accepted plates to 42 % rejected ones. It is interesting to note that this ratio is nearly exactly the same as the one of the Palomar group with the northern atlas.

Rejected plates are not completely useless; many of them have only a scratch or an unaesthetic patch, or a broken corner – details which do not allow them to be copied, but they are still useful and stored together with the master plates in the ESO files in the Garching archives.

The ESO Quick Blue Survey is now in full use and a direct follow-up work is also nearly finished. In collaboration with Uppsala Observatory, ESO has scanned the 606 southern sky fields, and any object larger than 1 mm (or about 67 arcsecs) is compiled in a catalogue, with the coordinates and a preliminary description. This catalogue, which contains several thousand objects, and the sky surveys done in Chile and Australia are the basis for future photometric and spectrographic programmes with the large telescopes now in operation in the south.

As said above, moontime does not permit us to take BLUE or RED atlas plates, the background would get to high. There exists, however, a combination of emulsion and filter which makes it possible to work even during full moon and to reach a colour band-pass which has become more and more of interest for astronomers. Using a KODAK IV-N emulsion with a filter RG715 the so-called near infrared is covered. The IV-N emulsion needs a careful wet sensibilization in a solution of silvernitrate, and then an immediate drying before use in the telescope. ESO has in its files in Garching a selected atlas along the band of the southern Milky Way. This IR atlas is not meant for distribution but available for use in Garching. On the other extreme of the spectrum, the ultraviolet has called more and more the attention of astronomers. Sporadically, there are informal talks about an atlas in the UV band. The same talks concern the possibility to have an atlas of objective prism spectra of the southern sky or at least of certain selected areas. But for the moment and for some time in the future the ESO RED atlas is the main task of the La Silla Schmidt.

Simultaneous Optical and Satellite Observations Provide New Understanding of a Famous Nova

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Most stars in our Galaxy appear to be stable and shine with essentially the same intensity over millions of years. Novae (and supernovae), on the other hand, suffer suddenly a gigantic explosion. Their brightness increases in only a day or two by more than several 10,000 times, marking them often the brightest objects in the night sky, before they eventually fade in the course of several years to their former relatively insignificant pre-outburst brightness. These stars were called "novae" (which literally means "new stars"), long before it was realized that they are not new at all, but existed already as stars long before their outburst. Nova Aquilae (1918) is actually one of the very few objects which had been known to exist before it turned into a "nova".

Until now, more than 150 "normal" novae have been recorded in our Galaxy, and typically one or more can be observed in a year. Although many novae remain undetected, it is estimated that about 25 appear per year in our Galaxy.

In the outburst, a shell is ejected with typical velocities of about 2000 km/sec. In many cases, the expansion of this envelope could be followed in direct photographs. In the case of nova V 603 Aquilae (see Fig. 1), the envelope showed a radial velocity of about 1700 km/sec; it expanded by about 1″ per year.

It is now generally accepted that novae are in fact close binary systems, consisting of a very compact object, which is probably a white dwarf, and a large, cooler late-type secondary that fills its Lagrangian lobe. The hydrogen-rich material lost by the expanding cooler star flows through the inner Lagrangian point towards the white dwarf, forming a fast rotating ring of material around it.

To obtain a better understanding of a typical old nova, extended optical observations with the ESO 1.5 and 3.6 m telescopes as well as ultraviolet measurements with the IUE satellite were conducted.

Nova Aquilae (1918) was the brightest new star that appeared in the sky since Tycho's and Kepler's supernovae in 1572 and 1604, which reached a maximum brightness of -4^m and -3^m, respectively (Clark and Stephenson, 1977). It shone with a visual magnitude of $-1\overset{m}{.}1$, on June 10, 1918, and was the brightest nova discovered since the invention of the telescope. It is a spectacular example of a "fast" nova that went through a very sharp light maximum and showed a steep brightness decrease which was followed by pronounced post-maximum fluctuations (Payne-Gaposchkin, 1957). The fading nova was soon found to be surrounded by a small nebula (Barnard, 1919) which expanded at a uniform rate (Mustel and Boyarchuk, 1970), and which by now has essentially vanished (Williams, 1980).

The binary character of nova V 603 Aquilae was discovered by Kraft (1964) from an analysis of Palomar coudé spectrograms. The radial velocity curve had a period of $3^h\ 19\overset{m}{.}5$ and a rather small amplitude of v. sin i = 38 km s^{-1}, which indicates a low inclination of the system. Pronounced eclipses of the accretion disk around the white dwarf by the late main sequence star were therefore not expected.

Although, over the years, light fluctuations were reported by a number of authors, up to now, no photometric measurements

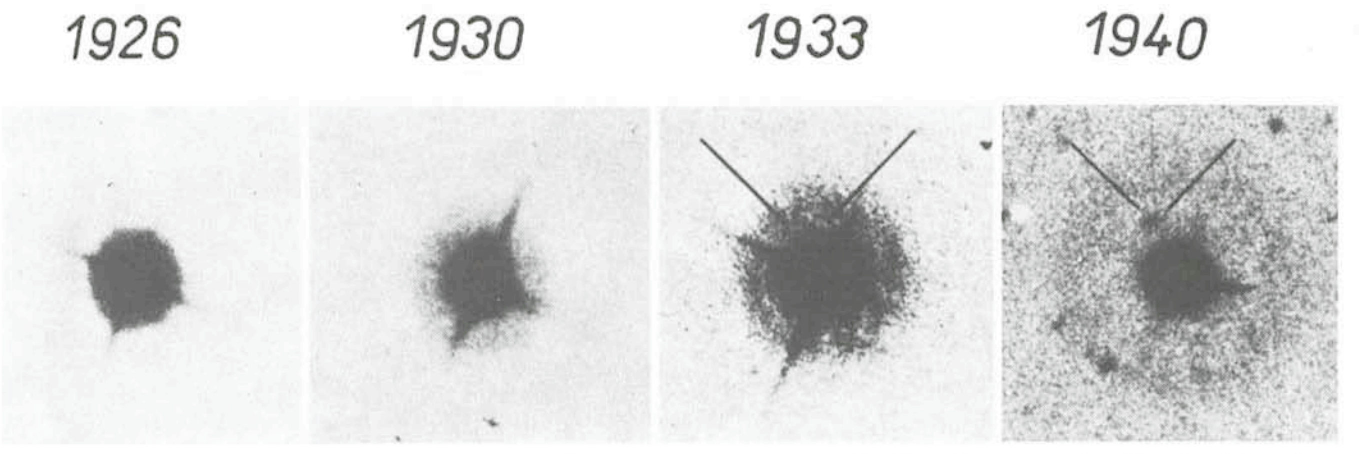

Fig. 1: *Photographs of the expanding envelope around the old nova V 603 Aquilae, taken at Mt. Wilson Observatory (from Mustel and Boyarchuk, 1970).*

covering time intervals of the order of the binary period have been reported. Now, exactly 62 years after the outburst, on June 10, 1980, the brightness and spectroscopic behaviour of nova Aquilae was monitored for eight hours continuously by the IUE satellite. At practically the same time, as well as earlier and later, the nova was observed with the ESO 1.52 m and 3.6 m telescopes.

Photometric measurements were made with the Fine Error Sensor (FES) onboard the IUE with 5.1 sec integration per observation. The FES is an unfiltered image dissector tube with an S-20 photocathode. In the track mode, the stellar visual magnitude can be derived from the FES count rate for the observed star. These measurements revealed pronounced periodic changes in the lightcurve with an amplitude of about $0^m.3$ and a period of $3^h\, 18^m.3$ (Rahe et al., 1980). The magnitude during maximum light was about $11^m.7$. A statistical flickering with a typical time scale of one or a few minutes is always superimposed on the lightcurve.

In principal, the light variations could be due to orientation effects. The observed brightness depends on the angle under which the radiating surface is seen. Part of the light comes from a hot area which arises from the release of kinetic energy of the material transferred from the late star to the accretion disk around the white dwarf. In addition, light can be reflected and re-radiated from those regions of the cool companion which are facing the accretion disk and are thus considerably heated by its radiation and by the white dwarf.

The viewing angle of these surface areas varies periodically with phase and can produce a sinusoidal lightcurve. Such a behaviour was, e.g., observed for the old novae RR Pic 1925 and HR Del 1967. Another, perhaps even more likely explanation is that during the observed minimum phases, the hot area is partially eclipsed by the late companion or the optically thick material of the disk itself. This, however, implies a higher inclination angle than previously assumed.

Strongly correlated with the visual lightcurve are changes in the ultraviolet emission line fluxes of C IV (1548,1550 Å), Si IV (1393, 1402 Å), and He II (1640 Å) by about a factor of two (Drechsel et al., 1980). The intensity of these lines is highest during maximum light at about phase 0.5 and lowest near orbital phase 0.0. The correlation of their intensity with the orbital motion suggests that they originate in close proximity to

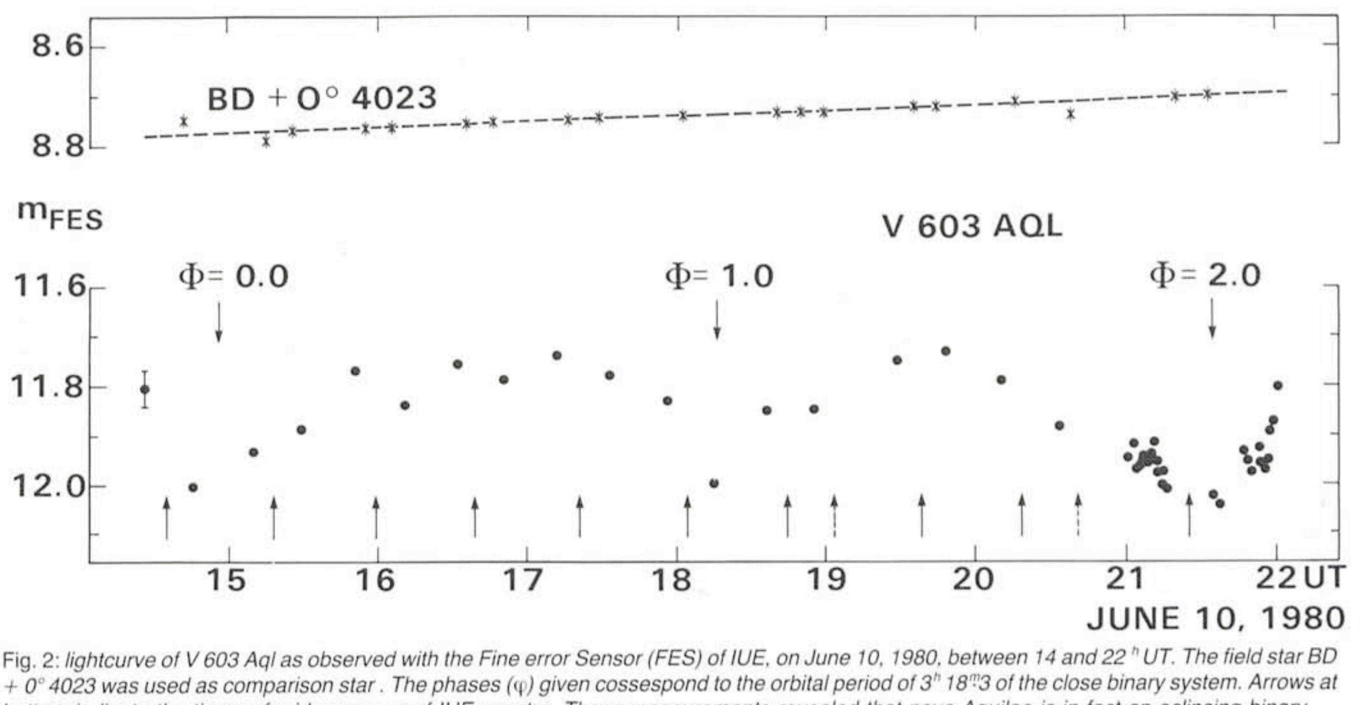

Fig. 2: *lightcurve of V 603 Aql as observed with the Fine error Sensor (FES) of IUE, on June 10, 1980, between 14 and 22^h UT. The field star BD + 0° 4023 was used as comparison star. The phases (φ) given cossespond to the orbital period of $3^h\, 18^m.3$ of the close binary system. Arrows at bottom indicate the times of mid-exposure of IUE spectra. These measurements revealed that nova Aquilae is in fact an eclipsing binary.*

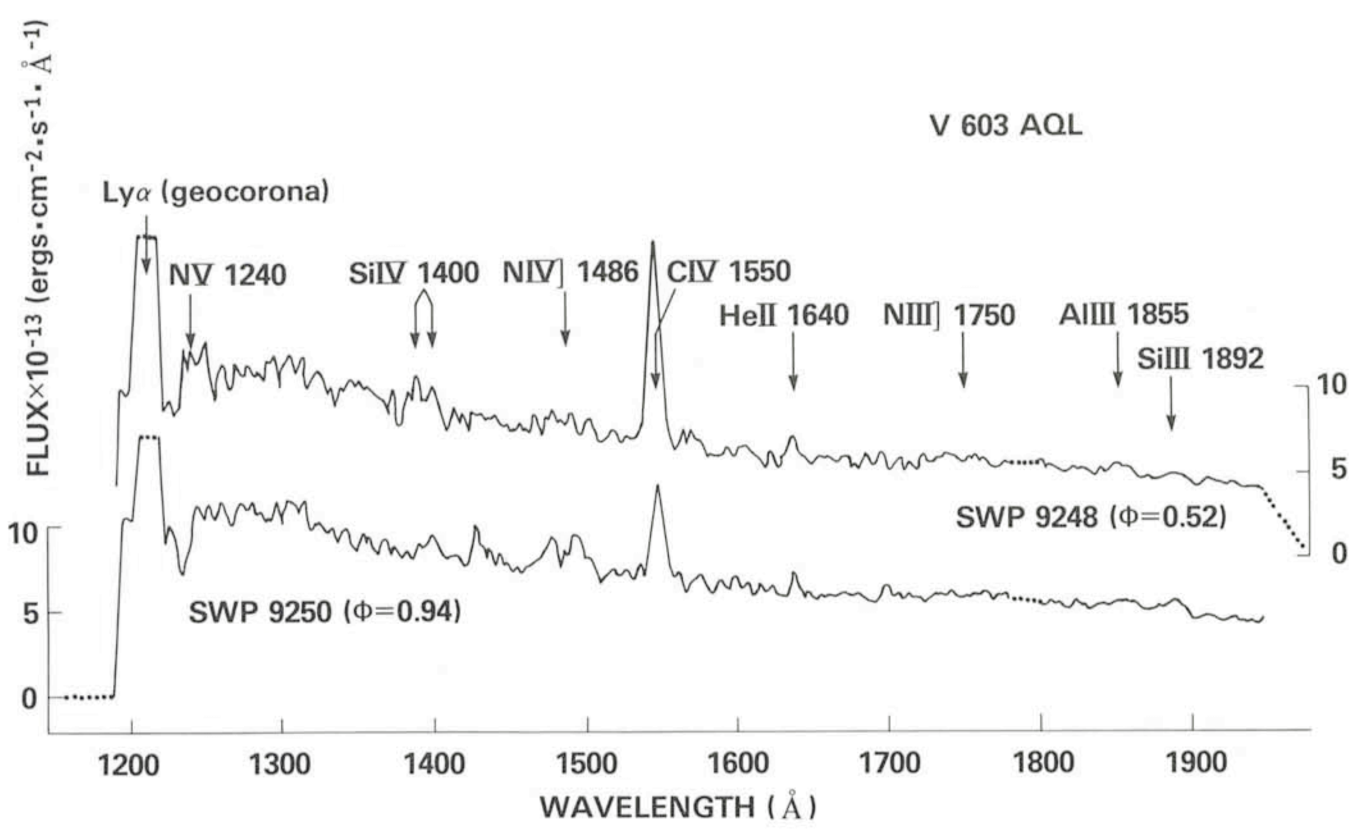

Fig. 3: *Two selected IUE short wavelength spectrograms of V 603 Aql obtained at orbital phase 0.52 and during the eclipse at phase 0.94. Pronounced variations of the strengths of C IV (1550), Si IV (1400) and He II (1640) as well as of N IV] (1486) — but in an opposite sense — are clearly noticeable.*

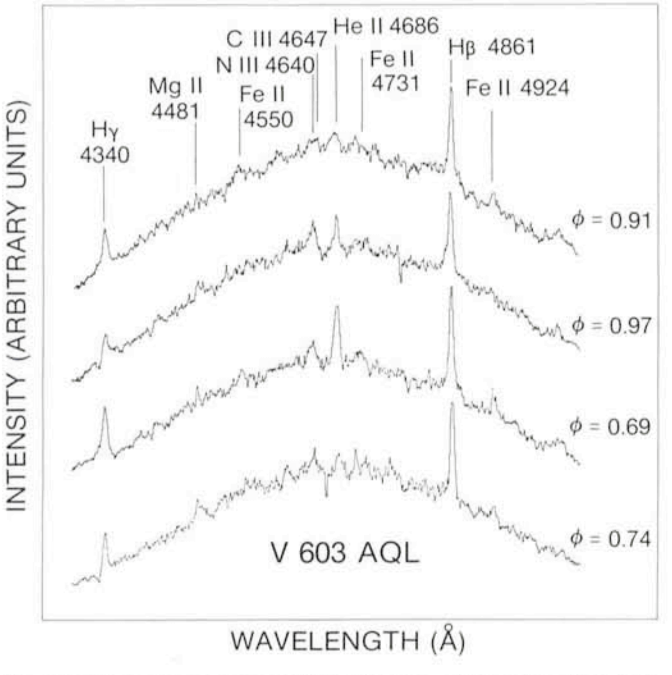

Fig. 4: *Optical observations of V 603 Aquilae, obtained in June 1980 with the ESO 3.6 m telescope, equipped with the Boller and Chivens Cassegrain spectrograph and IDS. Dispersion 39 Å/mm, wavelength region 4290-5050 Å. The four spectrograms shown are typical examples of the more than 40 spectrograms obtained continuously during one complete orbital cycle (3ʰ18ᵐ3) of the close binary. Variations in the line strengths (e.g., He II at 4686 Å) and profiles (e.g., H-gamma at 4340 Å) with the orbital phase φ are clearly noticeable.*

the two stars. Several semi-forbidden lines can be identified; the most prominent is N IV] (1486 Å). They originate probably in a somewhat extended region of diluted gases, and their intensity is not affected by eclipse effects. The effects of mass transfer from the late main sequence star onto the disk surrounding the white dwarf component should also be noticeable in X-ray observations of this old nova.

More than 40 spectrograms were obtained with the ESO 3.6 m telescope during one complete orbital cycle. Similar to the UV spectra, very pronounced, short-term changes occurred in the emission lines, especially of He II (4686 Å). The analysis of these optical spectra and their correlation to the UV measurements is in progress, and first results look already very promising.

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