

Organizing Committee: Christopher Tout (President), Ilya Mandel (Vice President), Henri Boffin (Secretary), Virginia Trimble (Advisor - Past President), Scott Fleming, Elizabeth Griffin, Swetlana Hubrig, Styliani Kafka, Laszlo Szabados

Annual Report March 2022

It is with deep sadness that we must report the death of our Vice President Dimitri Pourbaix in November 2021 and of G1 members Rodolfo Barbá in December and Arlo Landolt in January 2022. We also remember the lifelong contribution of Roger Griffin to the work of our community. We lost Roger in February 2020.

Commission G1 covers a very broad range of topics including both observations and theoretical modelling of binary and multiple star systems. Probably the most important contributions in the last year have come from surveys and the production of catalogues of more and more systems with well measured parameters. Not least amongst these has been the contribution from the Gaia mission. The Gaia Early Data Release 3 (EDR3) available from December 2020 stimulated a number of studies related to binary and multiple stars. Moreover the Gaia DR3 which is scheduled to be released on 13 June 2022 will already contain first results on non-single stars data processing. And we note here Dimitri Pourbaix's important contribution as the head of the Coordination Unit 4 (Object Processing) of the Gaia Data Processing and Analysis Consortium, responsible for the non-single star aspects of reduction of Gaia astrometric data.

Of specific interest are works by El-Badry et al. on a million binaries from Gaia eDR3 – sample selection and validation of Gaia parallax uncertainties; Makarov & Fabricius on astrometric mass ratios of 248 Long-period binary stars resolved in Hipparcos and Gaia EDR3; Smart et al. on the Gaia Catalogue of Nearby Stars; Bischoff et al. on identification of additional young nearby runaway stars based on Gaia data release 2 observations and the lithium test; and El-Badry et al. on the birth of the ELMs, a ZTF survey for evolved cataclysmic variables turning into extremely low-mass white dwarfs.

Another highlight is the first catalogue of eclipsing binaries from TESS. Prša et al. report on 4584 systems observed during its first two years.

More specifically, numerous stars with HgMn peculiarity were identified using optical observations by Gonzalez et al. and Paunzen et al. following the discoveries of a few hundred of such stars in the near-IR APOGEE survey by Chojnowski et al. These stars of spectral type B6-B9 are usually members of binary and multiple systems and studies of these peculiar stars are important for the general understanding of B-type star formation in binary systems.

Common envelope evolution remains probably the most important least understood aspect of binary star evolution. The last year has seen the publication of a plethora of papers on the subject both observational and theoretical covering both the process and its descendant stars. Thus, Jacoby et al. present the identification of 34 likely binary central stars of planetary nebulae (CSPNe) from Kepler/K2 data, while Chornay et al. uncovered many binary CSPNe using Gaia, and Korol et al. found astrometric evidence from Gaia for a gap between the double white dwarf separation distribution. TESS also led to some

interesting results. On the theoretical side, many studies looked at the role of the common envelope in the formation of merging black holes.

The quest for quiescent black holes in binary systems, thought to exist in great number, continues. Recently, several teams thought they had found good candidates, but further scrutiny have challenged these claims, the systems hosting a stripped B star instead. These interpretations and re-interpretations highlight both the observational challenges and the importance of accurate modelling to correctly interpret some of the most exciting binary observations. A recent, nice summary can be found in Bodensteiner & Heida et al.

It is of interest to the commission that Helmut Abt, much of whose research career was devoted to estimating incidence of binaries in various stellar populations, has published in 2021 his autobiography, “A stellar life”.

In March 2021, the virtual workshop on triple evolution and dynamics 3 took place (CIERA, Northwestern, USA), in August, Technion organised another virtual workshop on common envelope physics and outcomes, while in September, the 9th microquasar workshop was held in Cagliari, Italy. We draw attention to the twice postponed conference to celebrate the 80th birthday of Peter Eggleton who has made many contributions to the theory of binary and more recently triple and higher multiple stars systems. The conference will take place in Cambridge from 14th to 20th August 2022. Also of interest to G1 members is the special session at the EAS 2022 on eccentric binaries with long, but too short, orbital periods, and the conference on the Impact of Binaries on Stellar Evolution that will take place in Munich in November 2022.