

Herschel's Catalogs and Classes

Double and Multiple Stars

Everywhere in the sky where William Herschel pointed his mighty telescopes there were wonders no one before him had ever seen and he truly had a boundless untrodden field before him. He left the world with two great catalogs of his astronomical discoveries resulting from these heady celestial explorations. The earlier of these contain the double and multiple stars found during his sweeps of the heavens, the first of which was conducted with his favorite 6.2-inch 7-foot reflector at a fixed magnification of 227 \times . (As previously mentioned, this is the same instrument that was used for his discovery of the planet Uranus.) During later reviews with both the 7-foot and his two 20-foot telescopes, he found many more – his total number of discoveries being in excess of 800 pairs. (One of his most spectacular finds is the beautiful triple system β Monocerotis, better-known as Herschel's Wonder Star.) He would often examine more than 400 stars a night, looking for duplicity, multiplicity, and anything else noteworthy such as marked colors.

Herschel grouped his many double star discoveries into the following six classes (somewhat reminiscent of his classes for clusters and nebulae, discussed below) in the several catalogs he issued between the years 1782 and 1784:

- H I – difficult to resolve and/or measure
- H II – close but measurable
- H III – 5" to 15" separation
- H IV – 15" to 30" separation
- H V – 30" to 60" (1') separation
- H VI – 1' to 2' separation

Note that Herschel used the prefix "H" to distinguish his discoveries from those of his son John (designated by "h") – which for the northern and southern sky combined, number well into the thousands! (Just one outstanding example of the latter's findings is the magnificently-hued orange and blue pair h3945, located southeast of Sirius in Canis Major – an object I have dubbed the Winter Albireo from its resemblance to that famous namesake in Cygnus.) An additional catalog of new doubles found by Sir William appeared much later, in 1821, using the prefix "H N" to distinguish them from his earlier discoveries.

Incidentally, readers interested in observing these tinted jewels of the sky are referred to the author's book *Double and Multiple Stars and How to Observe Them* (Springer, 2005).

Star Clusters, Nebulae and Galaxies

Despite Herschel's pioneering discoveries in the field of stellar astronomy, it is his deep-space explorations for which he is best-known and remembered. The more than 2,500 star clusters and nebulae (which included many galaxies, the true nature of which was unrecognized at that time) were cataloged under the following eight categories or "Classes" as he called them, with the total number of objects in each indicated in parentheses:

- Class I – Bright Nebulae (288)
- Class II – Faint Nebulae (909)
- Class III – Very Faint Nebulae (984)
- Class IV – Planetary Nebulae (78)
- Class V – Very Large Nebulae (52)
- Class VI – Very Compressed and Rich Clusters of Stars (42)
- Class VII – Compressed Clusters of Small (Faint) and Large (Bright) Stars (67)
- Class VIII – Coarsely Scattered Clusters of Stars (88)

Thus, Herschel's entire catalog contains a total of 2,508 *entries*, with Classes II and III accounting for 1,893 of them. (Note that the actual *number* of objects is somewhat less than this, since some three dozen were either inexplicably assigned to more than one Class or were entered twice in the same Class by Sir William.) Such a large number of targets (with a great percentage of them being labeled faint and very faint by their discoverer who used the largest telescopes in the world at the time to find them) have discouraged most observers from attempting to view the entire catalog. As mentioned previously in the Preface, the author had suggested some years ago in articles and letters in both *Sky & Telescope* and *Astronomy* magazines that a much more realistic goal could be had by dropping Classes II and III as largely difficult and visually less-interesting specimens and going after the remaining 615 objects. This suggestion was the motivation for the founding of a national Herschel Club, as discussed in both the Preface and also in Appendix 1. Chapters 5 through 10 highlight a total of some 165 showpieces contained in the six remaining Classes. These not only provide a great sampling of Herschel objects in themselves, but they are also ideal as preparation for those observers who are considering viewing all 615 targets (a complete listing of which will be found in Appendix 3). (Fig. 3.1).

Out of respect for Messier's work, Herschel included very few of the famed M-objects in his own compilations, and those that he did were mostly ones numbered from M104 to M110. These objects were only attributed to Messier long after Herschel's time, later historical research showing that they had indeed been seen by Messier (or one of his colleagues) but were not included in his original catalog. One rather surprising exception to this rule is H V-17, which is actually