

Some Favourite Double Stars

by James O'Connor

Each branch of observational astronomy has attractions peculiar to itself. For example, we observe planets both because of their similarities and dissimilarities with our own Earth; galaxies have a particular fascination as the basic “building blocks” of the universe; we like to look at globular clusters because of their packed masses of stars, while open clusters attract mainly because of the juxtaposition of so many bright sparklers.

In the case of double stars, there are many reasons for wanting to observe them. There is, first of all, the practical reason that, compared with other objects, viewing is comparatively little affected by light pollution of the background sky. Some may be observed because they are “easy”, i.e., with the components well separated; others may be viewed for the opposite reason, i.e., that they are difficult and so present a challenge. Particular pairs may be selected because there is an attractive colour contrast between the components; in other cases the observer may wish to monitor the orbital motion and the changing separation of the components.

Lists of favourite double stars drawn up by a range of observers would, no doubt, contain a lot of common ground. But there would probably be some items on the lists that would be chosen by few and perhaps only one. Such choices might be made for personal reasons such as having come across them in memorable circumstances or during the impressionable early days of initiation into astronomy.

I set out below a few of my own favourites. While acknowledging that some of the choices were influenced by personal events, I feel able to claim that anyone might have picked precisely the same objects.

Double stars are of two kinds. The first, forming the vast majority, are those that are physically close to one another in space and therefore in orbital motion about their common centre of gravity. These are called “binaries”. The remainder are simply stars lying close to the same line of sight but not near each other in space. These are called “optical pairs”. All the objects mentioned in this article are of the physically associated kind.

The doubles in my list are those that I like to return to again and again. I think that they are all very interesting, if for a variety of reasons. If there are any on the list that you haven't yet seen, I suggest that you have a look as soon as you get the chance. You won't be disappointed. Many of the objects are not simple doubles but systems involving several stars.

Gamma (?) Andromedae (also known as Almach): (Situated in the constellation of Andromeda): Position: Right Ascension 2h 04.2m, Declination +42° 21': This is a magnificent object, being the partnership of a golden yellow star of the third magnitude and a blue star of the fifth magnitude. This two-magnitude difference means that the primary is about six times brighter than its companion.

Quite a small telescope will separate the components since the angular distance between the components is 10 seconds of arc.

A feature that adds interest to the object is the fact that the blue component is not a single star but is itself a double. This pair revolve around their common centre of gravity every 61 years in a very eccentric orbit. At the moment, they are too close to be separated in a small or medium sized telescope. And, going a little further, it has been found from spectroscopic studies that one component of this close pair is itself a double with a period of 2.67 days. So, what seems to the naked eye to be a single star is in reality a system of four!

R.A. Proctor, in his "The Orbs Around Us", tells of an odd incident involving what was almost certainly this double star. He says: "A visitor to 'a London observatory', having for a moment the 'run of the Observatory', decided to turn the telescope, a large clock-driven refractor, on 'the celebrated double'. The object was close to the zenith and this brought the viewing position close to the floor. Provision was made for viewing from such a position by an arrangement under which the observer lay on an observing frame with a variable headrest. Proctor goes on:

"But while the frame remained, of course, at rest, the clock-work was slowly driving the telescope after the star; and, as the star happened to be approaching the point overhead, the eyepiece of the telescope was being brought lower and lower. Intent on observing . . . our astronomer failed to notice that this movement of the eyepiece was gradually imprisoning him; for his head was fixed by the head-rest, and the eye-tube was beginning to press with more and more force against his eye. The telescope was a very heavy one and the very slowness of the movement made it irresistible, while the observer's position prevented him from helping himself. Fortunately, his cries for assistance were quickly heard, the clock-work was stopped, the head-rest lowered and the prisoner released; otherwise, he would undoubtedly have suffered severely."

Theta (?) Aurigae: (Situated in the constellation of the Charioteer): Position: Right Ascension 5h 59.7m, Declination +37° 14': This is an object that is a real test of your telescope. Arthur P. Norton, in his famous Star Atlas, describes the pair as "a test for a 4-inch". However, he was thinking of a refractor and if your telescope is a reflector you will need a considerably larger instrument and a good observing night. The difficulty in detecting the companion arises from two considerations. Firstly, the components differ by the whopping factor of 83 in brightness (magnitude 3 -v- magnitude 7.5). Secondly, they are separated by only 3.4 seconds of arc. However, the difficulty of sighting the companion makes success all the more rewarding. To me, it has a greenish tinge; the colour probably resulting from a contrast effect with the main star. The companion has almost the same intrinsic luminosity as our sun, while the primary is nearly 100 times as bright as the sun.

The main star is of special interest. It is called a "silicon star" because of the abnormal strength of the lines in its spectrum arising from the presence of this element.

145 Canis Major (also known as h 3945): (In the constellation of the Greater Dog): Position: Right Ascension 7h 16.6m, Declination -23° 19'. The attraction of this object lies in the vivid colour contrast

(orange and blue) between the components, a contrast that to me is more striking than in the case of any other double. The stars are magnitude 5 and 6, respectively, and they are separated by 27 seconds of arc.

I first came upon this object by accident when searching for the open cluster NGC 2362 in the same constellation and was immediately struck by the colour contrast. The only negative point about it is that, as far as Ireland is concerned, it is always low in the sky. This reduces opportunities for viewing it and tends to interfere with the splendour of its colour contrast.

Zeta (?)Cancri: (In the constellation of the Crab): Position: Right Ascension 8h 12.2m, Declination $+17^{\circ} 39'$: This is one of the finest triple star systems in the sky. (Striking triples are quite rare!) It was listed simply as a double star until William Herschel discovered that one of the components was itself double. The current separation of the “original” double is about six seconds of arc while that of the close pair is rather less than one second. A 6-inch (15-cm.) telescope should show all three. The components do not differ greatly in brightness, all being close to magnitude 6. The close pair completes an orbit in just under 60 years while the third star takes about 1000 years to complete an orbit about the other two.

It is interesting to note that orbital movements taking long periods to complete can, in certain circumstances, be detected over quite a short period of time. In 2002, the orbital motions of the three stars brought them briefly into alignment with each other, i.e., all three were in a straight line. In these special circumstances, the changes in the relative positions of the stars could be detected easily over the space of just a few weeks.

The outer star of the Zeta Cancri system is itself a close double. The orbital period has been determined as 17.64 years.

Iota (?) Cancri (also known as 48 Cancri): (In the constellation of the Crab): Position: Right Ascension 8h 46.7m, Declination $+28^{\circ} 45'$: This is a really beautiful object, the components having delicate yellow and blue colours. The components, of magnitudes 4 and 6.5, respectively, are separated by 31 seconds of arc and so can be seen with the slightest optical aid.

My most memorable encounter with Iota was on the morning of September 1, 1989 (easily remembered as the 50th anniversary of the outbreak of World War II). I was searching for Comet Brorsen-Metcalf in the pre-dawn sky when I accidentally came upon Iota. Although I had seen the double on many previous occasions, the delightful contrast between the components seemed much more pleasing by reason of my having come upon them accidentally.

24 Coma Berenicis: (In the constellation of Berenice’s Hair): Position: Right Ascension 12h 35.2m, Declination $+18^{\circ} 23'$: I have never failed to be delighted by views of the delicate colour contrast – light yellow and light blue – between the components of this double. The stars are of the 5th and 6th magnitude and are separated by 20 seconds of arc.

Alpha (α) Canum Venaticorum (Cor Caroli): (In the constellation of the Hunting Dogs): Position: Right Ascension 12h 56.1m, Declination +38° 19': This star is fairly conspicuous in the springtime sky, despite its modest brightness, because it is located in a blank space between the stars of the “Plough” and those of Leo. The name “Cor Caroli” means “Charles’ Heart”. It was named after King Charles I of England.

The star is an easy one to separate as the components (which are of magnitudes 3 and 6, respectively) are separated by 20 seconds of arc. The primary is of great interest to astrophysicists as it is a “magnetic” star with an over-abundance of metals.

To me, the double’s chief attraction is the subtle difference in the colours of the components. I see them as white and light yellow but others have described them differently. The components belong to the same spectral class (A).

Epsilon (ε) Bootis (also known as Mirak or Izar): (In the constellation of the Herdsman): Position: Right Ascension 14h 45.2m, Declination +27° 03': The 5th magnitude companion to this 2.5-magnitude star was discovered by F.G.W. Struve in 1879. He gave the pair the Latin title *pulcherrima*, meaning “most beautiful” because of the fine colour contrast between the yellow-orange primary and the blue companion. The separation of the components is just short of three seconds of arc.

Arthur P. Norton, to whom I referred in relation to Theta Aurigae, describes Epsilon Bootis as “a test for a 2-inch”. However, as in that case, he had refractors in mind and one shouldn’t assume from his remark that this is a very easy object. There is a 10-fold difference in the brightness of the components and, when a reflecting telescope is used, the spurious appendages it tends to create about the brighter star tend to obscure the companion. It is only when one observes through a refractor or other unobstructed optical system that Struve’s title of “most beautiful” really applies.

Perhaps, next year, I will share some more of my double star experiences.

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