

CHAPTER 1

About this book

I DETAIL EACH SOUTHERN Gem in Chapter 2 – the heart of the book. Each object essay opens with a photograph of the target object (oriented with north up and east to the left) and a table of basic data. The data table includes the following: the Southern Gem number; common name(s), if any (note that many of these names are not officially sanctioned but rather fun monikers that reflect imaginings by me and/or other observers); NGC, IC, or other catalogue name; object type; constellation (Con); right ascension (RA) and declination (Dec) in equinox 2000.0 coordinates; apparent magnitude (Mag); surface brightness (SB) in magnitudes per square arcminute (for most objects); angular size or dimensions (Diam/Dim); distance (Dist); and the object's discoverer (Disc) and date of discovery.

Beneath the table, you'll find the discoverer's catalogue description of the object, with its original catalogue number in parentheses at the end. In most cases, James Dunlop made the discovery, otherwise Dunlop's description follows that of the discoverer(s). John Herschel's catalogue description and catalogue number always follow Dunlop's.

The catalogue number in parentheses at the end of each object description is a code – sometimes simple, sometimes a bit more complex. For instance, following Dunlop's description of NGC 2546 (Southern Gem 37) is the code (D 563), which means that it is the 563rd object in Dunlop's catalogue;



the capital letter D stands for Dunlop. The code for NGC 2546 used by John Herschel is (h3116), meaning it's the 3116th object in John Herschel's *Cape Catalogue*. (John Herschel uses a small "h" to differentiate himself from his father William Herschel, whose catalogue code is "H.")

In the case of Lacaille, the code is a little more involved. For example, Lacaille's discovery code for NGC 2456 is (II-4). Lacaille placed his objects into three "classes" – Class I: "nebulousities not accompanied by stars"; Class II: "nebulousities due to clusters"; and Class III: "stars accompanied by nebulosity." NGC 2456 is the fourth object in his Class II.

William Herschel's code is the most complex. For instance, NGC 6624 (Southern Gem 105) is Herschel's (H I-50). The Roman numeral in William Herschel's system

identifies the class into which Herschel placed each object:

- I. Bright nebulae
- II. Faint nebulae
- III. Very faint nebulae
- IV. Planetary nebulae: Stars with burrs, with milky chevelure, with short rays, remarkable shapes, etc.
- V. Very large nebulae
- VI. Very compressed and rich clusters of stars
- VII. Pretty much compressed clusters of large or small stars
- VIII. Coarsely scattered clusters of stars

So H I-50 is the 50th object in Herschel Class I (bright nebulae).

The original 1888 *New General Catalogue* (NGC) description or a description from the supplemental *Index Catalogues* follows these entries. If the object is not from one or the other of these catalogues, it is left blank.

Most object essays start with a general description of the object, followed by where it lies in the sky (in what constellation and near which stars) and how easy or difficult it will be to see through a small- to moderate-sized telescope from the city or country. I usually then follow this opener with historical anecdotes about the constellation in which it lies, the object's discovery, and/or early telescopic impressions of the object.

As with Messier's catalogue, Dunlop's includes not only objects discovered by him but also those who preceded him in the search for southern nebulae and clusters: most notably Giovanni Batista Hodierna (1597–1660), Edmond Halley (1656–1742), Abbé Nicolas Louis de Lacaille (1713–1762), Charles Messier (1730–1781), and William Herschel (1738–1822). John Herschel (1792–1871) appears prominently in many of the

historical accounts because he investigated Dunlop's catalogue during his monumental search for southern nebulae and clusters from South Africa in the 1830s. The essays also include references to other notable historical figures who played prominent roles in the early astrophysical studies of these objects.

In many cases, the essays describe recent observations from the Hubble Space Telescope, the world's largest ground-based telescopes, and a fleet of spacecraft that now peer (or have peered) into the universe with x-ray and infrared-sensitive "eyes." I then tell you how to find the object using the book's wide-field and detailed star charts. I conclude each essay by describing how the target object appears through the telescopes I used. And many of the essays include additional observations by some avid Southern Hemisphere observers using larger telescopes. Most notable are the contributions of Magda Streicher (see photo), who lives in Polokwane/Pietersburg, in the far northern part of South Africa. Of her interest in the heavens, she says:

My interest in the stars goes right back to childhood and I can clearly recall the fascination those twinkling, silvery lights in the dark skies above held for me as a youngster. Since then I have become an active amateur astronomer, and over many years I have become steadily more involved in advanced participation in South Africa. Using 12-inch and 16-inch Schmidt-Cassegrain telescopes enables me to do useful deep-sky observing [from Polokwane] as well as on our farm close to the Zimbabwe border with excellent dark skies. I have done that with great passion and satisfaction over the past years, searching out deep sky objects, sketching them to add to a wonderful interesting world with certain exceptional and unique characteristics. I strive to share my interest with others through regular radio talks, and articles



for the local newspaper. I hope that my humble contribution can help reveal some of the wonders of the universe.

Several appendices complete the work. Appendix A tabulates and identifies each Southern Gem's NGC, IC, or other modern designation, its right ascension and declination, the constellation in which it appears, type (galaxy, nebula, open cluster, etc.), apparent magnitude, angular size, and Dunlop (D) catalogue number. Appendix B does the same for the 42 additional Southern Gem objects, but with the addition of a Dunlop catalogue description for each object. Appendix C is a brief history of the early telescopic exploration of the southern skies, highlighting the contributions of James Dunlop. At the end of the book is a Southern Gem checklist – a place for you to make personal notations on each object you find; it includes spaces for you to write down important information, such as the date observed, your location, the telescope and magnification used, atmospheric seeing and transparency, and any other special notes you want to record. It is a personal log that you can return to weeks, months, or

years later to see how you are progressing as an observer.

SOURCES OF DATA AND INFORMATION

The data and information in this book were drawn from a variety of modern sources. Generally speaking, I gleaned recent research findings on the physical nature of each object from the *Astronomical Journal* or the *Astrophysical Journal*, and citations are given. From each object's apparent diameter and distance, I calculated its physical dimensions using the formulas that appear on page 35 of the first edition of *Deep-Sky Companions: The Messier Objects*.

The Dunlop catalogue descriptions are from Dunlop's *Catalogue of Nebulae and Clusters of Stars in the Southern Hemisphere observed at Parramatta in New South Wales*, published in 1828 (provided by Brent Archinal). William Herschel's quotations come from his original observing notes (provided by Larry Mitchell of Houston, Texas). The Messier quotations were gleaned from my *Deep-Sky Companions: The Messier Objects*. Aside from John Herschel's quotations, all others are from the late Kenneth Glyn Jones's *The Search for the Nebulae* (Chalfont St. Giles: Alpha Academic, 1975).

Most of John Herschel's quotations have been gleaned from his original observations, published in 1847 as *Results of Astronomical Observations made during the years 1834, 5, 6, 7 & 8, at the Cape of Good Hope*. During his stay in South Africa, John Herschel often made several observations of each object. The quotations used in this book's tables, however, refer only to his first observation; a date is given only if he discovered the object.

Other information, such as constellation lore, properties of stars, and each object's position, apparent magnitude, angular size, and surface brightness, come from the

following excellent sources (primary sources are listed first).

Star names, constellations, and mythology

Allen, Richard Hinckley. *Star Names: Their Lore and Meaning*. New York: Dover Publications, 1963.

Ridpath, Ian. *Star Tales*. New York: Universe Books, 1988. See also <http://www.ianridpath.com/startales/contents.htm>.

Staal, Julius D. W. *The New Patterns in the Sky: Myths and Legends of the Stars*. Blacksburg, VA: McDonald and Woodward, 1988.

Stellar magnitudes and spectra

Stars, <http://stars.astro.illinois.edu/sow/sowlist.html>.

Hirshfeld, Alan, Roger W. Sinnott, and Francois Ochsenbein, eds. *Sky Catalogue 2000.0*, vol. 1, 2nd ed. Cambridge: Cambridge University Press, and Cambridge, MA: Sky Publishing Corp., 1991.

Stellar data

Stars, <http://stars.astro.illinois.edu/sow/sowlist.html>.

ESA. *The Hipparcos and Tycho Catalogues*. Noordwijk: European Space Agency, 1997.

Double stars

Luginbuhl, Christian B., and Brian A. Skiff. *Observing Handbook and Catalogue of Deep-Sky Objects*, Cambridge: Cambridge University Press, 1989.

USNO. *The Washington Double Star Catalog*. Washington, DC: Astrometry Department, U.S. Naval Observatory. <http://ad.usno.navy.mil/ad/wds/wds.html>.

Variable stars

American Association of Variable Star Observers, <http://www.aavso.org/>.

Open star clusters

Archinal, Brent A., and Steven J. Hynes. *Star Clusters*. Richmond, VA: Willmann-Bell, Inc., 2000.

Open star cluster distances generally were gleaned from the professional literature.

Globular star clusters

Harris, William E. *Catalog of Parameters for Milky Way Globular Clusters*. Hamilton: McMaster University. <http://www.physics.mcmaster.ca/~harris/mwgc.dat>.

Skiff, Brian A. "Observational Data for Galactic Globular Clusters." *Webb Society Quarterly Journal* **99**:7 (1995), updated May 2, 1999.

Globular star cluster distances generally were obtained from the professional literature.

Planetary nebulae

Skiff, Brian A. "Precise Positions for the NGC/IC Planetary Nebulae." *Webb Society Quarterly Journal* **105**:15 (1996). (Positions.)

Luginbuhl, Christian B. and Brian A. Skiff. *Observing Handbook and Catalogue of Deep-Sky Objects*. (Dimensions and central star magnitudes.)

Cragin, Murray, James Lucyk, and Barry Rappaport. *The Deep-Sky Field Guide to Uranometria 2000.0*. Richmond, VA: Willmann-Bell, Inc., 1993.

Planetary nebula distances generally were taken from the professional literature or from the Web page of the Space Telescope Science Institute (www.stsci.edu).

Diffuse nebulae

Cragin, Murray, James Lucyk, and Barry Rappaport. *The Deep-Sky Field Guide to Uranometria 2000.0*.
 Diffuse nebula distances were gleaned from the professional literature.

Galaxies

The Deep-Sky Field Guide to Uranometria 2000.0. (Position, angular size, apparent magnitude, and surface brightness.)
 NASA. *The Extragalactic Database*.
 Pasadena, CA: Infrared Processing and Analysis Center, <http://nedwww.ipac.caltech.edu/>. (Types, mean distance, radial velocity, and all detailed descriptions of galaxy structures as seen in photographs have been taken from the accompanying notes.)
 Tully, R. Brent. *Nearby Galaxies Catalog*.
 Cambridge: Cambridge University Press, 1988. (Inclination, total mass, and total luminosity.)
 Some galaxy distances were obtained from the professional literature.

Extragalactic supernovae

"List of Supernovae." Cambridge, MA:
 Central Bureau for Astronomical Telegrams. <http://cfa-www.harvard.edu/iau/lists/Supernovae.html>.
 Other details of discovery were taken from individual IAU *Circulars*.

Historical objects

Smyth, Captain William Henry. *A Cycle of Celestial Objects*. Richmond, VA: Willmann-Bell, Inc., 1986.
 Glyn Jones, Kenneth. *The Search for the Nebulae*. Chalfont St. Giles: Alpha Academic, 1975.

Other historical anecdotes in this book were gleaned from various individual and professional papers from the nineteenth and early twentieth centuries.

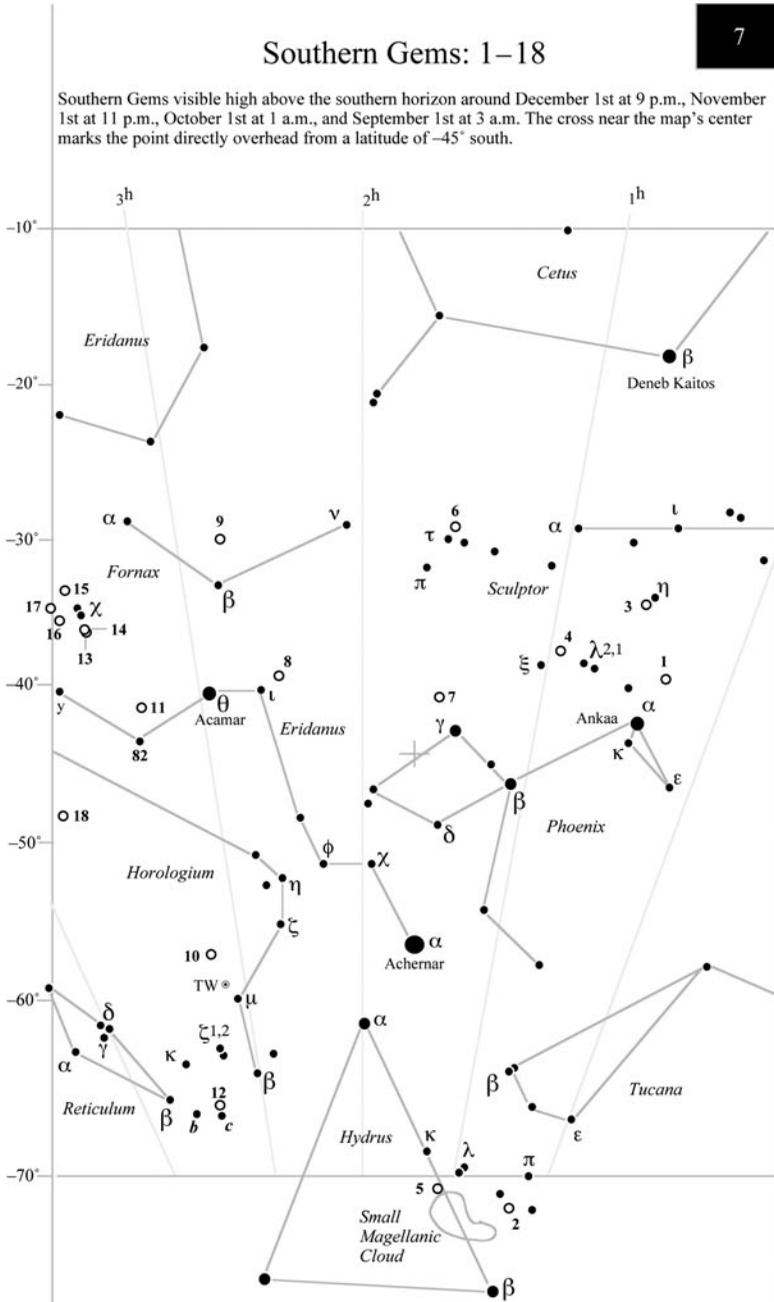
General notes

Note that the Web Uniform Reference Locators, or URLs, are subject to change. The dimensions, magnitudes, and positions of all other additional deep-sky objects in this book were taken from *The Deep-Sky Field Guide to Uranometria 2000.0*.

This book contains the most up-to-date astronomical data and more accurate historical and observational information about each object in the Southern Gems catalogue than you'll find in any other book in the popular literature.

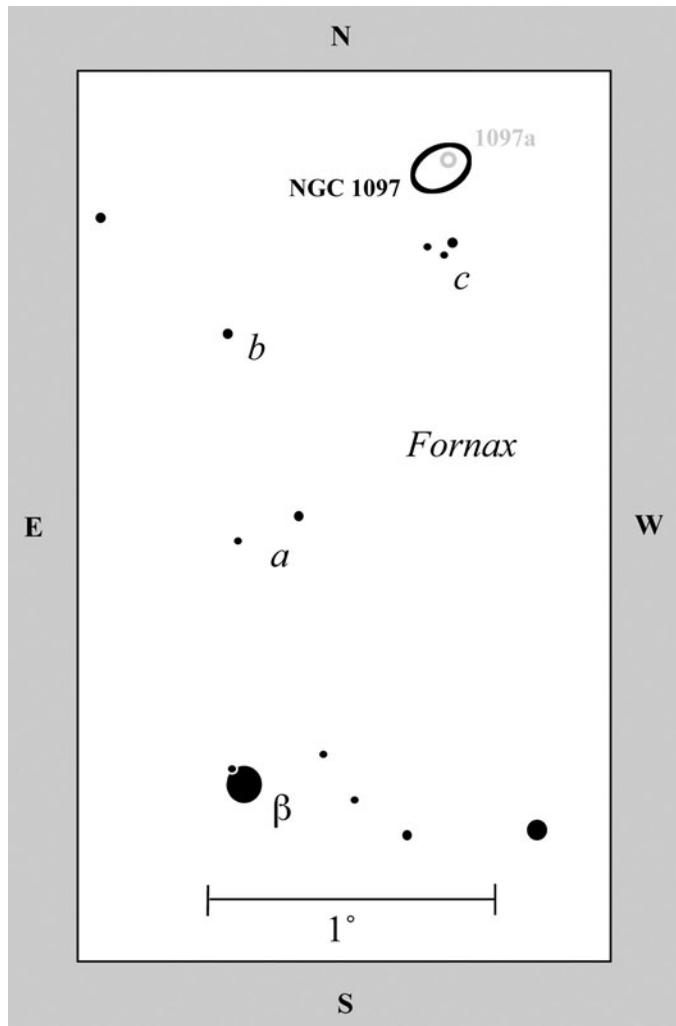
THE FINDER CHARTS

In each object essay in Chapter 2, I suggest a fast and efficient way to find a Southern Gem object. First I direct you to one of the seven wide-field finder charts that appear at the end of this book. The charts are of my own design and are simply intended to guide you to the general region that includes your target. Each wide-field chart shows the positions of numerous Southern Gem objects within a few hours of right ascension between -10° and -70° (at times, a bit farther south). It also shows the brightest stars in each constellation. For instance, wide-field chart 7 shows the Southern Gem objects visible within a few hours of right ascension high above the southern horizon around December 1 at 9 p.m., November 1 at 11 p.m., October 1 at 1 a.m., and September 1 at 3 a.m. The cross near the map's center marks the point directly overhead from a latitude of -45° south.



Each chart shows stars roughly to magnitude 4 or 5 but generally only in the region near the Southern Gem object, and only if I feel they will help in the naked-eye or binocular search. To help you in your search, I've traced out the "stick figure" forms of the main constellations. I've also labeled them and their brightest stars using the traditional Bayer (Greek) letters or Flamsteed numbers. Sometimes I've included a popular star name, such as Achernar (Alpha [α] Eridani). In special cases, you'll find a nontraditional, italicized, lowercase letter, such as *a* or *b*. These are additional unnamed or numbered guide stars, which you'll find in the text described as Star *a* or Star *b*, for example. One symbol, a circle, is used to mark the location of each Southern Gem object on the wide-field charts. Where there are several objects in a small region of sky, I use a line to point out the target(s).

I then ask you to find the brightest star near the object, from which you can start your search using the detailed star chart accompanying the object's text. (Both the wide-field finder charts and the detailed finder charts are oriented with north up and east to the left.) Once you locate that bright star in the sky, I ask you to switch to the detailed part



of the text that describes how to locate the object and simply follow the directions.

In creating these detailed charts, my philosophy was to simplify the view to help you focus on your target by removing peripheral "noise." The purpose of these charts is to help you hone in on your target, and I've done the fieldwork to help you get there the fastest and most efficient way possible. The detailed finder charts have the same orientation as

the wide-field charts, but they show a much smaller area of sky in more detail. The constellation name is given. A scale bar appears at the bottom of each chart. Stars near the target are shown to magnitude 10 or 11. I've labeled each Southern Gem target with its full proper name (such as NGC 55) in black. A faint gray symbol is used to mark the location of other interesting deep-sky objects nearby, which are labeled (also in gray) with the NGC prefix omitted. Note, too, that on these charts the italicized letters may also refer to an asterism (a triangle, arc, pair of stars, or line), as described in the text.

I use the traditional symbols that follow to represent the different classes of deep-sky objects. In the case of galaxies, I also show their apparent orientations.

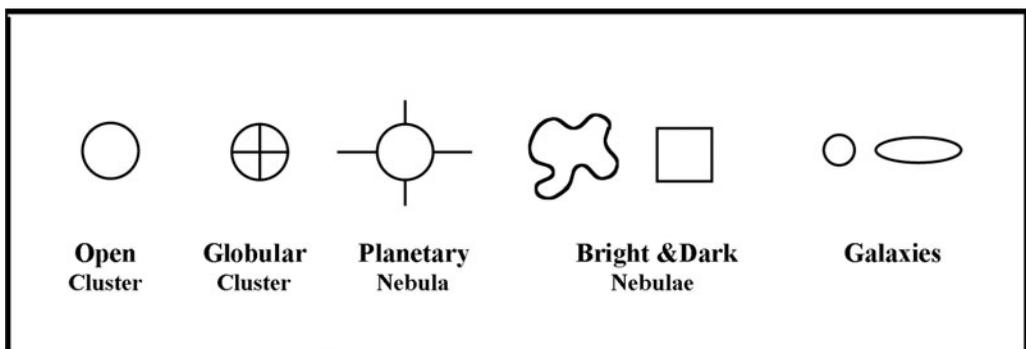
Again, to find a Southern Gem object, first locate the object's position on the wide-field finder chart. Next, note the brightest star near the object and locate it on the detailed finder chart. Then read the accompanying text on how to locate the object, and simply follow the directions.

Note that you don't have to use the charts in this book. Because I provide the object's equinox 2000.0 coordinates, you can instead employ your favorite detailed sky atlas (such

as Wil Tirion's *Sky Atlas 2000.0*) to locate the object. The choice is yours. The charts I created have a simple appearance. I've tried not to clutter them up with unnecessary details. They are designed to help you make the simplest and fastest sweep to each object, based on my personal experience. You might think otherwise, and I encourage you to pursue whatever venue you find suitable to your needs.

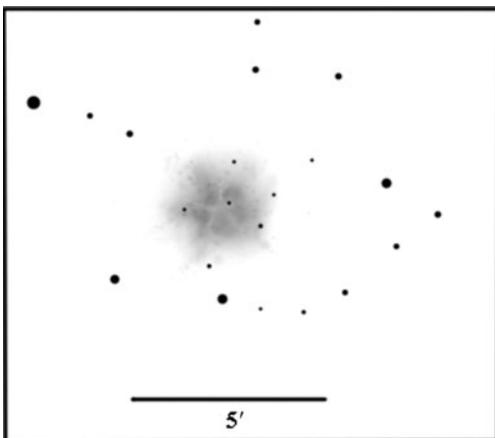
THE IMAGES

All the object images in this book are reproduced in black and white, with north up and east to the left. All are 15×15 arcminutes unless otherwise noted. If the images are larger, a scale bar accompanies the photo. All the main object images are from the Digitized Sky Survey and are reproduced here with permission, except for that of Barnard 283 (Southern Gem 97), which I took. Some object essays also include images from the Hubble Space Telescope and other large telescopes. These images were used for the sole purpose of inspiring you to use your imagination. You certainly will not see anything like these images when you look through your telescope, but how else can you fully appreciate what it is you are seeing? So do not be discouraged, be enlightened.



THE DRAWINGS

All the sketches in Chapter 2 are composites of field drawings I made at various magnifications. They are shown with north up and east to the left. The orientation matches that of the corresponding photograph. Each Southern Gem object in the drawing has a scale bar to help you size up each object in your own telescope.



The composite drawings (such as that of the dim globular cluster NGC 6362 [Southern Gem 91]) show details visible at low, medium, and high powers. This is a technique I've employed for decades and that enables me to share with you the overall grandeur of the object in one portrait. It's important to note, however, that I've boosted the contrast greatly for two reasons: (1) to hold the detail for reproduction and (2) to enhance the beauty of the subtle view. If I were to try and reproduce the delicate details of some deep-sky objects, you probably wouldn't recognize them, or see them for that matter, in the drawings because they would be too faint. In the text, I do break down what details I could see (and could not see) at different magnifications, so use the verbal description as your explanatory guide.

The time has come now for us to begin our adventure, to survey some of the wonders catalogued by one of the pioneering deep-sky explorers in the Southern Hemisphere: James Dunlop, the "gentleman astronomer" and the Messier of the southern skies.

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Excerpt
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