

The Summer Sky

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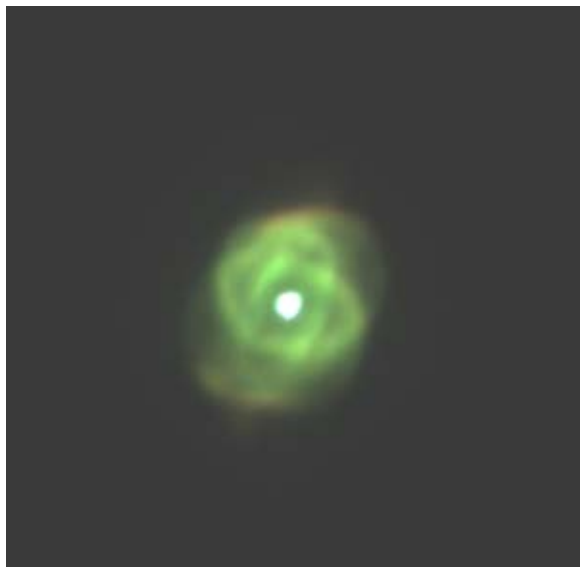
Fixed Stars

Some years ago this column had occasion to discuss planetary nebulae, using the Ring Nebula in Lyra, everyone's favorite, as an example. The simple morphology of the Ring Nebula makes it ideal for this purpose. It can be explained as a slightly ellipsoidal expanding shell, where the asymmetry is due to a slight anisotropy in the initial expansion velocity.

Very few planetary nebulae have the simple structure of the Ring Nebula. In fact, there is a baffling variety in the shapes of these objects. Most of them, however, show symmetry about a plane, which we might identify with the equator of the central star. The expansion seems to take place mainly in the direction of the poles. This could be caused by the presence of a massive ring of material around the equator, which would direct the expansion toward the poles. This ring might have been left over from the giant phase of the star.

This agreeable situation came to an abrupt end when Hubble Space Telescope images of planetary nebulae, starting with the Cat's Eye Nebula (NGC 6543), showed far more complex structures than had been previously suspected. This complexity, particularly its fine detail, could not be explained by the model of a general expansion toward the poles.

Attempts to explain these structures seem to fall into two categories. The presence of a companion star would provide both the dynamical perturbations and the symmetry plane (in this case the orbital plane) required by the observations. A magnetic field strong enough to dominate the expansion motions could also explain some detail. Unfortunately, it is very difficult to verify directly the presence of a companion or of a magnetic field, so much work, both observational and theoretical, remains to be done.



The complex structure of the Cat's Eye Nebula may be seen easily in this MIRA image of the object, made with the 36-inch telescope and the ST-7 CCD camera.

The Cat's Eye Nebula, which seems to have been at the root of all this trouble, is quite small, only about 20 arc seconds, bright and easily observed with a moderate sized telescope. Its blue-green color is striking and the central star is easily seen. It is far north and thus almost always observable. The nearest bright star is Aldhibah (zeta Draconis), about 5.5 degrees almost due west. It is a bit surprising that it did not find its way into Messier's catalog. Perhaps it was too small to be easily distinguished from a star. At any rate, it could not have been mistaken for a comet, which might in itself have kept it off the list.

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Even ground based observations show that there is something exceptional about the Cat's Eye Nebula. Instead of a single elliptical ring, there are two, both of about the same size and oriented at right angles to one another. It seems quite certain that these are on opposite sides of the plane of symmetry, for otherwise they would interfere with one another. Their difference in orientation is hard to explain, as is the fact that they are nearly concentric. The whole object is embedded in a rather prominent halo. Among the wide variety of planetary nebulae, there are very few that look anything like this one.

Planets

Mercury can be seen in the evening only with difficulty from the northern hemisphere during July, but it will be favorably placed as a morning object in the middle of September.

Venus, having transited the Sun in the early morning of June 8 without serious consequences, will appear in the eastern morning sky in early July, where it will remain, very favorably placed for observation, throughout the remainder of the summer. Mars will not be observable at all during the summer. It will reach conjunction with the Sun on September 15 and not reappear until the end of October.

Jupiter will be visible low in the western evening sky until about the middle of August, when it will become lost in the twilight. It will reach conjunction on September 22.

Saturn will be in conjunction on July 8 and will become visible again low in the morning sky during August. During September it will be in Gemini and will rise after midnight.

Uranus, which will be in Aquarius, will be at opposition on August 27. Neptune, in Capricornus, will be at opposition on August 6. Both will be quite far south and thus unfavorably located for observation.

Meteor Showers

The Perseids, the best known of all meteor showers, will suffer little from moonlight at maximum on the morning of August 12. Multiple peaks were observed in the 1990s when the parent comet, Swift-Tuttle, was nearby, but in the last few years only the traditional peak has been seen. Some calculations predict a return of the temporary maximum this year, coinciding closely in time with the traditional maximum. As usual for the Perseids, the best time for observation is from somewhat before midnight onward. The maximum activity is predicted to occur shortly before dawn on August 12.

The second and third strongest showers, the Southern delta-Aquarids on July 27 and the alpha-Capricornids on July 29, fall too close to full moon to be of much interest this year. A number of weaker showers during the quarter will be of interest only to observers with extraordinary patience.

Comets

Comet NEAT (2001 Q4) moved into the northwestern evening sky in June and will remain observable there during the whole summer quarter, moving from Ursa Major through Draco and into Ursa Minor by the end of the quarter. It will fade from magnitude 6 to magnitude 9 as it recedes from both the Sun and the Earth.

Comet LINEAR (2002 T7), which was becoming brighter at the beginning of the year, will be too close to the Sun or too far south for observations during the rest of this year.

Comet LINEAR (2003 K4) will brighten from magnitude 7 to 6 as it approaches perihelion. It

will move from Hercules into Virgo and will disappear behind the Sun in September.

Comet Tabur (2003 T3) will fade from magnitude 9 to 11 as it recedes from the Sun, moving from Camelopardus toward Ursa Major by the end of August.

Not yet easily observable is LINEAR (2003 T4), which will reach magnitude 6 in early 2005, before it disappears behind the Sun.

Eclipses

There will be no eclipses during the summer. We will have to wait until October, when there will be a partial solar eclipse and a total lunar eclipse, the latter partly visible from our location.