

Preface

IAU symposium 165 'Compact Stars in Binaries' was held from 15 through 19 August 1994, as part of the 22nd General Assembly of the IAU in The Hague. The symposium, supported by IAU Commissions 35, 37, 44 and 48, and co-sponsored by Commission 42, was attended by about 400 to 500 participants.

This symposium received support from:

- The International Astronomical Union;
- The Royal Netherlands Academy of Sciences;
- The Netherlands Ministry of Education and Science;
- The Leids Kerkhoven Bosscha Fonds;
- The Stichting Fysica.

The field of compact stars in binaries is one of the most active areas of present-day astrophysics. An absolute highlight of the last few years was the 1993 Nobel Prize of physics, awarded to Taylor and Hulse for their discovery of the binary pulsar PSR 1913+16, and the measurement of the orbital decay of this system due to the emission of gravitational waves.

The aim of the organizers of the symposium was to present an overview of the most significant observational discoveries of the past decade, in combination with a review of the most important theoretical developments. We were very happy that most of the world's leading experts in observation and theory were present at the symposium to review the various aspects of the subject. The contents of their oral presentations are now published in the form of these proceedings, which we expect to become an important source of reference for the coming years.

Among the highlight discoveries of the past several years we mention here just a few:

- The discovery by Backer, Lyne, Kulkarni, Taylor and their co-workers of several dozen millisecond pulsars, many of them in binary systems. These objects and their possible formation mechanisms are reviewed here by Backer, Lyne, Lorimer, Bailes, Kulkarni, Deich, Ergma, Bhattacharya, H. Johnston and Hut.

- The discovery in 1991 of a planetary system around a millisecond radiopulsar, reviewed here by its discoverer Wolszczan, while possible formation mechanisms of such systems are reviewed by Podsiadlowski.

- The discovery of a class of black-hole X-ray binaries, the so-called "soft X-ray transients", consisting of a stellar-mass black hole and a low-mass K- or G-star (notably: an overabundance of lithium). The amazing X-ray and optical properties of these systems, their structure and their possible formation and evolution are reviewed here by Charles, Haswell, Romani, Verbunt and Lasota (unfortunately, the manuscripts of the important contributions by Sunyaev and Grebenev – presented at the symposium by Sunyaev – had not reached us at the moment when the manuscript of these proceedings was sent to the printers).

- The discovery in 1990 by the ROSAT team of a new class of luminous X-ray sources with a very soft spectrum, the so-called "super soft sources". These are reviewed here by two of the discoverers: Trümper and Kahabka. Some 30 of these sources have been found now in external galaxies and another dozen in our own Galaxy.

It has become clear that they are white dwarfs in binaries which are steadily nuclearly burning on their surface the hydrogen which they receive from a companion star. The physics, formation and possible fate (Type Ia supernova?) of these systems are reviewed at this symposium by Van Teeseling and Rappaport, and their optical characteristics by Cowley.

- The discovery by Mirabel of superluminal expansion in the radio source associated with the bright transient galactic gamma-ray source GRS 1915 +105.

During the symposium the discovery with the Molonglo Telescope of a second superluminal source took place and was reported by Campbell-Wilson and Paciesas: the X-ray transient "Nova Scorpii" (GRO J1655–40) which flared up in X-rays on 27 July 1994, and in radio on 15–20 August.

- The discovery of two radio pulsars in very eccentric orbits around B-type stars, reviewed here by S. Johnston and Kaspi.

- The gamma-ray burst sources (now widely believed to be associated with merging double neutron stars or neutron-star black hole binaries), reviewed here by Fishman and Piran, and the Soft Gamma Repeaters reviewed here by Kouveliotou.

- The discovery of quasi-periodic oscillations in the pulsating X-ray binary A0535–26, by Finger, which appears to confirm the Alpar-Shaham “beat-frequency” model for this system.

Other highlights of the meeting and these proceedings are:

- Thorne’s review of the expected sources of gravitational radiation in the Universe, in relation to presently planned gravitational wave observatories. Merging close neutron star and black-hole binaries are the most certain sources among those expected to be detectable on Earth.
- The presentation by Oppenheimer and Mattei of long-term AAVSO observations of the recurrent nova RS Oph. Ben Oppenheimer (16 yr) is the youngest author of which a paper was presented at this symposium (and in these proceedings), and at the entire 22nd General Assembly.

Apart from the oral presentations, there were 205 posters presented at this meeting, many of them of such excellent quality that we regret very much that space did not allow us to publish them.

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Dedication: These proceedings are dedicated to the memory of our dear friend and colleague Jacob Shaham, one of the foremost workers in the field of compact stars in binaries, who died on April 20, 1995 in New York.