CHAPTER 1

A glimpse into the life of Charles Messier

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Charles Messier

On the evening of April 13, 1781, French astronomer Charles Messier (1730–1817) made his final observation for what was to become the most extensive catalogue of nebulae and star clusters of the time. The list, which took more than two decades to create, contained the positions and descriptions of 100 objects visible above his Paris horizon (48°51′ north). Just before Messier submitted this list for publication, he received from his contemporary Pierre Méchain (1744–1804) a note that included information on three more objects discovered by him. Although Messier had no time to check the positions of Méchain's additions, he added them to his list, bringing to 103 the total number of nebulae and star clusters in it. This final compendium (the last to be created by Messier) appeared in the French almanac *Connaissance des Temps* for 1784 (published in 1781).

The number of objects in Messier's catalogue has since increased to 110: the original 103 objects, plus 7 more added posthumously by other astronomers for various reasons. (I will discuss these latter objects in more detail later.) In recent times, we have also learned that object number 102 in Messier's 1781 list may be a duplicate observation of object number 101; but this matter remains a topic of much interesting debate. Regardless, the 103 objects in Messier's catalogue and the seven subsequent additions have endured the test of time to become the most popular listing of deep-sky objects targeted by Northern Hemisphere amateur astronomers (both visual and astro-imagers alike), especially by those just beginning in the hobby.

Ironically, this was not Messier's intent. "What caused me to undertake the catalogue," Messier explained in the *Connaissance des Temps* for 1801, "was the nebula I discovered

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above the southern horn of Taurus on September 12, 1758, while observing the comet for that year.... This nebula had such a resemblance to a comet, in its form and brightness, that I endeavored to find others, so that astronomers would not confuse these same nebulae with comets just beginning to shine ... and this is the purpose I had in forming the catalogue."

Messier, the first astronomer to devote himself to the systematic search for comets, had obviously suffered the frustration of wasting time on "false comets" – diffuse deep-sky objects that could be mistaken for comets during a sweep of the heavens, especially with a small telescope at low power; every minute spent on a "false" comet was time spent away from the potential discovery of a real one in this highly competitive pursuit.

Unlike the skywatchers of today, Messier had no star charts with known deep-sky objects plotted on them, except for a few that included some of the brightest naked-eye wonders, such as the Beehive (M44) or Pleiades (M45) star clusters. To further his success, one could say Messier employed the intelligent strategy of "knowing thy enemy": the objects Messier included in his catalogue are those he wanted to know existed, so that he could ignore them and move along in his attempt to visually capture his ultimate prey.

The magnitude to which Messier was perceived to dedicate his thoughts to the hunt is reflected in a colorful story that has been passed down since the beginning of the nineteenth century. Here is the tale, as told by French astronomer François Arago (1786–1853) in his *Popular Lectures on Astronomy: Delivered at the Royal Observatory of Paris*, published in 1845:

> An interesting memoir of Messier may be found in the *Histoire de l'Astronomie au dixhuitième Siècle* [History of Astronomy in the Eighteenth Century], by Delambre. La Harpe (*Correspondence Litteraire*, Paris, 1801, tom. i, p. 97) says that "he passed his life in search of comets. The *ne plus ultra* of his ambition was to be made a member of the Academy of Petersburgh. He was an excellent man, but had the simplicity of a child. At a time when he was in expectation of discovering a comet, his wife took ill and died. While attending upon her, being withdrawn from his observatory, Montaigne de Limoges anticipated him by discovering the comet. Messier was in despair. A friend visiting him began to offer some consolation for the recent affliction he had suffered. Messier, thinking only of his comet, exclaimed: – *'I had discovered twelve. Alas, that I should be robbed of the thirteenth by Montaigne!'* and his eyes filled with tears. Then, remembering that it was necessary to mourn for his wife, whose remains were still in the house, he exclaimed, – *'Ah! cette pauvre femme,'* [Ah! This poor woman] and again wept for his comet."

THE "BIRD-NESTER" OF COMETS

Given the incredible and efficient technologies used to discover comets in the twenty-first century, both on Earth and in space, many of today's telescopic observers pursue comets mostly as objects of passing interest – especially when they blaze forth to naked-eye splendor or threaten to hit the Earth ... or other planets! (Note, however, that owing to the same leaps in technology, some amateur astronomers across the globe also conduct extremely serious studies of, and searches for, comets, and have contributed greatly to the science.) Nevertheless, to the mid-eighteenth-century observer, comets were among the most mystifying sights in the sky. And the astonishing appearance of six-tailed C/1743 XI (Chéseaux's comet of 1744) – one of the greatest since the dawn of modern astronomy – may have inspired Messier's lifelong passion for comets.

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Comet C/2006 P1 (McNaught).

With history having recorded only some 50 comets known by Messier's time, these celestial itinerants presented the burgeoning telescopic astronomers of the day not only with a fascinating challenge (namely to find them) but also the promise of some fame and notoriety. And Messier was the man who first thrust this challenge to the forefront of desire.

Messier was born on June 26, 1730, in the small village of Badouvillier, Lorraine (about 200 miles east of Paris, near the German border). He was the tenth of 12 children born to Nicolas and Francoise Messier, and one of only six to survive into adulthood. His father was a type of mayor/administrator, who, among other duties, collected taxes throughout the serfdom and served as a judge for local misdemeanors; Nicolas passed away in 1741, when Charles was only 11.

When Charles's older brother Hyacinthe took over the Messier household, he began to prep young Charles as a manager of finances – Hyacinthe's particular field of expertise. As his brother's personal clerk, Charles obtained the skills of clean handwriting, draftsmanship, and journal keeping – all traits that would soon help him secure his future employment at the Paris Observatory.

Charles led a safe and secure country life, immersing himself in his spare time in the natural wonders of the local countryside. He also grew up during the height of Rococo development in France, the start of the classical period of music, and the time of the cultural Enlightenment in Europe. These important shifts in scientific and cultural trends may have swept up young Messier's thoughts in their currents, leading him into new areas of imagining. And while it is uncertain what exactly inspired Messier's interest in astronomy, the remarkable sight of Chéseaux's comet in 1744 and the annular solar eclipse of June 25, 1748 (visible from his hometown), must have been major influences.

When a changing political climate in France in 1751 forced his brother Hyacinthe to take a position as a tax collector in his mother's hometown, the orphaned Charles found himself in need of a job. With the help of a family friend, Charles traveled to Paris that October to meet with astronomer Joseph Nicolas Delisle, who then hired Messier to be his apprentice at the Marine Observatory at the Hotel de Cluny in Paris – even though, as Delisle said, the young man had "hardly any other recommendation than that of a neat

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and legible handwriting and some little ability in draughtsmanship."

Nevertheless, Delisle assigned Messier the task of mapmaking and the recording of astronomical observations. Under the tutelage of Delisle's secretary, Libour, Messier also learned how to use the observatory's astronomical instruments. Charles found them well suited to the purpose of comet hunting, a field of research he not only invented in 1758 but would soon dominate.

Within three years, Messier had become a proficient observer and was promoted to clerk. Then, on January 21, 1759, Messier tasted the bittersweet flavor of success. After 18 months of searching, he recovered the long-sought return of Halley's comet predicted by the late Edmond Halley. As Messier reports in the *Connaissance des Temps* for 1810:

> At about six o'clock I discovered a faint glow resembling that of the comet I had observed in the previous year [the one that led Messier to his discovery of M1 in Taurus]: It was the Comet itself, appearing 52 days before perihelion!

Alas, Messier would eventually learn that he was not the first to catch the comet's return. A Saxon farmer named Johann Georg Palitzsch had spied it telescopically nearly a month earlier, on Christmas night, 1758. For Messier, the news must have come as quite a blow. That recovery observation was monumental, as it confirmed the late Edmond Halley's suspicion that comets were not omens or signs of Divine Providence but celestial bodies governed by gravity and destined to orbit the Sun. This loss of opportunity and a certain degree of fame may have ignited Messier's competitive flame, for he went on to make another independent comet discovery on January 7, 1760, followed by his first comet discovery only 19 days later.

Messier's comet pursuits blossomed after Delisle retired in 1761, the year Messier took charge of the observatory, observed the transit of Venus, and made other acute observations. But Messier's passion clearly was the pursuit of comets. Indeed, of the four new ones discovered between 1762 and 1766, Messier found three of them! Also during that time, in 1764, Messier published in the *Philosophical Transactions* a table of the positions of the Comet of 1764, which he "discovered at the Observatory of the Marine at Paris, the 3rd of January, about 8 o'clock in the evening, in the constellation of the Dragon."

Messier's successes and honors then began to flourish. In 1764, for his contributions to astronomy, the elite Royal Society of London made him a foreign member. In 1769, after his discovery of another comet, the Berlin Academy of Sciences bestowed on him his second foreign membership. In 1770, after he had found yet another comet, he became a member of his beloved French Royal Academy of Sciences in Paris and the official Astronomer of the Navy; in that same year, the Paris Academy accepted his original catalogue of 45 nebulae and star clusters for publication in its *Memoirs* for 1771 (which was to be published in 1774).

THE ORIGINAL CATALOGUE BY MESSIER

Messier did not discover all of the objects in his catalogue. Nor were all the objects in it discovered during comet searches. His is a list of nebulae and clusters compiled from previously existing catalogues of such objects, as well as from the discovery of new objects by him and his contemporaries. As previously mentioned, the catalogue had its origins in 1758, after Messier encountered the Crab Nebula (which we now call the Crab Supernova Remnant, M1) while following the

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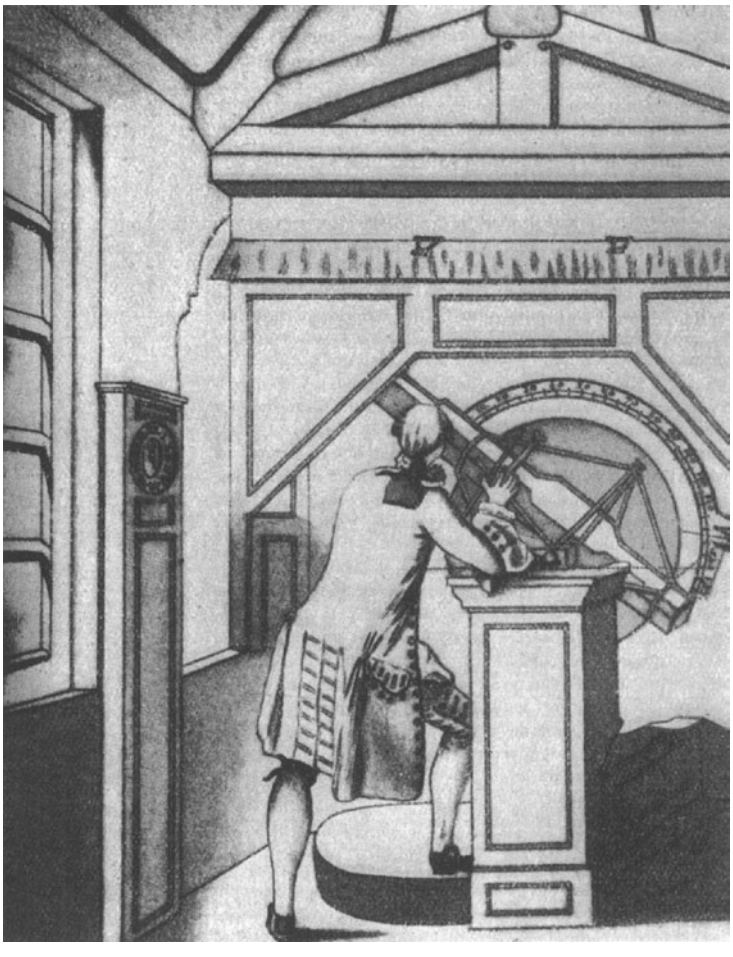

Messier.

comet of that year; he later magnanimously credited English amateur astronomer John Bevis (1695–1771) with the nebula's discovery in 1731.

Likewise, on September 11, 1760, Messier chanced upon the globular star cluster M2 while following Halley's comet through Aquarius; he later credited its discovery to Jean-Dominique Maraldi (1709–1788), who found it first while looking for Chéseaux's comet in 1746. Again, the comet's remarkable multitailed appearance to the unaided eye may have inspired Charles's passion for comets at an early age.

Messier's first original deep-sky discovery (globular cluster M3 in Canes Venatici) came on May 3, 1764. That year, he had begun to conduct, in earnest, a systematic search for these "comet masqueraders," as the late twentieth-century American comet hunter Leslie C. Peltier called them. But it's uncertain as to whether Messier's discovery of M3 sparked the idea for this dedicated search or if it was the first product of it. No matter, we know at least that he swept up M3 while *not* following a known comet, and that he continued to find others systematically after it.

By January 1765, Messier had compiled a list of 41 previously known or newly discovered objects he had observed and for which he had determined positions. Prior to submitting this list for publication in the Paris Academy's *Memoirs* for 1771, Messier in March 1769 had observed four additional objects – the Orion Nebula (M42 and M43), the Praesepe star cluster (M44), and the Pleiades star cluster (M45)[1] –

[1] Messier probably included these four objects to "round off" the list. The author believes that Messier did not originally include them because they are all bright enough, and were well known enough, not to be confused with a comet when seen under a dark sky. Later, he probably realized that these objects can be mistaken for comets when seen telescopically in a twilit sky. See Chapter 6 for a possible explanation as to why Messier did not include the Double Cluster in Perseus in this list.

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bringing to 45 the total number of nebulae and star clusters in his list.

MESSIER'S FIRST SUPPLEMENT

After presenting his original catalogue to the French Academy in 1771, Messier no longer systematically searched the sky for nebulae and clusters. He did, however, continue to collect additional objects that he either encountered during his comet searches and observations or learned about from his contemporaries or other sources. One of these, M49, was the first object to be discovered in the now famous Virgo cluster of galaxies.

Other discoveries of deep-sky objects in the region would follow, especially during the passage of the Great Comet of 1779, discovered by Johann Elert Bode (1747–1826) and independently discovered by Messier, which passed through the Virgo–Coma Berenices region of the sky in that year. The multitude of objects in this area, coupled with the passage of a comet through it, must have caused a sensation and some confusion. In fact, on the evenings of May 5 and 6, Messier tells us he mistook the galaxy M61 for the comet, and that he did not realize his mistake until May 11, when he listed M61 as a new discovery. Unfortunately for Messier, Italian astronomer Barnabus Oriani had beaten him to the discovery six days earlier.

Of the 23 nebulae and star clusters Messier ultimately compiled and published in 1780 as a supplement to his original catalogue in the French almanac *Connaissance des Temps* for 1783 (bringing the total to 68), 13 of them were found by chance owing to the passage of a comet nearby. On the flip side, consider his catalogue entry for M66, which he discovered along with M65 on the evening of March 1, 1780. In that entry, Messier attributes his missing the object earlier to the fact that the comet of 1773–74 passed between it and neighboring M65 on the evening of November 1–2, 1773, when "Doubtless M. Messier, did not see it then because of the comet's light."

The Comet of 1779's passage through Virgo and Coma Berenices also appears to have triggered an avalanche of interest in comets and the deep sky. As we shall see, it also appears to have inspired Messier's greatest rival, Pierre Méchain, who not only began discovering deep-sky objects in 1779 but also began a successful search for comets.

THE SECOND SUPPLEMENT

The contributions of Pierre Méchain to Messier's second supplement are great. Born in Laon on August 16, 1744, Méchain was the son of an architect and a student of mathematics, physics, and architecture. He learned astronomy under the tutelage of Joseph-Jerome le Francais de Lalande (1732–1807), professor of astronomy at the College de France, who found young Méchain at ease with difficult astronomical mathematics.

In 1772, Lalande obtained for him a temporary position of astronomer-hydrographer at the Dépot de la Marine at Versailles. Two years later, the Dépot moved Méchain and its entire department to Paris, where he had his first acquaintance with Messier, who was then well established as the Navy astronomer.

It's hard not to consider the impact Messier must have had on the younger Méchain, for although Méchain's post had him traveling frequently to chart the French coastline, he apparently turned his attention to the night sky in 1774, starting with the occultation of Aldebaran by the Moon.

Aside from his well-earned reputation as a comet fanatic, Messier had an interest in other Solar System objects. For instance, the facsimile, reproduced here, of a page written by Messier in 1754 details some of his solar

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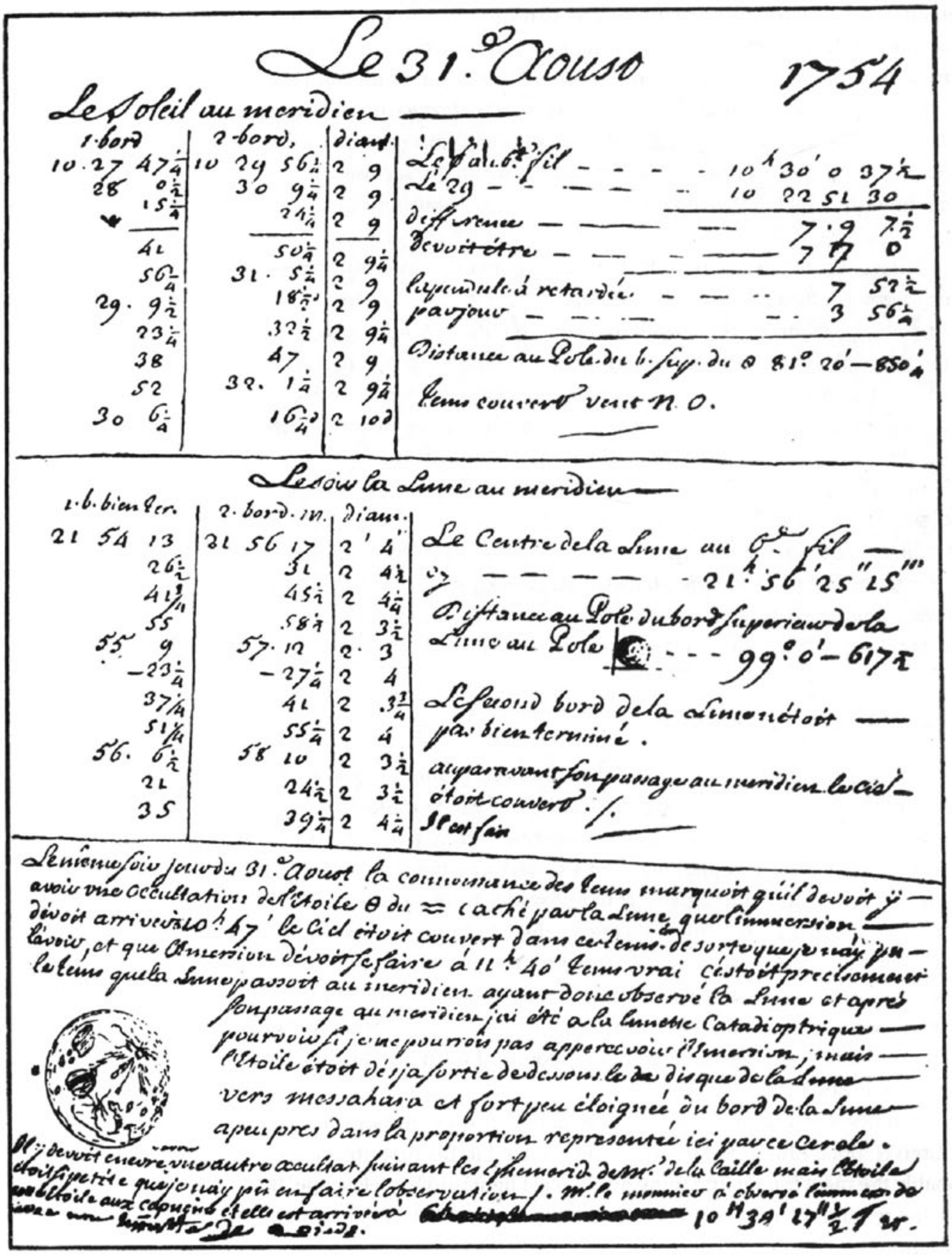

Le 31.e Aoust 1754

Le Soleil au meridien

1. bord	2. bord.	diam.
10.27 47¾	10 29 56½	2 9
28 0½	30 9¾	2 9
15¼	24¼	2 9
41	50¾	2 9¼
56¼	31. 5½	2 9
29. 9½	18½	2 9
23¼	32½	2 9¼
38	47	2 9
52	32. 1¼	2 9¼
30 6¼	16¼	2 10

Le Soleil au 6.e fil ---- 10h 30' 0 37½
Le 29 ---- 10 22 51 30
difference ---- 7 9 7½
devoit être ---- 7 17 0
la pendule a retardée ---- 7 52½
par jour ---- 3 56¼
Distance au Pole du b. sup. du ☉ 81° 20' — 850¼
temps couvert vent N.O.

Le soir la Lune au meridien

1. b. bien ter.	2. bord. m.	diam.
21 54 13	21 56 17	2' 4"
26½	31	2 4½
41¼	45½	2 4¼
55	58¼	2 3½
55 9	57. 12	2 3
23¼	27¼	2 4
37¼	41	2 3¼
51¼	55¼	2 4
56. 6½	58 10	2 3½
21	24½	2 3½
35	39¼	2 4¼

Le Centre de la Lune au 6.e fil — 21h 56' 25" 15'''
Distance au Pole du bord superieur de la Lune au Pole ☾ --- 99° 0' — 617
Le second bord de la Lune n'étoit pas bien terminé.
auparavant son passage au meridien le Ciel étoit couvert. Il est fin

Le meme soir jour du 31.e Aoust la connoissance des temps marquoit qu'il devoit y avoir une occultation de l'Etoile θ du ≈ caché par la Lune que l'immersion devoit arriver à 10h 47' le Ciel étoit couvert dans ce temps de sorte que je n'ay pu le voir, et que l'emersion devoit se faire à 11h 40' temps vrai c'étoit precisement le temps que la Lune passoit au meridien. ayant donc observé la Lune et après son passage au meridien j'ai été à la lunette Catadioptrique pour voir si je ne pourrois pas appercevoir l'emersion, mais l'Etoile étoit déja sortie dedessous le disque de la Lune vers [illegible] et fort peu éloignée du bord de la Lune à peu pres dans la proportion representée ici par ce cercle.
Il y devoit encore une autre occultation suivant les Ephemerides de M. de la Caille mais l'Etoile étoit petite que je n'ay pû en faire l'observation. M. le monnier a observé l'immersion de l'Etoile aux capucins et elle est arrivée [illegible] 10h 39' 17½" [illegible]

Facsimile of a page written by Messier in 1754, detailing solar and lunar observations. ***Bulletin de la Société Astronomique de France*, 1929.**

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and lunar observations, including a drawing of the Moon as it appeared in his simple inverting refractor.

And, in 1776, one month after the American Revolution, Messier made the first observation of Saturn's globe since 1750, discovering a new belt; the following is from an extract of a letter to Mr. Magellan, Fellow of the Royal Astronomical Society, dated "Paris, May 29, 1776":

> June 6, 1776. I have observed, since the 14th of May, a belt of a fainter light on the body of Saturn, opposite to the part of the ring behind the planet. It is pretty broad, and almost as distinct as those of Jupiter. It was with a very good achromatic of three foot and a half, made by Mr. Dolland, that I discovered this appearance. I wish you would communicate it to the astronomers, because those who are furnished with better instruments may, perhaps, see some inequalities in this belt of Saturn, and so the time of the planet's revolution on its axis may be better ascertained than it is at present. Mess. John and James Cassini seem to have been the only astronomers who discovered this phenomenon about the end of the last century.

As mentioned, however, a turning point for many skywatchers occurred in 1779, when the comet of that year sailed through the rich Virgo and Coma clusters of galaxies. That year, Méchain literally burst onto the scene, being adept not only at the visual discovery of comets but also in observing them and calculating their orbits (the latter something for which Messier had no mental facility). One can imagine Messier's chagrin; the "bird-nester" or "ferret" of comets had found a notable competitor. "It would not be surprising to discover a strong jealousy between these rivals," admits Harvard astronomical historian Owen Gingerich in John Mallas and Evered Kreimer's *The Messier Album*, "Yet, if it existed, biographers have remained silent. We can only deduce that the two were professional acquaintances, freely sharing their data."

Méchain made no apparent effort to catalogue new nebulae and clusters, though he did communicate new discoveries to Messier, who, in turn, checked their positions. Messier also continued to add new objects to his list until April 13, 1781 (a month after William Herschel discovered Uranus), when it grew from 68 objects (his original catalogue plus the first supplement) to 100 only a year later; 75 percent of these new discoveries belonged to Méchain.

Although Messier had in his possession three additional discoveries by Méchain, he had no time to check their positions before his publication deadline. Nevertheless, he decided to append them to the list (the latter two without positions) as objects 101, 102, and 103, with a note attesting that "M. Messier has not yet seen." For the final publication, Messier also added more recent observations of the earlier 68 objects.

THE "MISSING MESSIER" OBJECTS AND OTHER CURIOSITIES

Two of the objects in Messier's original catalogue have come under question: M40 in Ursa Major and M24 in Sagittarius. Of the 23 objects in Messier's first supplement (published in 1780), two are of particular note: open star cluster M47 in Puppis and open star cluster M48 in Hydra. And, in Messier's second supplement, we find two of the most controversial listings: M91 in Coma Berenices and M102 in Draco. Some brief explanations of the curiosities follow; all are discussed in more detail under the object entries in Chapter 2.

M40 is a pair of close stars of nearly equal magnitude in Ursa Major that John Hevelius (1611–1687) had described as a "nebulous

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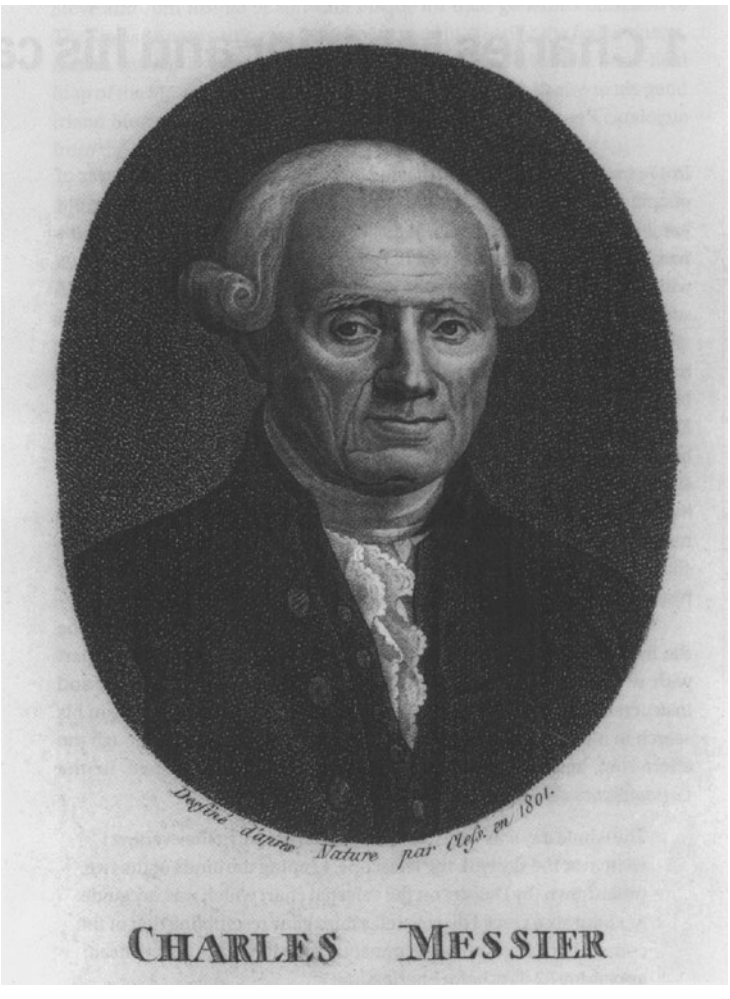

Portrait of Charles Messier in 1801, 20 years after his last catalogue observation on April 13, 1781. *Bulletin de la Société Astronomique de France*, 1929.

star" in his *Uranographia* atlas. Although some have disputed the necessity of including this object in the catalogue, Messier clearly notes why he decided to do so: "[E]ven though Hevelius mistook these two stars for a nebula, they are difficult to distinguish with an ordinary telescope of six feet."

M24, the Small Sagittarius Star Cloud, is part of the naked-eye fabric of the Milky Way. Messier, however, appears to have been the first to resolve its light into a cluster-like patch of stars divided into several regions. Many early references credit Messier with discovering not the large Star Cloud but the little 11th-magnitude open star cluster NGC 6603 within this rich segment of the Milky Way's Sagittarius-Carina spiral arm, but John Herschel first discovered the latter object on July 15, 1830.

M47, an open star cluster in Puppis, proved problematical to identify with Messier's catalogued position, which places it in a region of sky devoid of any deep-sky objects. German astronomy popularizer Oswald Thomas (1882–1963) offered a viable solution to this "missing" Messier object. In his 1934 book *Astronomie*, he identifies M47 with the bright and obvious open star cluster NGC 2422. Twenty-five years later, T. F. Morris of the Royal Astronomical Society of Canada's Montreal Centre arrived at the same conclusion, noting that Messier appears to have made an error in computation: if you simply reverse Messier's offset positions from his comparison star 2 Navis, you arrive at NGC 2422, Messier's M47.

M48 was another "missing" Messier object, as no cluster exists at Messier's published

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position. But, as with M47, Morris proposed that Messier had, once again, made an error in offset. An open star cluster does exist at the correct right ascension, but nearly 5° south of Messier's position: NGC 2548 in Puppis, Messier's M48.

M91 presents us with a respectable challenge because the "missing" object Messier had sighted lies in the rich Coma–Virgo cluster of galaxies, leaving us with several possibilities (which, again, will be explored more deeply in Chapter 2). These include a passing comet, the nearby spiral galaxy NGC 4571, a duplicate observation of M58, and the barred spiral galaxy NGC 4548.

When Texas amateur astronomer W. C. Williams investigated the problem in 1969, he found it possible that Messier had made yet another error in plotting. Williams argues that Messier had determined M91's position by offsetting from M89, but had mistakenly applied the difference in right ascension and declination to M58 (the bright "nebula" he used as a reference to determine the positions of other nebulae in the field). Although somewhat contentious, his conclusion (and the most generally accepted one) is that NGC 4548 is M91.

M102's identity has caused some heated, though enlightening, debates among amateur astronomers. First, it must be made clear that Messier never observed this object. It is one of three objects discovered by Méchain that Messier did not have time to observe and hastily included in his final catalogue. Of those three objects, Messier provided a position (from Méchain) for only one object, 101, which has been identified as the spiral galaxy NGC 5457 in Ursa Major. And while Messier listed no position for 103, it, too, has been definitely identified by description as open star cluster NGC 581 in Cassiopeia.

Object 102, however, is problematical. Messier provides no position, and his description of the object is confusing: "A very faint nebula between the stars o Bootis and ι Draconis, close to a 6th-magnitude star."

The problem is that Omicron (o) Boötis lies some 40° south of Iota (ι) Draconis, leaving much confusion as to which of several objects in the region Méchain had discovered. If Omicron was a misprint of Theta (θ) Boötis, it's been argued, then either NGC 5879 or NGC 5866 could be M102. On the other hand, if Iota (ι) Draconis is a misprint for Iota Serpentis, as others have suggested, then M102 might be NGC 5928 in Serpens. Which is correct?

In a 1947 paper in *Journal of the Royal Astronomical Society of Canada* (vol. 41, p. 265), Helen Sawyer Hogg writes that, "The question, however, was settled by Méchain himself in 1783, when he announced flatly that Nebula No. 102 was an error, and the same object as No. 101. I translate Méchain's letter as follows:

> On page 267 of the Connaissance des temps for 1784, M. Messier lists under No. 102 a nebula which I have discovered between *o* Boötis and *i* Draconis: this is, however, an error. This nebula is one and the same as the preceding No. 101. M. Messier confused the same as the result of an error in the sky-chart, in the list of my nebulous stars communicated to him.

"Therefore," she continues, "Messier 102 may now be stricken from the records as a non-existing object."

In *The Search for the Nebulae* (Alpha Academic, Chalfont St. Giles, 1975), Kenneth Glyn Jones agreed, writing, "Despite the tempting field for conjecture which Méchain's original description exposes, his later explanation must be accepted and M102 declared as non-existent." But in his *Messier's Nebulae and Star Clusters* (Cambridge University Press, 2nd ed., Cambridge, 1991), Glyn Jones quipped, "Nevertheless, a lingering doubt remains."