Steve O'Meara's
Herschel 400 Observing Guide

The Herschel 400 is a list of 400 galaxies, nebulae, and star clusters, picked from over 2500 deep-sky objects discovered and cataloged by the great eighteenth-century astronomer Sir William Herschel and his sister Caroline. It comprises

- 231 galaxies
- 107 open clusters
- 33 globular clusters
- 20 planetary nebulae
- 2 halves of a single planetary nebula
- 7 bright nebulae

In this guide Steve O'Meara takes the observer through the list, season by season, month by month, night by night, object by object. He works through the objects in a carefully planned and methodical way, taking in some of the most dramatic non-Messier galaxies, nebulae, and star clusters in the night sky.

Ideal for astronomers who have tackled the Messier objects, this richly illustrated guide will help the amateur astronomer hone their observing skills.

STEVE O'MEARA earned a Bachelor of Science degree from Northeastern University and has spent much of his career on the editorial staff of *Sky & Telescope* magazine. The Texas Star Party gave him its Omega Centauri Award for "advancing astronomy through observation, writing, and promotion, and for his love of the sky," and the International Astronomical Union named asteroid 3637 O'Meara in his honor.

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How to find and explore 400 star clusters, nebulae, and galaxies discovered by William and Caroline Herschel

CAMBRIDGE UNIVERSITY PRESS

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9780521858939

First published 2007

Printed in the United Kingdom at the University Press, Cambridge

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-85893-9 hardback

To Donna, my North Star. Whenever I look into the face of the night, I am reminded of your beauty.

To Milky Way, Miranda Piewacket, and Pele, three angels living in my heart.

And to Daisy Duke Such a Joy, my angel here on Earth.

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Preface

Congratulations, you are about to begin a remarkable visual journey, and this book is to be your faithful guide. The Herschel 400 is a list of 400 galaxies, nebulae, and star clusters, culled from the more than 2,500 deep-sky objects discovered and cataloged by the great eighteenth-century astronomer, Sir William Herschel and his sister Caroline. The list comprises 231 galaxies, 107 open star clusters, 33 globular star clusters, 20 planetary nebulae, 2 halves of a single planetary nebula, and 7 bright nebulae. It contains some of the most dramatic non-Messier galaxies, nebulae, and star clusters in the night sky; it also includes some objects at the very limits of detection in modest-sized telescopes.

Members of the Ancient City Astronomy Club (ACAC) of St Augustine, Florida, created the list in response to a letter published in the April, 1976 issue of *Sky & Telescope* (page 235). In that letter James Mullaney (Pittsburgh, Pennsylvania) suggested that amateurs set up an informal "Herschel Club" with the goal of observing the brightest of the more than 2,500 objects discovered and cataloged by William Herschel. "The total count of the Herschel objects is inconveniently large," Mullaney explained, "but can be reduced to about 615 by excluding his classes II and III (see page 3), which are largely made up of more difficult and less interesting specimens."

While ACAC members agreed with Mullaney's contention that most of the objects in Herschel's catalog were too faint for amateur astronomers to detect with modest-sized telescopes from the suburbs, they decided not to discount the class II and III objects; after careful consideration, they came up with a list of 400 Herschel objects that they said would *challenge* observers with 6-inch or larger telescopes under skies that were affected somewhat by light pollution (no pain, no gain). So, the Herschel 400 is not a list of Herschel's "brightest and best" deep-sky objects. It is a list designed to hone (or test) the observing skills of amateur astronomers living in the Northern Hemisphere, and there is much to be said for that.

Since its creation, the Herschel 400 list has become very popular. A Herschel 400 Club is now part of the Astronomical League (AL) – an organization composed of more than 240 amateur astronomical societies across the United States – which awards certificates to members who complete the Herschel 400 list. The AL promotes these certificates as "prized possessions among serious amateurs as an indication of the advanced level of their amateur capabilities." The key word here is "advanced." If you complete the Herschel 400 list, you will be considered an advanced observer. The craze is catching on. Other astronomy clubs and institutions now routinely challenge members to observe the Herschel 400 objects as well, and some offer their own awards. But, until now, no book has been available to help observers find these objects in any systematic or detailed way.

This Herschel 400 observing guide, then, will be a valuable asset to the growing masses of visual observers who desire a long-term project and challenge. Its purpose is mainly to guide you, star by star, to each of the 400 objects in the Herschel 400 list, but it will also help you to grow as an observer. Observers usually take interest in the Herschel 400 list after they succeed in finding all of the Messier objects – the 109 "nebulae" and star clusters cataloged by the eighteenth-century French comet hunter Charles Messier* – and want to continue searching for more rewards. Finding the Messier objects has long been regarded as an important first step for beginners wanting to learn the deep sky. Doing so not only helps them to become familiar with the varied appearances of deep-sky objects, but it also helps them become more adept at finding their way around the starry heavens.

But completing the Messier list is not a requirement to completing the Herschel 400 list. In fact, this book is designed to help observers of all levels find these objects in a carefully planned and methodical way – season by season, month by month, night by night, object by object.

Four things are required: a general knowledge of the night sky, an understanding of how to use binoculars and a telescope, a strong sense of commitment, and the will to succeed. By sticking to the strategy outlined in this book, you will not only master the Herschel 400 list but prove to all that you have mastered the deep sky.

This book is divided into four seasons: winter, spring, summer, and fall. Each season is further broken down by month (three months per season). Each month is subdivided into seven nights – the *minimum* number of nights I expect you will need to observe the target objects for each month. The number of objects I have selected for each night's observing varies; it depends largely on how difficult I believe each object will be to find or see. Note that the number of target objects on many spring evenings is high; that's because most of the objects are galaxies in the rich Virgo Cluster of galaxies, and the targets lie so close to one another that several can be seen in the same field of view.

* *Deep-Sky Companions: The Messier Objects*, Stephen James O'Meara (Cambridge, Cambridge University Press; Cambridge, MA, Sky Publishing, 2000).

I have taken great care to offer you a logical plan of attack for each night, taking into consideration the object's declination and when it is reasonably high enough in the sky for you to see well. I have considered how troublesome an object will be to find – whether it is near a bright guide star or isolated in a vast or seemingly empty field of dim suns. And I have considered how difficult it will be to see each object in a modest-sized telescope.

With these points in mind, each target opens with a general description that details the object being sought, where it is located in the sky, and, if applicable, its appearance to the unaided eye or binoculars. Many times, the general descriptions provide you with some words of warning or advice, which should prepare you for the search, or tell you what you should expect to see or how best to see it. Each evening's hunt is accompanied by a general sky chart that plots the target objects as well as a series of detailed star charts that not only zoom in on the object's position but also show the proposed plan of attack, which is detailed in the text. The object's general description is further complemented with a general view – a more detailed description of the object as seen at various magnifications in a 4-inch telescope under a dark sky.

It's important for me to stress that the *main* purpose of this guide is to help you find and see (not study) each object. My goal is to help you achieve success in the hunt – in the most swift and efficient manner; if you feel you'd like to study a particular object in more detail at a later date, I have provided a place for you in Appendix B to check off the object for further study – preferably after you've completed the Herschel 400 list.

Appendix B is, in fact, a checklist for you to keep track of when and where you observed each object. It also includes spaces for you to write down important information, such as telescope size, magnification, 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. Two other appendices complete the work. Appendix A tabulates each object's type, constellation, position, magnitude, angular size, visibility rating, and Herschel catalog number. And Appendix C lists the book's photo credits.

I would like to thank Simon Mitton for encouraging me to pursue the book, and Vince Higgs, Lindsay Barnes, and the editorial staff at Cambridge University Press for helping me take the book through to completion. I sincerely thank Sue Tritton at the Plate Library of the Royal Observatory Edinburgh for granting me permission to use the Digitized Sky Survey images taken with the UK Schmidt Telescope; her contribution was invaluable. I give a tip of the hat to Al and David Nagler of Tele Vue Optics in Sufferin, New York, for making such a superb telescope that lets me reach the limits of vision in a small telescope. And I thank my friends and colleagues Larry Mitchell and Barbara Wilson of Houston, Texas, for their help in the histories of William and Caroline Herschel. I would also like to thank Michael Tabb of the William Herschel Society for his time and patience with me in Bath, England; the Society's venture is a most honorable and worthy one.

Finally, I would like to hug my beautiful wife, Donna, and Daisy Duke, our loving papillon, for tolerating my long absences at night as I flirted with the heavens, I thank them for their love, support, and understanding. Of course, any errors that might have materialized in this work belong solely to yours truly.

Stephen James O'Meara
Volcano, Hawaii
June 2006