

The Seventeenth General Assembly of the International Astronomical Union was held at Mcntrial, Canada between August 14-23, 1979. There Dr. M.K. Vainu Bappu, the first President (1973-74) of the Astronomical Society of India, was elected President of the International Astronomical Union for three years (1979-82). Dr. Bappu is very well known for the effect, which bears his name—Wilson-Bappu effect, that has been extensively used for stellar distance determination. He is not only a codiscoverer of comet Bappu-Bok-Newkirk (1949), for which he was awarded the Donohoe medal of the Astronomical Society of the Pacific, but his polarization measurement of the Comet Arend-Roland from Uttar Pradesh State Observatory, of which he was the founder Director, is a classic in the field. He has also been active in the field of Solar Physics and Stellar Chromospheres.

Dr. Bappu has been the Director of the Indian Institute of Astrophysics (formerly called Kodaikanal Observatory) since 1960. The Institute has grown enormously under his able leadership and is now busy in completing a 2.3 metre optical telescope.

Dr. Bappu is a Fellow of the Indian Academy of Sciences, as well as of the Indian National Science Academy. He is an honorary Fellow of the Royal Society of Sciences of Liege, and is perhaps the first Associate of the Royal Astronomical Society (London) from India. He was awarded the Shanti Swarup Bhatnagar Prize for Physical Sciences by the Council of Scientific and Industrial Research in 1970.

He is the first Asian to be elected President of the IAU. Earlier, he was Vice-President (1967-73) of the I.A.U. and President of the IAU. Commission 12 on Radiation and Structure of the Solar Atmosphere (1976-79).

Professor V. Radhakrishnan, Raman Research Institute, Bangalore, has been elected President of the IAU Commission 34 on Interstellar Matter.

Professor G. Swarup, Tata Institute of Fundamental Research, Bombay, has been elected President of the IAU Commission 40 on Radio Astronomy.

#### REPORT ON THE IAU SYMPOSIUM NO. 88 ON CLOSE BINARY STARS: OBSERVATION AND INTERPRETATION

An exciting few days for students of close binary systems occurred in the second week of August at Toronto in Canada, when 169 registered participants from 26 countries gathered together to take part in the eighty eighth symposium of the International Astronomical Union. Over a hundred papers were presented during the four day conference—the great majority as short contributions lasting about ten minutes each, together with a few invited review papers of about thirty minutes duration. The papers were arranged into sixteen fields, which together must have covered almost all aspects of current research in this rich branch of astronomical science. It will be, of course, impossible for me to convey,

in this brief article, anything like all of the many thought provoking problems touched on in the papers—all I can do is reflect a personal impression of attention catching topics, and I should therefore apologise in advance for not mentioning all of the individual contributors by name, creditworthy though their efforts all were.

The conference was started with one of the longer papers from Dr. Leon Lucy on the formation of binary stars. After a brief survey of the history of the problem Dr. Lucy summarized by referring to the alternative mechanisms of fission or fragmentation. He drew attention to a key observational point, namely the large frequency of unevolved close binaries with mass ratio close to unity. Fission would produce too many binaries with very unequal mass ratios. This had motivated a detailed numerical study of the fragmentation of a rotating mass of gas. Interesting sequences of "particle pushing" computer programme results showed how equal mass pairs could result from the break up of a toroidal structure. Though the role of fragmentation in producing equal mass pairs seemed thus demonstrated, Dr. Lucy emphasized that many problems still remain in matching proposed binary production mechanisms with the observed facts of binary stars. Disagreements between various complications of binary star statistics also seemed evident from Tutukov and Yungelson's paper which followed Lucy's, where the role of observational selection effects was stressed.

More emphasis on how reliable determinations of stellar data from combined spectrographic and photometric observations of classical standard eclipsing binaries were given in a contribution of some Danish authors in the next section of the conference which was on detached binaries. With absolute mass and radius values accurate to 1%, details of main sequence evolution for detached pairs could be accurately checked.

Statistics on binary mass ratios again provided a subject for discussion in a contribution of C.D. Garmany in the following group of papers on massive binaries. Here many authors were concerned with the role of mass loss effects in early type stars, the various methods of observationally determining mass loss rates and theoretical consequences of such mass loss rates on binary evolution for massive stars. One small but perhaps highly significant point was made by Massey and Conti who argued on the basis of two examples, that WR stars are not necessarily always found in binaries, and that spectral analysis of such single stars should be a useful prelude to studying them in the binary situation.

The following section was devoted to mass transfer and mass loss mechanisms in a more general context of binary stars and some lively discussion was generated, particularly by the presentation of Dr. Sugimoto. The interesting problem of why Algol type primaries superficially look like normal main sequence stars was discussed in an interesting contribution from W. Packet. Also the frequently neglected role of radiation pressure was referred to by Dr. Nariai, who presented an account of mass loss from the outer Lagrangian point of a close binary system. A group of authors from Trieste

gave some interesting expressions relating mass loss to period variations, a matter which had already been touched on in a previous paper of T.J. Herczeg.

The second day of the conference was mostly occupied with a large number of mainly observational papers on Algol like systems—classical semi-detached pairs. It was in some ways perhaps a little surprising (as later mentioned in the summary address of Dr. Smak) to find this emphasis on what might have been thought a well trodden path, but new methods of observation and new instrumentation techniques including results of satellite UV observations and the new and potentially powerful methods of polarization photometry applied to close binary systems proved to give a stimulus not only to observational methodology, but to questions of more detailed agreement between theory and observations. In this latter area, a few of those who presented new observational results could resist the temptation to make some interpretation in terms of the now familiar language of Roche lobe overflow, gas streams and accretion disks; but there did appear to be a thought provoking gap between some of the variations these constituent elements which observers thought were required to explain results, and the few more well documented theoretical pictures that exist in the literature on this subject. Such detailed matching of theory and observation obviously calls for further investigation, probably on both sides.

Apart from this there is surely always an important place in science for that kind of work which scrutinizes and supports our faith in more basic pieces of information. It was nice, in this context, to see direct determination of the long indirectly derived masses of secondaries of Algol type systems using the type of solid state spectrograph discussed by F.Fekel; as it was also to see the small group of papers devoted to Algol itself.

After spending most of the day considering those systems where the effects of mass transfer may require specialized techniques of observation because of their relatively small scale nature, the conference moved on to discuss the more dramatic manifestations of mass transferring close binaries, i.e. the cataclysmic variables. A useful introduction to the different type of cataclysmic variable and their possible evolutionary background was given by Dr. Mitrofanov. Later, a extensive series of observation, including IUE UV data, on a number of dwarf novae, together with the detailed computation of a dwarf nova mechanism involving the work of a team of Cambridge specialists were presented with great clarity by Dr. Pringle.

Due to some overlap with a conference which had been held at Rochester the preceding week on white dwarfs and variable degenerate stars the time devoted to those binaries containing white dwarf stars was unfortunately rather cut down, and even some exciting recent observations of the prominent novae of last year were relegated to one rather short late evening session where, perhaps because they came at the end of a hard day's slog, the papers seemed to me, at least, to be rather bitty and disjointed.

One thing which I remember from that session, though, was the easy way in which Santiago Tapia talked about determining optical polarization measures with

an impressive accuracy of a few percent during a brief period of total eclipse of an AM Her star at 19th magnitude.

My admiration for such feats of modern instrumental technology continued to be stirred by papers of the following morning on X-ray binaries. In one of the longer introductory talks, Dr. S.S. Holt described the capabilities of the new second High Energy Astrophysical Observatory satellite, which has, in honour of the famous scientist's centenary, come to be called Einstein. Of particular interest was the bright long period spectroscopic binary Capella. This star has been recently associated with the class of active middle or late type binaries known as RS CVn stars (of which, more later); though because of its relative brightness and therefore long history of detailed study there are many small pieces in the jigsaw puzzle that we have for this star, and the recently discovered soft X-ray emission is just one more of the pieces which somehow doesn't quite allow a clear fitting together of the whole.

Speaking of jig-saws, the term was used by Dr. Ziolkowsky (although he later corrected this to what he really meant, which was "saw-tooth"), to describe his model for neutron star binary X-ray sources which switch between high and low states. In his very interesting account, there is a longish wind up phase in which angular momentum is dumped from the mass losing component into an accretion disk about the collapsed star. This is followed by an active spin down phase when hard X-rays may be detected.

In this section on X-ray binaries, there was a small group of papers dealing with polarimetric evidence. My impression about that was that while the results of careful polarization variation observation obviously contain much information, there must be an equal if not more careful approach given to how the information is to be interpreted. Certainly, the mean form of the Lissajou figure in the two dimensional plane of two Stokes parameters may be misleading if, as is asserted, the individual points show a scatter which cannot be attributed to errors of observation.

In the afternoon of the third day, there came a session on the RS CVn stars, introduced by Dr. Hall, who was the first to give an extensive categorization of these objects some years ago. In his introductory address, Dr. Hall returned to a more detailed consideration of one aspect of these systems which he has commented upon before, namely the apparent or real variations of period exhibited by them. His conclusion was that most of the short term and irregular variations are probably unreal and related to photometric effects. However, the long term trends he felt were statistically significant and evidenced real dynamical effects. Dr. Hall's talk was followed by one from Dr. Feldman where it transpired that for the first time the circumstance of binary geometry could enable radio astronomy to provide definite clues about details of structure and location of active regions in the outer envelopes of stars.

Most of the papers in this group were observationally inclined, but there was one attempt, if at times light-hearted, to give some kind of deeper physical background to this class of star. This was given by Dr. Shore, and the general gist of his remarks was to look towards

orbitally sustained high rotational energies to provide the root of the manifestations of electromagnetic activity in such stars.

The last day's activities started with an interesting confrontation between the alternative picture of contact binaries developed by Drs. Lucy and Shu, a presentation given by the latter, who distinguished between what thermal relaxation oscillator model of Dr. Lucy and his own contact discontinuity model. The discussion centred around the interpretation of entropy of material in the common convective envelope and that of the star from which it originated. Although entitled "theories and observations of contact binaries" it was not clear to me, however, whether Dr. Shu had proposed some clear observational discriminant between the two models—though, through shortness of time, the last section of his talk was a bit rushed. Later papers did spend more time on empirical information, however, though I was not conscious of a clear theme of ideas linking the papers. Evidently the subject is sufficiently complex that several sets of ten minutes could be used up in its various aspects.

The five remaining areas of the general field consisted of small numbers of contributions under the headings: common envelope binaries, late type binaries, symbiotic objects, population II binaries and binaries in planetary nebulae—presenting something of a variety performance for the last afternoon. There was even a final contribu-

tion from Drs. Rajamohan and Venkatakrisnan concerning the attainment of synchronism in binaries, and clues which non-synchronism might provide about binary history, which did not easily slot into any of the preceding topics. I can sympathise now with the task of Dr. Smak who had to try to summarize all the conference proceedings in a brief half hour. The mainstream of well-covered subjects in close binary research had proved fruitful enough to occupy the largest fraction of attention at the conference the "blue-straggler" type papers which appeared towards the end were at once exciting, because of our uncertainty at fitting them into the general picture, and disturbing, because we were not yet really all that certain about the general picture itself.

Apart from all the excitement and learning of the scientific sessions themselves, our hosts at Toronto were very kind in providing all the participants with an enjoyable reception, convenient accommodation and a number of occasions for social and cultural interchange. I would end this brief review with a stong acknowledgement of this kindness.

**E. Budding**

*Department of Astronomy  
University of Manchester  
Manchester, U.K.*

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## A N N O U N C E M E N T

The next National Space Science Symposium, sponsored by ISRO, INSA, UGC and BHU, will be held at the Banaras Hindu University, Varanasi, between January 22-25, 1980. The three major areas that will be covered are:

- (a) Astronomy and astrophysics, and cosmic rays:
- (b) Solar-terrestrial relationship, meteorological observations by space vehicles, ionosphere and planetary physics.

and (c) Remote sensing and other space applications.

The last date for receiving abstracts is December 10, 1979. Further details can be obtained from Professor R. N. Singh, Institute of Technology, Banaras Hindu University, Varanasi 221 005.