

## CONCLUDING REMARKS

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The great success of this Colloquium has been in a large part due to the high quality of the results presented. Not all of the results have been understandable; neither have all topics been covered. In picking out a few on which to comment I run the risk of offending those whom I omit and possibly offending those whom I include. Nevertheless, these are my thoughts.

Firstly, I want to elaborate on something that Ed Sion did not say. In showing us the IUE spectra of accretion discs he pointed out the recently discovered P Cygni profiles and estimated the mass outflow. What has not yet been satisfactorily modelled is the concomitant angular momentum outflow. It is possible that we see here for the first time direct evidence of significant angular momentum loss from cataclysmic variables. This may be useful in solving what I consider to be the greatest unsolved problem in the CV's: the driving mechanism for the mass transfer. The observationally inferred rates of mass transfer are greatly in excess of what is available from the canonical theory of gravitational radiation. No other quantitative theory has yet been propounded; a subject studiously avoided at last year's Santa Cruz Workshop and again at this Colloquium.

Perhaps the most perplexing result to be launched at this Colloquium was Bob Williams's analysis of the C, N and O emission lines from CV discs. Last year it was He, now it is C, N and O as well that are hugely overabundant. Furthermore, there is rough agreement between the composition of novae ejecta and the CV discs; a conclusion derived from rather different physical conditions in the two locations. If these abundance anomalies are verified by alternative and independent procedures, the implications for evolution of the secondary components of the CVs are profound. As I pointed out in discussion, K-type secondary spectra are observable for several of the longer period CVs. At this temperature, the simultaneous occurrence of low opacity (from H-depletion) and overabundance of C and N should make the CN band at  $3883\text{\AA}$  of much greater strength than in K stars of normal abundance. The CH band, on the other hand, may not be so anomalous. A direct measure of the C and N abundances would therefore appear feasible and urgent.

One of the objects for which a secondary spectrum is accessible is GK Per. Bianchini and Crampton presented new observations, the latter showing that the orbital period is 2 days: considerably longer than previously thought. As the longest period system among the classical novae, and one for which the secondary must be in an advanced stage of evolution, a more concerted effort - employing Williams's techniques, abundance analysis of the secondary spectrum and evolutionary interpretation of the secondary - is overdue.

Rob Robinson started our Colloquium on a rather downbeat note by pointing out the hazards of interpreting emission line profiles for the purpose of deriving radial velocity amplitudes. His apprehensions were borne out by Gilliland who showed that in WZ Sge, despite a careful analysis of the highest quality data, there remains an anomalous phasing of the radial velocity curve and the eclipse - indicative that naïve models cannot give reliable results.

This same effect showed up at the end of Jim McDonald's contribution: having presented a simplified but comprehensive theory of nova eruptions, in which he indirectly derived masses for the white dwarf components, his attempt to compare such masses with those "directly" observed from analysis of eclipsing systems, met with the conclusion that, for DQ Her, any mass in the range  $0.4 < M/M_{\odot} < 1.4$  is available in the literature. This situation, where an honest theoretician is confronted by observers who speak with many tongues, is a disgraceful one and it is high time that the large range of interpretations of observational material are analysed for their discordancies.

Friedjung and Evans unveiled an unexpected problem with Nova Aquila 1982, which has the appearances of an intermediate supernova. Messrs. Colvin and Schatzman considered supernovae explosions from a theoretical viewpoint, employing various brands of catastrophysics, and Sugimoto presented a study of mass loss from X-ray bursters employing physical theory that would have delighted Sir Arthur Super Eddington. Geoff Bath, in contriving to teach us the  $\alpha$  to  $\omega$  of discs, has got as far as  $\alpha\beta$ . Peter Eggleton, observing the literature with a critical eye, discovered a large number of exotic beasts that seem never to have ridden on the Common Envelope Binary bandwagon. All of these individual contributions raised new problems or made progress in the solution of old ones.

Probably the most coherent set of presentations concerned the observation and implications of large magnetic fields in the degenerate components of the cataclysmic variables. The Polars (AM Her stars), reviewed by Santiago Tapia, appear more and more complex and difficult of interpretation. Both Tapia and Piirola find large night-to-night variations in polarisation, not necessarily accompanied by total flux changes. No matter where Tapia observes - from Arizona, Chile or South Africa - the rotation axes seem to point towards him! Whether this is a selection effect or too naïve an interpretation of the observations is not yet evident, but the result contains a warning that in most cases where radial velocity measurements have been made in the polars, it is not cer-

tain that it is orbital motion (rather than effects of rotation of the white dwarf) that has been measured. In other words, the claim of phase-locked rotation, although probably correct, needs to be carefully re-examined: the evidence for such synchronous rotation in the polars is at present still tenuous.

The intermediate polars, reviewed by Mlle Mouchet and myself, have emerged as a distinct class of asynchronously rotating magnetic white dwarfs that shows great potential for future study. No sooner had the observers presented their results than Don Lamb took the floor and presented a more-than-complete theory that gave not only a quantitative explanation of the observations but provided estimates of magnetic field strengths with such narrow limits of uncertainty that further observations almost seemed unnecessary!

In looking at the detailed structure of accreting magnetic white dwarfs, however, Messrs. King and Chanmugam showed how tremendously complicated even the so-called simplest models really are. Perhaps the intermediate polars, in which we are able to observe the angular distribution of the beamed radiation as the beam sweeps across the secondary, will introduce sufficient new information to assist the theoretical discussion of emissions from accretion columns.

In thanking the Local Organizing Committee, on behalf of the participants, for their sterling work, I must point out that Mario Livio, as well as having had a major share in organizing local affairs, the SOC and apparently most of Haifa, found time to prepare a contribution which turned out to be probably the major announcement at the Colloquium: the discovery of non-radial oscillations in neutron stars.

Although I formally opened the meeting as "The 72nd Colloquium of the International Astronomical Union", it is clear from the events of the week that it will henceforth surely be looked back on with affection as "The Haifa Meeting".