Z Andromedæ

In 1901 Scottish astronomer and curator of astronomical photographs at Harvard University Williamena Fleming, came across an unusual spectrum of a star during an investigation into observatory spectrum plates. She noted that the spectrum resembled that of the recently discovered Nova Persei 1901 (GK Per) and Nova Oph 1898 (RS Oph), and catalogued it as a 'star with peculiar spectrum'. Further investigations were carried out at Harvard, most notably by Annie Jump Cannon, but it was to be another 30 years before the star in question – Z Andromedæ – was grouped with other stars of similar peculiar spectra (AX Per, CI Cyg and RW Hya) by Paul Merrill and Milton Humason into a new classification of variable star – termed Symbiotic Stars by Merrill – in which Z And was to be the prototype.

The variations observed in Z And can be quite dramatic. At intervals of 10-20 years, the star will undergo a bright outburst by as much as 3 magnitudes, followed by a series of fainter outbursts decreasing in amplitude before the system returns to its quiescent state. Photographic plate searches have allowed the visual observation data to be extended back to the beginning of the 20th century, and from these combined data we can see from observations collected by the AAVSO that there have been five major outbursts brighter than magnitude 8 since that time, with the brightest occurring in 1939 when the magnitude reached 7.2. BAA data began in 1985, but as the accompanying light curve shows, Z And has been in almost a constant active state since that time.

A century of observations have revealed that all 'ZAND' stars are binary systems consisting of a hot compact star which is usually a white dwarf, and a cool red giant star orbiting the hotter component, with both stars lying within a common envelope of nebulosity. Usually in eruptive binary systems, accretion takes place directly between the hot and cool stars resulting in an accretion disc forming around the white dwarf which powers any outburst activity. In the Z And system it would appear that the white dwarf is accreting material from the red giant via its stellar wind, with the presence of an accretion disk yet to be confirmed! If this is the case then the observed outbursts are due solely to a build-up of material on the white dwarf itself. The spectrum during outburst is dominated by the hot primary, where blue shifted P Cygni absorption lines reveal the presence of an expanding gaseous shell, rather like a Nova (hence Fleming's attraction to the spectrum in 1901). As the shell fades and the star returns to quiescence, TiO (Titanium Oxide) bands emerge as light from the red giant star dominates, and small amplitude semi regular variations can be observed. It was this combination spectrum that led Merrill to suggest the term 'Symbiotic'.

The field in which Z And lies is easily located being some 40 arc minutes SE of the open cluster NGC 7686 (mag. 5.6) and 2d 40m North of the 4th magnitude star lambda And. The catalogued range is 7.7-11.3, so the whole cycle can be observed with a small telescope or medium sized binoculars. As the star is of an eruptive nature, observations should be carried out at every opportunity. Z And is circumpolar from mainland Britain, although it is very difficult to observe during the Spring months.