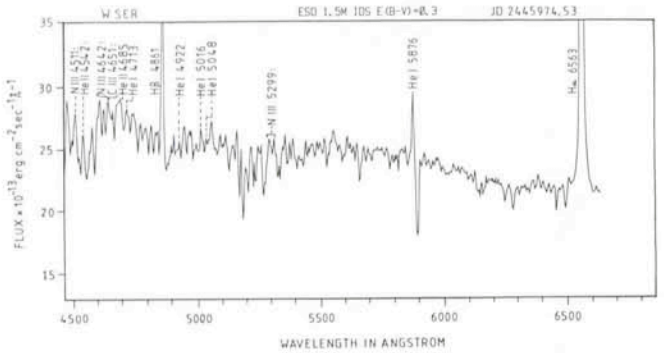

Fig. 4: *Red IDS spectrum taken at orbital phase Φ = 0.30.*

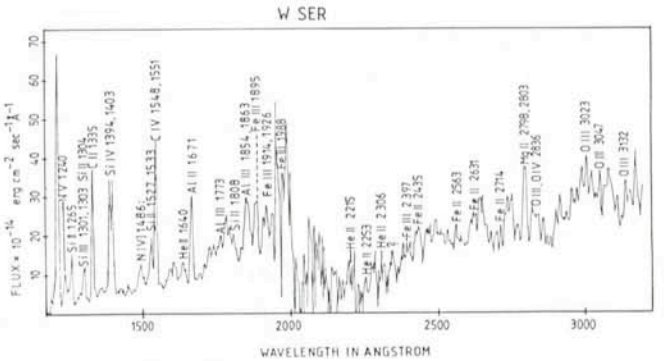

Fig. 6: *IUE spectrum of W Ser (SWP 22414 + LWP 2890) taken at the same orbital phase.*

The central absorption dips are conceivably due to a stream of matter transferred from the cool secondary contact component to the hotter primary; the double-peaked emission may also arise from a gaseous ring around a detached primary. The red-shifted absorption component of the inverse P Cygni profile of HeI (5876 Å) in a spectrum taken close to the quadrature phase 0.25 can be explained by the motion of the primary (with a velocity component in the direction of the observer) relative to a nearly stationary circumstellar envelope surrounding the whole binary system.

As a typical example for the W Ser class, the spectral appearance in the UV range of the prototype W Ser is illustrated in Fig. 6. Our combined SWP and LWP IUE spectra show a wealth of strong UV emission lines of partly semi-forbidden intercombination or forbidden transitions, as indicated in the figure.

Evolutionary Stage

Even with a very low effective temperature of $T_2 \sim 3{,}000$ K, the secondary still has approximately solar luminosity, and therefore appears overluminous for its mass, so that we are presumably dealing with an evolved M-type subgiant. This would imply that the system has already passed through the first phase of rapid mass transfer during which the mass ratio was reversed on a thermal Helmholtz-Kelvin time scale, and primary and secondary have interchanged their roles. In the course of this short-lived scenario, the originally more massive primary became an inconspicuous cool star—slightly evolved and probably close to the Hayashi limit—, while the mass gainer first moved up the main sequence and then evolved along the giant branch, where it can presently be observed.

Close binary evolution theory predicts that the previously more massive star is still in contact with its Roche lobe, and continues to transfer matter onto its companion at a rate which has been reduced as a consequence of re-establishment of thermal equilibrium and due to the fact that the evolution time scale of the original primary has now slowed down to a nuclear one.

The observed properties of W Ser are in qualitative agreement with what is expected in such a situation:

– mass transfer in a direction from the less massive to the more massive component can explain the observed increase of the orbital period;

– the continuing mass exchange is further assumed to be non-conservative, particularly in view of the present binary configuration as a near contact system, consisting of two evolved stars which fill their Roche limits;

– gaseous streams will arise and a large amount of circumstellar matter will accumulate around the binary, since the radiation pressure of only slightly evolved intermediate- and late-type stars is not effective enough to be the driving mechanism of a massive wind. Thus, the high ionization level can be explained in terms of accretion shock heating or acoustic wave dissipation in extended chromospheric regions.

It is too early to outline a more sophisticated model of these complex systems, which definitely deserve enhanced attention in the future, especially with respect to their importance for binary evolution theory.

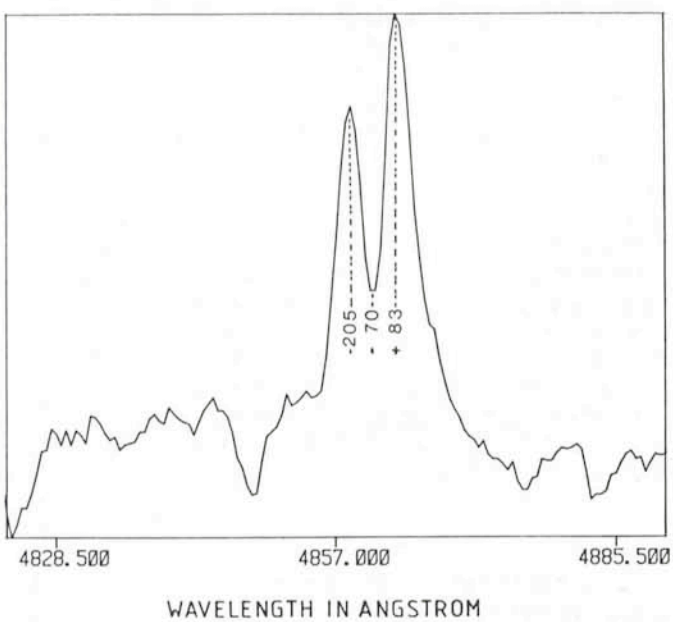

Fig. 5: *Hβ profile of W Ser at orbital phase Φ = 0.16; the numbers give the radial velocities in km sec^{-1}.*

References

Koch, R.H., Guinan, E.F.: 1978, *IBVS* **1483.**
Lynds, C.R.: 1957, *Ap.J.* **126,** 81.
Plavec, M., Koch, R.H.: 1978, *IBVS,* **1482.**

Visits to La Plata Observatory

La Plata Observatory will welcome visitors to ESO-La Silla that are willing to make a stop at Buenos Aires on their trip to Chile or on their way back. There is a nice guesthouse at the Observatory that can be used, for a couple of days or so, by astronomers interested in visiting the Observatory and delivering talks on their research work to the Argentine colleagues. No payments can, however, be made at present. La Plata is at 60 km from Buenos Aires. In the same area lie the Instituto de Astronomía y Física del Espacio (IAFE), in Buenos Aires proper, and the Instituto Argentino de Radioastronomía (IAR), about 40 km from Buenos Aires on the way to La Plata. Those interested should contact: Sr Decano Prof. Cesar A. Mondinalli, or Dr Alejandro Feinstein, Observatorio Astronómico, Paseo del Bosque, 1900 La Plata, Argentina. Telex: 31216 CESLA AR. *A. Feinstein*