

# The Herschel Project

ROD MOLLISE

A veteran deep-sky observer successfully completed the challenge of observing every object in the Herschel Catalog.

KEN CRAWFORD

**IS IT POSSIBLE** to run out of deep-sky objects to observe? Probably not. Not given the thousands of galaxies, nebulae, and clusters visible to the eye in modest telescopes and the tens of thousands more that can be captured with a camera. But three years ago I *thought* I had.

I had tracked down the brighter objects, the Messiers, when I was a novice astronomer, and had moved on to more exotic quarry. I had seen everything from dim galaxy groups to forgotten planetary nebulae to seldom-

**A RARE NEBULA** NGC 1491 in Perseus is one of the few emission nebulae in the Herschel Catalog. It is also one of the most spectacular Herschel objects, both visually and photographically.

observed star clusters. Was I done? At a star party a few years ago I thought I was. I wanted to see something new, and didn't know what that could be.

Then I remembered the Herschel Catalog, the approximately 2,500 objects discovered by William Herschel

## READY TO TAKE ON THE UNIVERSE

Noted book author and observer Rod Mollise of Mobile, Alabama, poses with one of the two workhorse telescopes he used to complete the Herschel Project: a Celestron 8-inch Schmidt-Cassegrain.



and his sister Caroline in the 18th century. The Herschel objects went on to form the core of the NGC list of objects visible from the Northern Hemisphere. I had seen some of them, 400 of the best and brightest, the Herschel 400, culled from the 2,500 by members of Florida's Ancient City Astronomy Club. But that left a lot of Herschels. What if I took on the whole big thing?

Observing that many faint and reputedly difficult objects sounded scary, but maybe that's what I needed. Like Julie Powell, who set out to cook all of Julia Child's recipes in *Mastering the Art of French Cooking*, maybe I was ready for a life-changing challenge. That night at the star party I resolved to take on the Herschels, all of them, and dubbed my quest, which I would document in my blog, "The Herschel Project."

## The Challenge

Unlike Ms. Powell, whose Julie-Julia Project had a time limit of one year, I decided not to set a date for crossing the finish line. Our weather in the Deep South made that a fool's errand. I'd observe all the Herschels, re-observing the Herschel 400, and I would not dilly-dally. But I would take as much time as I needed.

How tough are the 2,500? There are more galaxies than anything else, and the faintest one, NGC 2843, has the frighteningly faint magnitude value of 16.3. The good news is that the dim galaxies are almost all small — NGC 2843 is less than 1' across — and have sufficient surface brightness to show up in surprisingly small apertures. Also, I found that many of the galaxies look brighter, sometimes appreciably brighter, than their assigned magnitudes (depending on the source).

I used my 12-inch f/5 Dobsonian reflector for most of the visual observing, but I had little problem seeing 13th-magnitude and even fainter galaxies with my 8-inch Schmidt-Cassegrain telescope under good skies. There's no doubt, however, that at least 12 inches of aperture makes the 2,500 easier, and under light-polluted skies even that is not enough.

I had to conduct much of The Herschel Project from my astronomy club's substantially light-polluted

observing site. On poorer evenings, I often used a long-exposure Mallincam Xtreme deep-sky video camera on the SCT. The camera routinely captured 16th-magnitude background galaxies in near real time, and Herschel objects were trivially easy. Seeing the images of faint fuzzies on the video monitor made it easier to see the dimmest Herschel objects visually in the eyepiece.

There's a certain nobility to finding objects the old-fashioned way, by star hopping, matching patterns in the telescope's finder to what's shown on a chart. But that's not the way I attacked the Herschels. I was pretty certain I wouldn't live long enough to complete The Project if I did it that way, and I was more interested in seeing than finding. My Dob was equipped with digital setting circles and my SCT was sitting on a computerized Go To mount.

In addition to my computerized telescopes, one other tool proved vital to the success of The Herschel Project: an "observing planner" program called *SkyTools 3* that I reviewed in the April 2010 issue. It enabled me to easily generate a list of all 2,500 objects, find and remove non-existent ones (more than 100), tick off objects as I observed them, and record detailed log entries. *SkyTools* kept me well organized, vital for a project of this magnitude.

## Getting Started

Late summer is a good time to get started on the Herschels because it offers a wonderful selection of objects of all types. The summer constellations are hanging in and autumn's star patterns are on the rise. We'll jump all over the sky, but completing The Project was a different experience. There are so many targets in some constellations, especially in spring, that I spent many evenings in one small area. I don't have space in this article to describe every object in the catalog, but here are some highlights.



**PLANETARY IN AQUILA** Planetary nebula NGC 6804 is about 4,200 light-years away. Though discovered by William Herschel in the late 1700s, it was not identified as a planetary until 1917.



Aquila is a curious constellation. The Eagle wings along the summer Milky Way, so you'd think he'd be loaded with deep-sky objects. Surprisingly, he only has a few worthy of notice, including a mere 10 Herschels. When I first spotted 12.4-magnitude **NGC 6804**, it actually looked more like a faint galaxy than a planetary nebula. A bit of staring at it in my 12-inch telescope, though, and it took on a more planetary-like appearance. It's an attractive gray ball 1.1' in diameter with a fairly dim central star of magnitude 14.4.

**NGC 6946** is in Cygnus, but it really ought to be in Cepheus. It's located in "The Chimney," an odd area of Cygnus that protrudes into the neighboring constellation. No matter where it's located, it's a beautiful face-on SABC spiral galaxy. In my Dobsonian under dark skies, its pinwheel-like arms were surprisingly visible. At magnitude 9.8 and 10.5' across its longest dimension, this galaxy is not so large that its light is dimmed tremendously, but it's big enough to give up considerable detail.

What makes NGC 6946 a true standout among the many Herschel galaxies is the presence of an open star cluster, **NGC 6939**, only 40' to the northwest. In a wide-field eyepiece, both the cluster and galaxy are in the same field, which is an unforgettable sight. The 10'-diameter NGC 6939 shines with a combined magnitude of 10.1 and



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**CEPHEUS CLUSTER** NGC 7762 is one of the most visually satisfying open clusters in the Herschel Catalog. The cluster is nearly 2 billion years old and about 2,600 light-years from Earth.

is well resolved in 8-inch and larger telescopes. It looked round to me at first, but after a while, its mix of blue and gold suns seemed to arrange themselves into spiral patterns and it began to look like a strange "outline" of the nearby galaxy.



ALISON WONG

**TWO FOR THE PRICE OF ONE** NGC 6946 (lower right) is a face-on spiral galaxy in Cygnus that surrenders considerable detail in large telescopes. But wide-field eyepieces can also capture open cluster NGC 6939 (upper left) in the same view.





ROBERT CENDLER

**M31 STAR CLOUD** Just as our Milky Way has huge star clouds, the same goes for the Andromeda Galaxy. The bright cloud NGC 206 dominates the center of this image.

I don't think there's a single constellation that doesn't contain at least one Herschel galaxy, even cluster-heavy Cepheus. Given **NGC 1184**'s fairly dim magnitude of 13.0, I expected this Cepheus galaxy to be at least slightly challenging. But even in my C8 it was not. This  $3.4' \times 0.8'$  edge-on lenticular was easy with direct vision. In the 12-inch, I saw a small, bright central area and a razor-thin disk. Unlike many of the faint smudges I encountered in the Herschel 2,500, this one really looked like a galaxy.

Most of the Herschel Catalog consists of galaxies, but there are quite a few open star clusters too, such as Cepheus's **NGC 7762**. Although the open clusters are usually fairly disappointing, this pretty one is an exception. Approximately  $15'$  in diameter, it consists of tiny stars arranged in a vaguely rectangular pattern. There's a prominent line of stars just off-center that caught my attention.

### The Brighter Herschels

Herschel objects have a reputation for being dim and difficult, but that's not always the case. There are, in fact, 16 Messiers among them. The Andromeda Galaxy isn't in there, but one of its satellites is, **NGC 185**,  $7^\circ$  to its north in Cassiopeia. At magnitude 10.1 and  $11.7' \times 10'$  in size, this dwarf-elliptical galaxy was attractive in the C8. An elongated center is surrounded by bright oval haze set in

dimmer haze. A tiny, star-like nucleus was visible with the 12-inch.

M31 is not a Herschel object, but I visited it to tick off **NGC 206**, the huge star cloud inside one of the galaxy's spiral arms. I sometimes have trouble seeing this nebulous patch, but on a good night, especially one when



ROBERT CENDLER

**OWL OR E.T.?** NGC 457 in Cassiopeia is one of the brightest objects in the Herschel Catalog. Its dozens of bright stars form a figure that some visualize as an owl and others as E.T.



the seeing is steady, it stands out like a sore thumb 41' southwest of M31's center.

If you want a spectacular Herschel open cluster, it doesn't get better than **NGC 457**, the renowned 5.1-magnitude E.T. (or Owl) Cluster (see photo on previous page). Its brightest star, Phi Cassiopeiae, forms one of the "eyes" of the stick-figure alien. NGC 457 was amazing visually, but it became more amazing when I turned the Mallin-cam on it. The camera began to pick up tiny and dim PGC galaxies winking into view among the cluster's stars. The more I worked the list and saw wondrous sights such as this, the better my perspective on the universe became. The distant stars of NGC 457 are mere next-door neighbors compared to the unimaginably distant PGC galaxies.

### A Deepening Appreciation

Nebulae are few and far between in the Herschel Catalog. But there's a good one in Cassiopeia: **NGC 7635**, The Bubble Nebula — famous because of beautiful long-exposure images. I had a difficult time seeing the bubble shape formed by looping streamers, even in the 12-inch equipped with a nebula filter. Plenty of nebulosity was on display in a wide-field 13-mm eyepiece, but mostly the impression was "haze around an 8th-magnitude star."

Herschel galaxies range from the "barely there" to the "spectacular." **NGC 7331**, The Deer Lick Galaxy, is among



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**COSMIC BUBBLE** NGC 7635 in Cassiopeia is commonly known as the Bubble Nebula. A hot but aging star in the center sculpts the 10-light-year wide nebula with its fast and powerful wind.

the latter. It was beautiful in my 8-inch, with a large, bright, and elongated middle and hints of a sweeping spiral arm. Why is it "The Deer Lick"? Because numerous small galaxies hover nearby, like deer clustered around the salt lick of big NGC 7331. My Dobsonian revealed two



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**THE DEER LICK GALAXY** A group of small, faint galaxies form a deer-like pattern above the bright spiral galaxy 7331. But the smaller galaxies are about 10 times farther than NGC 7331's approximate 45-million-light-year distance.

## Read a BONUS AUTHOR INTERVIEW



To read more from Rod Mollise about his challenging Herschel Project, visit [skypub.com/herschelproject](http://skypub.com/herschelproject).

with fair ease in an 8-mm eyepiece, **NGC 7337** and **NGC 7335**. A third, **NGC 7336**, was at least suspected.

As Pegasus sinks, Perseus rises; let's head to the other side of the sky for a taste of that hero's Herschels. **NGC 1624** is a passable small open cluster 1.9' across composed of 12 to 15 fairly prominent stars. But that's only half the story. A quick glance at it in the 12-inch showed it to be embedded in subtle but real nebulosity. Even without a filter, it was obvious that a cloud surrounds the cluster's handful of 12th-magnitude-range stars. The nebula was round and reminded me a little of the Cocoon Nebula in Cygnus (IC 5146).

**NGC 1605**, our next Perseus target, is an open cluster, though it's not much of an open cluster. I'm including it because it's typical of many of the groups you will encounter as you travel the 2,500. In my 12-inch Dob at 200×, all I saw were five or six faint stars in a shapeless pattern. One slightly brighter red-orange star was visible 2' to the east of the cluster's center. Borderline objects such as this one gave me a greater appreciation for Herschel's achievement at seeing the faintest objects. It's amazing given the primitive nature of the telescopes and eyepieces that he was able to see things like this.

### Winter Objects

We don't normally associate the winter constellations with galaxies, but they are there. Perseus is loaded with them, including **NGC 1169**, which is a standout. At magnitude 12.3 it's not overly dim for a Herschel object, and it's large enough at 3.5' × 2.1' to be easy to spot. This Sb spiral has a slightly brighter center and an elongated disk. When I first put my eye to the eyepiece, my reaction was, "Oh my god, I've discovered a supernova!" Alas, my "supernova" turned out to be a dim field star superposed on the galaxy.



### THE HERSCHEL CATALOG

For more information about the Herschel Catalog and its 2,514 objects, visit <http://messier.seds.org/xtra/similar/herschel.html>. Canadian astronomer Lucian J. Kemble compiled the catalog, but British astronomer Richard Hook helped restore the list after some objects were lost. According to the website cited above, the Herschel Catalog is considered less reliable than the much smaller Messier Catalog in terms of duplications and other errors.



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**MINI-COCOON** NGC 1624 in Perseus is classified as an open cluster, but careful inspection also reveals a surrounding patch of nebulosity that's reminiscent of the Cocoon Nebula in Cygnus.

Nobody would call **NGC 1175** "prominent," but once you know what you're looking for in this galaxy-rich area of Perseus (a photograph helps) this near-14th-magnitude edge-on Sa galaxy is not overly difficult. It's strongly elongated, 1.9' × 0.5', with a stellar-like core that winked in and out in my Dobsonian at 200×. If nothing else, this galaxy provides a taste of what you'll face in many of the Herschel 2,500 galaxy fields: little elongated wisps that don't jump out at you, but that won't defeat you either.

Let's end this Herschel run on a high point with Perseus's lovely **NGC 1491**, an exceptional emission nebula. It was easily visible in the 12-inch with both 8- and 13-mm wide-field eyepieces, and I couldn't decide which provided the better view. Lower power brings in more of the star-laden field, but a bit more magnification pulls out more nebulosity. It's a substantial cloud around, but not precisely centered on, a magnitude-11.1 star. Screwing a UHC-type nebula filter onto my eyepiece almost made this vaguely comma-shaped 5' × 10' patch spectacular.

It took me several years to complete the Herschel Project. Did it change my life? I thought I knew the sky extremely well, but my odyssey at least gave me a better idea of the treasures hidden in its out-of-the-way corners. I also developed a feeling of kinship with those legendary astronomers, William and Caroline Herschel. One cold night I had had enough and was ready to pack up the telescope. Then I heard a faint voice, a female voice it seemed: "Rod, you know it was so cold one night when Brother and I were observing that the ink in my inkwell froze as I was taking notes. Don't you think you'd better get back to the telescope?" And I did. You'd better believe I did. ♦

Check out S&T contributing editor **Rod Mollise's** blog at <http://uncle-rods.blogspot.com>.