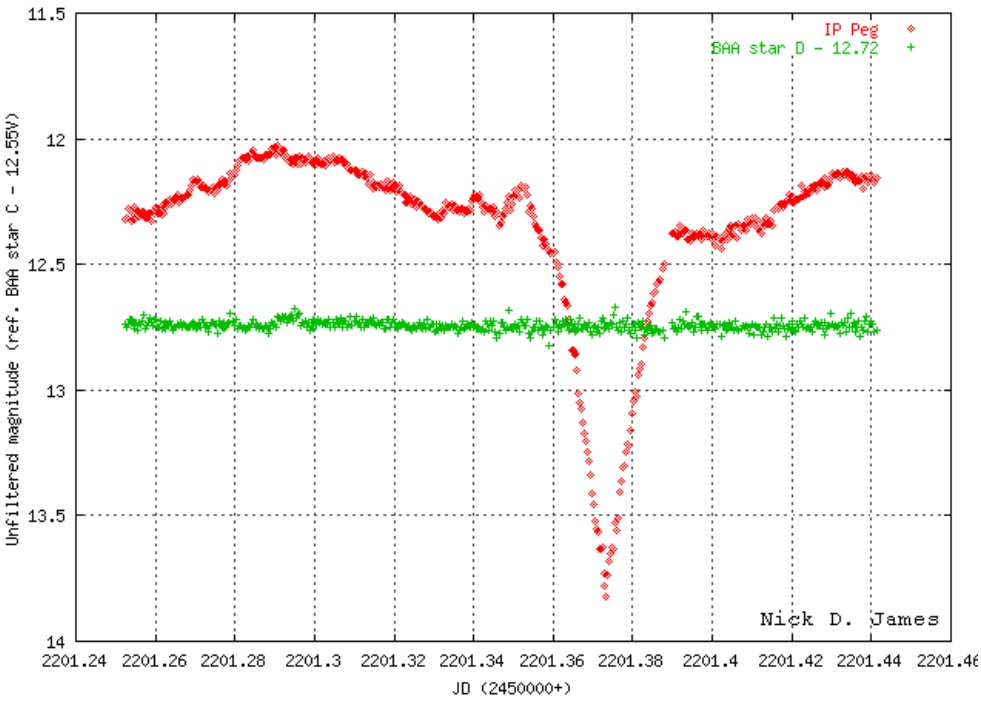
Variable Star of the Year
IP Peg

Dwarf Novae are cataclysmic interacting binary stars where a cool main sequence secondary star loses mass to a white dwarf primary. This material is stored in an accretion disc which forms around the white dwarf. As this material builds up the disc becomes unstable, which then results in an increase in brightness and is the outburst we see in our telescopes. Being binary stars, the opportunity to observe eclipses as well as outbursts might be expected to be quite high. However of the 400+ known dwarf novae, only a dozen or so have the correct angle of inclination as seen from Earth (around 70 degrees or higher) to display eclipses. Of these IP Peg is amongst the brightest and best known among amateurs.

IP Peg was discovered by V.A Lipovetskij and G.A Stepanyon in 1981 from searches of POSS plates, and was originally known as SVS 2549 (Soviet Variable Star). Six outbursts were detected on POSS plates, thus confirming it's dwarf nova status. It wasn't until 1981 however that eclipses were first detected by Goranskij et al, and announced in IBVS 2653. Eclipses in IP Peg include the accretion disc, white dwarf and the bright spot where the accreting material from the donor star impacts the disc. The outburst interval is around 95d, with the extreme range being 75-114 days. Eclipses occur every 3.8 hours (the orbital period) and last about one hour. What makes IP Peg so popular amongst amateurs is that in outburst, a magnitude of 12.0 can be reached, making it very accessible to small aperture telescopes. In quiescence, IP Peg can be seen or imaged around magnitude 15.5 outside of eclipse. Eclipse depth varies between 1.5 and 2 magnitudes.

Observations of eclipse profiles in this and other eclipsing dwarf novae, can reveal much about the physical processes occurring during outburst. Outbursts in IP Peg have been identified as occurring in the inner regions of the disc, moving outwards (inside-out outbursts). These observations were determined from the fact that early outburst eclipses are total, indicating that the bright area of the disc is small enough to be completely eclipsed by the secondary star. During maximum magnitude the light levels observed are higher, suggesting the outburst has spread to the outer regions of the disc, which are not eclipsed by the secondary. Because of this, eclipses appear to be deeper at the beginning and end of outbursts.

IP Peg lies in the SW corner of the square of Pegasus, 5 degrees North East of Markab (alpha Peg) and 2.3 degrees South of the 6th magnitude star 65 Peg. The field is visible for around nine months of the year, with the exception of the Spring months. Visually IP Peg is a challenging and rewarding star to observe. Once the outburst has been detected, visual observations should start about 10 minutes before the eclipse is due to begin (40-50 minutes before mid eclipse), and continue for the same amount of time after it has ended. However if observers wish to observe the orbital hump (caused by the bright spot on the accretion disc moving into the line of sight), then observations should begin up to 90 minutes before the start of eclipse. Visually, one estimate every minute will suffice for the duration of the eclipse. An accurate stopwatch is essential, and a small voice recorder can be of benefit to 'speak' the observation, rather than to move the eye from the eyepiece to write it down. A driven telescope is not a requirement, but again will be a benefit. CCD observers should use integration times of 25-40 seconds for each image, depending on equipment. V-filters should be employed where possible, as these will make observations achieved with different instruments comparable. However unfiltered observations should not on any account be discouraged. A mid eclipse ephemeris for IP Peg can be found on the BAA Variable Star Section web-pages at http://www.britastro.org/vss/dpredict.html


IP Peg
BAA star D - 12.72
Nick D. James
Unfiltered magnitude (ref. BAA star C - 12.55V)
JD (2450000+)
11.5
12
12.5
13
13.5
14
2201.24
2201.26
2201.28
2201.3
2201.32
2201.34
2201.36
2201.38
2201.4
2201.42
2201.44