculate an orbit if an object was observed for several hours in one night, but that two nights were usually required. R. T. Crawford remarked that he could use this method to calculate an orbit in less than 4 hours. Although the University of California quickly produced some of the first orbits for newly discovered comets, some of these orbits were later shown to differ considerably from the comets' actual orbits.

Cometography

The format of this volume of *Cometography* is essentially the same as with volume 2, although there are two significant changes.

The first is the way well-observed comets were handled. Instead of listing every magnitude, I have consolidated them to save space and to make the text a little more readable. Sometimes, I chose to present only the values made by an experienced observer, such as Holetschek and Nijland. At other times, I chose to give the range of magnitudes made on a particular night, followed by the observers' names.

Comet 29P/1927 V1 (Schwassmann–Wachmann 1) brought about an important change for this and future volumes. It had been the general practice of the Author to include the dates of full moon for every comet starting with the full moon prior to the discovery or recovery and ending with the full moon following the final observation. Comet 29P was the first of the so-called "annual" comets (i.e. periodic comets that can be seen all around their orbits) to be discovered. For this volume, the Author would have had to calculate full moon dates covering just over five years. For the next volume, the Author would have had to calculate full moon dates for about 16 years. The solution was to limit the full moon dates for the "annual" comets, as well as those observed for several years. This does not affect any comet mentioned in volumes 1 and 2, but it will be applied on several occasions for the remaining volumes.

This volume also represents a revised vision for the *Cometography* series. Volume 2 was much longer than volume 1, and the originally proposed volumes 3 and 4 would have been longer still. Cambridge University Press and the Author decided that splitting the remaining two volumes would keep the book sizes more manageable. This means the overall series will now total six volumes. It will also shorten the time it takes for each subsequent volume to be written and published.

Acknowledgments

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Special thanks go to my friends Eric Young, Mark Brown, and the members of the River Bend Astronomy Club for occasionally pulling me away from this very time-consuming project for a few hours of relaxation doing what we all enjoy as a group – stargazing. This was the original inspiration for my desire to learn more about comets, and it was always a nice break to bring things back into perspective. Eric also provided the cover art for *Cometography*.

The years following the publication of volume 2 were tumultuous ones for me, which ultimately led to a divorce. Together with my sons, David and Michael, we pushed forward as a family. A long-time friend, named Kathy, took on a new role in my life near the end of 2004. Her enthusiasm toward me, my sons, and my writing lifted me up and played a big part in my completing this book. We were married on 2005 July 3, and I have truly discovered what it is like to have a best friend as my wife.