

# The Spring Sky

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## Fixed Stars

We have noted quite regularly in these little essays on the spring sky that what we can best see during this season (weather permitting) is an assortment of galaxies. With so many objects to describe, it is clearly useful to have a system of classification. Since shortly after its introduction in 1926, the Hubble scheme, often called the tuning fork diagram, has been used for this purpose. In the intervening 80 years it has enjoyed many modifications and expansions, but its basic form has remained the same. In a recent review article, Alan Sandage, who should know more about this subject than anyone else, described these developments along with the earlier history of galaxy classification.

Sandage suggests that the classification of galaxies (and many other objects in nature) develops in three stages. First they are sorted, according to what can be observed, into descriptive groups. These groups will not, in general, have any particular relation to one another; they will simply reflect the features that are most evident to the observer. The first person to classify galaxies, long before anyone knew what they were, was William Herschel. He cataloged many non-stellar objects and classified them according to the properties that he could observe, such as apparent size and brightness, central condensation, smoothness, regularity, etc. He had, of course, no way of distinguishing galaxies from other extended objects.

This kind of classification was extended and refined until about 1920, when the second phase of classification began. In this phase the various classes of objects are arranged in some sort of sequence in one or more dimensions, introducing a degree of continuity into the classification. By this time spiral

nebulae were recognized as a separate class of objects, although their true nature was only suspected, and the initial classification scheme (which was not the work of Hubble) contained only the spirals. By the time Hubble introduced his scheme the galaxies were generally recognized for what they were and the elliptical galaxies were also included. The scheme was still based strictly on the morphology of the objects, although the use of the terms "early" and "late" to describe the two ends of the sequence suggested the possibility of an evolutionary sequence, quite incorrectly, as it turned out.

This illustrates the potential danger, which Sandage points out, of letting an uncertain interpretation of the

underlying physics influence the classification scheme. Happily that did not happen here, as the Hubble scheme does not depend upon any assumption about the physics. If it had, it would

have been impossible to use the classifications so derived to verify subsequent physical hypotheses. We would have to call this circular reasoning. Once the physics has been well established, then it is legitimate to use it to refine and expand the classification scheme. This is then the third phase, which, with our increasing understanding of the dynamics and evolution of galaxies, we are only now beginning to enter.

The classification scheme as proposed by Hubble lasted almost unchanged until after his death in 1953. There was some inconsistency in the transition between elliptical and spiral galaxies, where Hubble had introduced a hypothetical S0 type. These galaxies were subsequently identified, and they turn out to form a diverse and complex group, quite different from the simple transition type which was originally

Hubble Classification Scheme

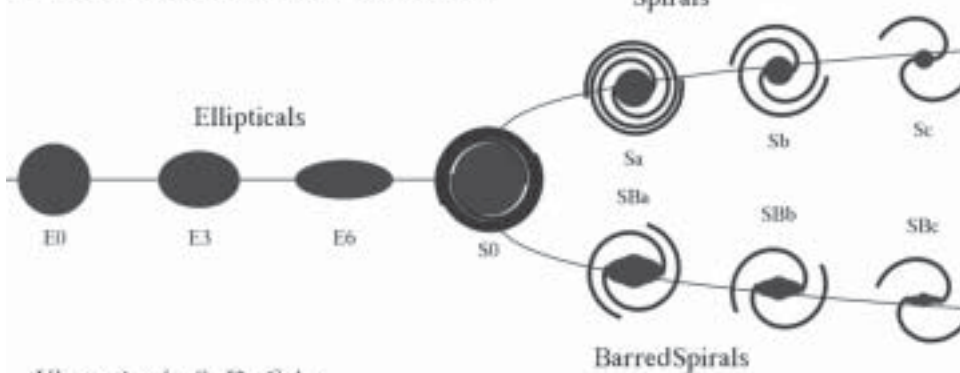


Illustration by S. D. Cohen

assumed. Hubble subsequently made the adjustments needed to remove the inconsistency, but this work was not published until after 1953.

Inevitably, as the observations improved, refinements and extensions were introduced. In particular, de Vaucouleurs expanded the classification of spirals to a fully three-dimensional system by including bars (as had Hubble) and inner rings and their relation with the bars. He even added outer rings, most of which appear to have a tightly wound spiral structure and are of some dynamical significance. One almost has to worry that the classification scheme will become so extensive that there will be only one galaxy in each class. In this case the scheme will become essentially useless and we will have to follow Baade's advice and go back to the pictures themselves. Van den Bergh classified the orderliness of the spiral structure and correlated it with the luminosity. The complexities which we now know to be present in the elliptical galaxies have yet to fully find their way into an accepted classification scheme. But despite all these complications, the original tuning fork diagram remains the basis of our classification scheme for galaxies.

### **Planets**

The quarter began with Mercury briefly visible in the morning sky and ends with its brief presence in the evening sky. In between it has passed inferior conjunction. Neither apparition is favorable for northern observers.

Venus is visible in the morning twilight during the whole three months, but it is not well placed for observation. A lunar occultation on April 24 was visible from parts of the southern hemisphere.

Mars is now moving into the evening sky and after the end of April is no longer well placed for observation. By the end of June it is well into the evening twilight.

Jupiter, which passes opposition on May 4, is easily observable throughout the spring. However, its southerly declination makes this opposition unfavorable for northern observers.

Saturn passed its stationary point in early April and is now moving rapidly into the evening sky. By the beginning of May it is already too low in the west for good observation, although it remains visible in the evening twilight through June.

Uranus, which is not well placed for observation,

is currently undergoing a series of lunar occultations, on April 24, May 21, and June 17. All of these are visible, however, only from far in the southern hemisphere.

Pluto is in opposition on June 16, but the nearly full moon will make observation even more difficult than usual.

### **Meteor Showers**

The Lyrids, which is only a moderate shower, peaked on April 22. The shower is of rather short duration, so they will probably all be gone by the end of the month.

The eta-Aquarids, which peaks on May 6 and has a duration of more than a month, is associated with comet Halley. It is observable in the morning hours and, unfortunately for us, largely restricted to the southern hemisphere.

The June-Boötids, a relatively unknown stream, peaks on June 27. Although it is often not seen at all, it can produce intense outbursts and is worth watching for.

### **Comets**

The brightest comets in the spring sky are the various components of 73P Schwassmann-Wachmann 3. The brightest of these, component C, will pass very close to the earth on May 12 when it should be easily visible with the naked eye and well placed for northern observers. The somewhat fainter component B is expected to reach magnitude 6 during May, while a third component, G, may reach magnitude 10.

Another bright comet, C/2006 A1 (Pojmanski), was brightest in February and is now slowly fading, but it should still be magnitude 10 and well observable throughout the night in May.

The featured comet of the previous quarter, C/2005 E2 (McNaught), has now disappeared into the evening twilight, but it is expected to be back, as a much fainter object, in the fall.

### **Eclipses**

The total solar eclipse of 29 March was studiously observed by a delegation from MIRA. We are informed that everything occurred as predicted, which we find very gratifying. A full report on the expedition is to be found elsewhere in this *Newsletter*. There will be no more eclipses of any sort until the late summer.