the name Pholus (another Centaur), but contrary to Chiron, Pholus has not shown any activity (yet).

Other minor planets are known to move in highly eccentric comet-like orbits much nearer the Sun. One of them, (3200) Phaeton (discovered by IRAS in 1983 and designated 1983 TB), moves in the same orbit as the Geminid meteor stream. It seems that it is the parent body of the material in this stream. This is strange, because only a comet, and not a solid minor planet, is thought to be able to disperse dust along its orbit.

Several comets in well-known orbits have been found to disappear from view, probably because their source of volatiles is exhausted. One of the most well-documented cases is that of Biela's comet, first discovered in 1826. It was seen to split into two pieces in 1846, it faded in 1852 and was not seen at all at its predicted return in 1866. When no more ice is available on the surface of the nucleus of a comet, or if the Sun's heat can no longer penetrate through the insulating surface to the reservoirs of ice that may still be present inside the nucleus, no coma and tail will develop. The comet will have become "inactive" and its small nucleus will only shine by reflected sunlight. This implies that it will be very faint and its image, if observable at all, will from then on be indistinguishable from that of a minor planet. This type of object is appropriately referred to as a "dead" or "dormant" comet.

It is widely believed that at least some of the minor planets, now in comet-like orbits in the inner solar system, are in fact dead comets. It may well be that we actually witnessed the death throes of comet 1949 III, and that its inactive nucleus was "re-discovered" in 1979 as minor planet 1979 VA. It is the first direct observation of this kind and it will surely stimulate much activity in this interesting research field.

Minor planet (4015) again passed through its perihelion in late August 1992. There is little doubt that it will be extensively observed during the coming months. Unfortunately, it will be located in the northern sky and will not be easily accessible from La Silla. Initial observations (IAUC 5585 and 5586, August 14, 1992) have not revealed any signs of activity whatsoever.

A Very Low Resolution Spectrophotometric Nova Survey

A. BIANCHINI, Dipartimento di Astronomia, Università di Padova, Italy
M. DELLA VALLE, ESO
H. W. DUERBECK, Astronomisches Institut der Westfälischen Wilhelms-Universität, Münster, Germany
M. ORIO, Osservatorio Astronomico di Torino, Italy

The Aims of the Survey

A very low resolution spectrophotometric survey of classical novae at minimum is of great interest for a more thorough understanding of these objects. As it was stressed in a previous account (Bianchini et al., 1991), up to now only Williams (1983) studied a number of spectra of old novae. There is therefore a strong need of a systematic study of the post-outburst spectra of a large number of these objects, in order to be able to derive statistical conclusions.

With very low resolution spectroscopy we can cover a wide wavelength range for many novae at minimum, obtaining a statistically meaningful sample, and detect the following features:
- the slope of the continuum;
- the ratios of the intensities of different emission lines of H, He I and He II, all meaningful to understand the accretion mechanisms;
- the presence of a nebular spectrum if this still exists;
- sometimes the spectrum of the secondary;
- the possible discovery of peculiar variabilities (see Bianchini et al., 1991).

Since we are engaged also in the systematic study of novae at minimum in other wavelength ranges, especially UV and X (Bianchini et al. 1991, Orio et al. 1992), this survey in the optical range becomes an important tool when the level of the continua is correlated with that in UV and IR or certain details of the optical spectra are used to understand the mechanisms of X-ray emission (the typical example is the He II λ4686 line, which has been shown by Patterson and Raymond (1984) to be the result of reprocessed soft X-ray emission for high accretion rates). Moreover, many objects were poorly studied at maximum and their classification is uncertain. Using the ESO 1.5-m telescope, we are able to distinguish between the spectrum of an old nova and that of a symbiotic star or a red variable up to $M_V = 20$; a proposed classification as dwarf nova (with long cycle length) instead of classical nova can be rejected on the basis of a strong λ4686 He II emission line, which is typical only of classical novae or magnetic CV's and is an indicator of accretion rates $m > 10^{16}$ g s^{-1} (Patterson and Raymond 1984).

A systematic study of classical novae at minimum is therefore extremely important to understand the physical mechanisms powering novae and the nature of the different systems.

First Results

The spectral atlas we are building consists already of 50 different objects, all observed in the range λ3000-9000 Å. In three observing runs at the ESO 1.5-m telescope (February 1991, December 1991, July 1992) we have been able to study 31 novae using a CCD detector and the Boller & Chivens spectrograph. In addition there are spectra of 23 objects taken by Duerbeck in the years 1986–1988 with the same telescope and B & C spectrograph; the majority was observed with the somewhat ageing image dissector scanner (IDS) instead with a CCD, resulting in a poorer S/N and a lower spectral resolution. However, these observations are useful in order to establish secular trends in the data – e.g. declining continuum fluxes and decreasing strengths of He II emission. Such findings are useful to find indications for a secular decrease in the accretion rate, which is postulated hy the hibernation hypothesis (Prialnik and Shara 1986, Shara et al. 1986). Accord-

Table 1

Nova	Year	Mag_v (observed)	Run	Classification
CI Aql	1925	15–16	1, 4	(new)
DO Aql	1925	18.5	1, 4	(new) DN?
V356 Aql	1936	17.8	1	
V368 Aql	1936	17.3	1	
V603 Aql	1918	11.8	1	
VY Aqr	DN	17.0	1, 4	DN
QY Ara	1910	18.5	1, 2	(new)
T Aur	1891	15.9	1	
CG CMa	1934	16.5	1, 2, 3	(new)
V411 Car	1953	17.5	2	
V812 Cen	1973	19	1	(new)
V840 Cen	1986	15.0	1, 2, 4	Symb
V842 Cen	1986	14.4	1	
WX Cet	DN	17.0	1, 3	DN
AR Cir	1906	14.2	2	star close to 18-mag old-nova
V655 CrA	1967	15.7–16.2	1, 4	(new)
HR Del	1967	12.6	1	
DM Gem	1903	17.0	2	(new)
nova Her	1991	18.9	4	
GW Lib	1983	16.6	1	DN?
BT Mon	1939	17.0	1, 3	
GI Mon	1918	16.2	1, 2	(new)
V616 Mon	RN	16.5–17	2, 3	stronger variability in the red
GQ Mus	1983	16.5	1, 2	
IL Nor	1983	17.4	1	(new)
RS Oph	RN	10.9	1, 4	
V841 Oph	1848	13.5	1	
V849 Oph	1919	18	1	
V942 Oph	1957	16.6	1, 4	(new), red variable?
BD Pav	1934	15.2	1, 4	DN?
RR Pic	1925	12.2	1, 2	
CP Pup	1942	15.1	1, 3	
HS Pup	1963	18	2, 3	(new)
HZ Pup	1963	17.4	1, 2	(new)
nova Pup	1673	19.5	2, 3	not yet confirmed
T Pyx	RN	15.5	1, 2, 3	
SS Sge	1926	17.8	1	Symb?
BS Sgr	1917	15.4	1	
GR Sgr	1924	16.5	1	Symb?
HS Sgr	1900	17	4	(new)
V522 Sgr	1931	16.8	1, 4	
V999 Sgr	1910	16.6	1	
V1017 Sgr	1919	13.7	1	
V1059 Sgr	1898	17.5	1	
V697 Sco	1941	19	4	(new)
EU Sct	1949	19.5	1	
GL Sct	1925	16.1	1	(new), uncertain
nova Sct	1938	14.0	4	(new), not a nova
V427 Sct	1958	16.7	1, 4	Mira
X Ser	1903	15.2	1	
FH Ser	1970	17–18	1, 4	
XX Tau	1927	18.5	2, 3	
RR Tel	1908	16	1, 4	Symb
DC Vel	1905	17.2–18.4	1, 2, 3	(new)

(new) = observed for the first time / Symb = Symbiotic Star / DN = Dwarf Nova
1 = First survey by Duerbeck, 1986–1988 / 2 = February 18–22, 1991 / 3 = December 1–5, 1991 / 4 = July 4–7, 1992

ing to this, novae should decrease in brightness and accretion rate in the centuries after outburst, and "hibernate" for several millennia before they experience another nova outburst.

All the observed objects have been localized using the finding charts provided by Duerbeck (1987). Table 1 lists (a) the name of the novae, (b) the year of their outbursts, (c) an estimate of the observed visual magnitude, (d) the observing runs, and (e) comments and the proposed classification for those objects for which the identification as a nova cannot be confirmed on the basis of our spectra. Unfortunately this is the case for the oldest objects of our sample, N Pup 1673, which we were able to detect at V ≃ 20, but for which no emission lines or other peculiarities could be detected. The identification is thus not yet clear, and the use of this object for a proof of the validity of the hibernation scenario is still not yet possible.

Objects like V840 Cen or BS Sgr appear like symbiotics, quite alike the famous RR Tel, a symbiotic nova that erupted in the late 1940s.

We also started analysing the possible correlation between the type of nova and the intensity of the λ4686 He II emission line relative to Hα or Hβ. The correlation of the intensity of the He II line with the level of soft X-rays is undoubtedly confirmed: all the objects that were detected during the *Rosat* All-Sky Survey that appear in our sample, show a very intense λ4686 in emission: RR Tel, GQ Mus, CP Pup, V603 Aql, V841 Oph, N Her 1991 (see Orio et al., 1992, Lloyd et al., 1991). The correlation with the type of nova is, however, less clear. Other objects with a strong He II feature are DO Aql, the DQ Her type nova T Aur, the moderately fast nova HZ Pup and the fast nova GI Mon. Finally, also the recurrent nova T Pyx has a strong He II λ 4686 line, perhaps favouring the interpretation of the outburst as a thermonuclear runaway.

An Example: Detection of a Puzzling (and Important) Variability

An example of variability of a nova during the survey is reported in Bianchini et al., 1991. As another example of the use of such a systematic survey we shall bring now the spectrum of an object that is not a classical nova, but was included in our survey because of its relationship with classical novae and its puzzling, interesting nature: the X-ray nova and black hole candidate V616 Mon, or A0620-00 (McClintock et al., 1987). It is the prototype of what seems a spectacular class with at least three more members: GS2023+338 = V404 Cyg, GS 1124-68 = N Mus 1991, and GS 2000+25. During its outburst of 1975, detected by *Ariel V* and followed by *SAS-3*, it was the brightest X-ray source in the sky with a peak X-ray luminosity $L_x \geq 10^{38}$ erg s^{-1} in the range 1-18 KeV, after a rise time of about 10 days. The determination of the position with a precision of 1 arcsec by *SAS-3* allowed Boley et al. (1976), to identify it with a source in outburst again in the optical in 1975 after a previous eruption in 1917. The amplitude, $\Delta M \simeq 8$ mag, and the decline in optical light in about 15 months, resembled the behaviour of classical novae. The spectrum, however, without absorption lines, did not

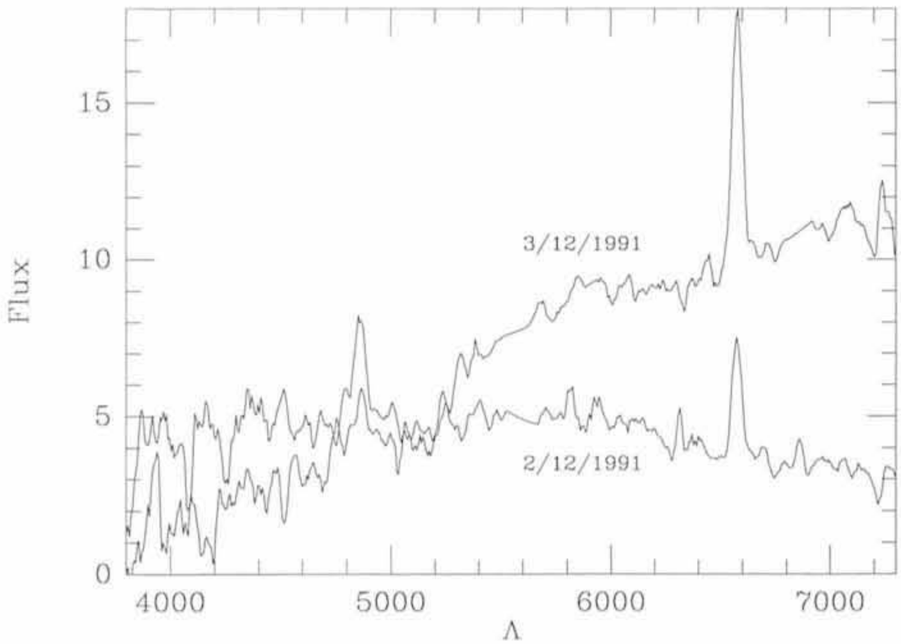

Figure 1: *Two spectra of V616 Mon (A0620-00) taken in December 1991. Fluxes in 10^{-14}erg $cm^{-2} sec^{-1} Å^{-1}$.*

resemble a classical or recurrent nova: the only feature was the late appearance of emission lines quite like those of dwarf novae (Duerbeck 1977). Modelling the physical mechanism powering the outburst of A620-00 and its associate sources has always appeared a challenge because there are problems both with mass overflow instability models implying X-ray heating of the secondary by the compact object (Hameury et al., 1986, 1990), and with disk instability models (Mineshige and Wheeler, 1989, Huang and Wheeler, 1989, Mineshige et al., 1991) that need a higher mass transfer rate to work than the one inferred by Fu and Taam (1989). For a detailed discussion see Haswell, 1992.

Two spectra were obtained on February 18 and 19, 1991, three on December 2, 3 and 4, 1991, and two more at an interval of a few hours on December 5, 1991. Although the two spectra of February are alike and their slope and characteristics appear to match those of Haswell of November 1987 (see Haswell, 1992), the spectrum of December 2 shows that the flux in the red can decrease significantly and re-increase on a time scale of one day (see Fig. 1, where the two spectra were taken at the same orbital phase). On December 5, the decrease of the red flux occurred again, but a second spectrum reappeared "normal" again after a few hours. The luminosity fluctuations in the red region of the spectrum were up to 1 mag (larger amplitude at longer wavelengths?) and the slope of the continuum totally changed (see Fig. 1). Such sudden, irregular variations in the flux and in the slope of the continuum were never noticed before and they were not correlated with the orbital phase. An explanation for the phenomenon could be a sudden variation in the mass transfer rate, causing a shrinking of the disk that appears bluer, but less luminous. However, the contribution of the disk to the total flux does not seem to exceed 15% in any band (Haswell, 1992). These results appear therefore very puzzling and they should be connected also with the secondary star, which must have undergone some kind of instability. For better understanding it is undoubtedly necessary to study possible new spectral variations, monitoring the object regularly. This could offer a key to understanding the complex phenomena that are happening and the mechanism that powers the outbursts, because it is crucial for any model to know if and how there is variability of the mass transfer rate and what is the nature of the disk.

Such serendipitous discoveries of variability, already known not to be infrequent for certain symbiotics and X-ray binaries, can be detected also for classical novae during a survey of this kind and certainly be meaningful to understand the nature of the systems.

References

Bianchini, A., Della Valle, M., Orio, M., Ögelman, H., Bianchi, L., 1991 *The Messenger* No. **64**, 32.

Boley, F., Wolfson, R., Bradt, H., Doxsey, R., Jernigan, G., Hiltner, W.A., 1976, *Ap.J.*, **203**, L13.

Duerbeck, H.W., 1977 in *Novae and Related Stars*, ed. M. Friedjung, Dordrecht: Reidel, p. 150.

Duerbeck, H.W., 1987, *Space Sci. Rev.*, **45**, 1.

Fu, A., Taam, R., 1989, *Ap.J.*, **349**, 553.

Hameury, J.M., King, A.R., Lasota, J.P., 1986, *Ap.J.*, **353**, 85871.

Haswell, C.A., 1992, Ph. D. Thesis at the University of Texas at Austin.

Huang, M., Wheeler, J.C., 1989, *Ap.J.*, **343**, 229.

Lloyd, H.M., O'Brien, T.J., Bode, M.F., Predehl, P., Schmitt, J.H.M.M., Trümper J., Watson, M.G., Pounds, K.A., 1991, *Nature*, **356**, 222.

McClintock, J.E., Remillard, R.A., 1986, *Astrophys, J.*, **308**, 110.

Mineshige, S., Wheeler, J.C., 1989, *Ap.J.*, **343**, 241.

Mineshige, S., Kim, S.W., Wheeler, J.C., 1990, *Ap.J.*, **358**, L5.

Orio, M., Ögelman, H., Pietsch, W., Bianchini, A., Della Valle, M., Krautter, J., Starrfield, S., contributed paper to the Cospar Meeting, Washington, September 1992.

Patterson, J., Raymond, J.C., 1984, *Ap.J.*, **292**, 550.

Prialnik, D., Shara, M.M., 1986, *Ap.J.*, **311**, 172.

Shara, M.M., Livio, M., Moffat, A.F.J., Orio, M., 1986, *Ap.J.*, **311**, 163.

Williams, G., 1983, *Ap.J. Suppl. Ser.*, **53**, 523.

STAFF MOVEMENTS

Arrivals

Europe

BEDDING, Timothy (AUS/GB), Fellow
CONZELMANN, Ralf (D), Designer-Draughtsman (Mechanics)
HAINAUT, Olivier (B), Student
KJELDSEN, Hans (DK), Fellow
RASMUSSEN, Bo (DK), Technician (Software)
RODRIGUEZ ULLOA, Jesus (E), Operation Technician (Remote Control Equipment)

Transfers

ALLAERT, Eric (B), Engineer (Software) (from La Silla to Garching)

Departures

Europe

LIU, Xiaowei (RC), Associate
MAZZALI, Paolo (I), Fellow
PRAT, Serge (F), Mechanical-Project Engineer
STEFL, Stanislav (CS), Associate
VAN MOORSEL, Gustaaf (NL), Scientific Programmer/Analyst
WARREN, Stephen (GB), Fellow
ZEILINGER, Werner (A), Fellow

Erratum (*Messenger* **68,** p. 2, June 1992)

The 6.5-m MMT mentioned in the list of large telescope projects is of course located on Mt. Hopkins, not on Mt. Graham.