Annual Report of IAU Commission G4 Pulsating Stars – 2022

Budapest, April 2023

The President of the Commission is Róbert Szabó. Jadwiga Daszyńska-Daszkiewicz is the vice president, the Secretary of the Commission is Maria Pia Di Mauro. The previous president, Jaymie Matthews acts as an Advisor. The Organizing Committee has five additional members: Victoria Antoci, Daniel Huber, Steve D. Kawaler, Marcella Marconi, and Konstanze Zwintz. The Commission has 230 members.

Notable scientific results /papers

Here we present a short list on the latest, most important, and interesting results and papers on pulsating and oscillating stars published in the reporting period:

Bonanno, A., Corsaro, E., 2022 "On the Origin of the Dichotomy of Stellar Activity Cycles" The Astrophysical Journal Letters 939, L26, doi: 10.3847/2041-8213/ac9c05

Bowman, D. M., Vandenbussche, B., Sana, H., Tkachenko, A., Raskin, G., Delabie, T., Vandoren, B., Royer, P., Garcia, S., Van Reeth, R., CubeSpec Collaboration. 2022. "The CubeSpec space mission. I. Asteroseismology of massive stars from time-series optical spectroscopy: Science requirements and target list prioritisation" Astronomy & Astrophysics 658, 98, doi: 10.1051/0004-6361/202142375

De Somma, G., Marconi, M., Molinaro, R., Ripepi, V., Leccia, S., Musella, I. 2022. "An Updated Metal-dependent Theoretical Scenario for Classical Cepheids". The Astrophysical Journal Supplement Series 262, 25. doi:10.3847/1538-4365/ac7f3b

Di Mauro, M. P. , Reda, R., Mathur, S., García, R. A., Buzasi, D. L., Corsaro, E., Benomar, O., Cuesta, L. G., Stassun, K. G., Benatti, S., D'Orazi, V., Giovannelli, L., Mesa, D., Nardetto, N. 2022 "On the characterization of GJ 504: a magnetically active planet-host star observed by TESS" The Astrophysical Journal 940, 93, doi: 10.3847/1538-4357/ac8f44

Forró, A., Szabó, R., Bódi, A., Császár, K.: 2022 "Kepler Pixel Project: Background RR Lyrae Stars in the Primary Kepler Mission Field of View", The Astrophysical Journal Supplement Series, Volume 260, Issue 1, id.20, 14 pp. doi:10.3847/1538-4365/ac5e9e

Kurtz, D. W. 2022. “Asteroseismology Across the Hertzsprung-Russell Diagram”. Annual Review of Astronomy and Astrophysics 60, 31. doi: 10.1146/annurev-astro-052920-094232; https://arxiv.org/abs/2201.11629

Marconi, M. and 10 colleagues 2022. “New Theoretical Period-Luminosity-Metallicity Relations for RR Lyrae in the Rubin-LSST Filters”. The Astrophysical Journal 934, 29. doi:10.3847/1538-4357/ac78ee

Mombarg, J. S. G., Dotter, A., Rieutord, M., Michielsen, M., Van Reeth, T., Aerts, C., 2022. “Predictions for Gravity-mode Periods and Surface Abundances in Intermediate-mass Dwarfs from Shear Mixing and Radiative Levitation”, The Astrophysical Journal 625, 154. doi: 10.3847/1538-4357/ac3dfb

Netzel, H. Smolec, R., 2022. “Asteroseismology of RR Lyrae stars with non-radial modes”, Monthly Notices of the Royal Astronomical Society, Volume 515, Issue 3, pp.3439-3452, doi:10.1093/mnras/stac1793

Reda, R., Di Mauro, M. P., Giovannelli, L., Alberti, T., Berrilli, F. , Corsaro, E. 2022, “A Synergic Strategy to Characterize the Habitability Conditions of Exoplanets Hosted by Solar-Type Stars" Frontiers in Astronomy and Space Sciences 9, 909268 doi: 10.3389/fspas.2022.909268

Silvotti, R, Nèmeth P. , Telting, J. H., Baran A. S., Østensen, R.H., Ostrowski, J., Sahoo, S. K., Prins, S., 2022, “Filling the gap between synchronized and non-synchronized sdBs in short-period sdBV+dM binaries with TESS: TIC137608661, a new system with a well-defined rotational splitting” Monthly Notices of the Royal Astronomical Society 511, Issue 2, 2201

Steindl, T., Zwintz, K., Vorobyov, E. 2022. “The imprint of star formation on stellar pulsations”. Nature Communications 13, 5355. doi: 10.1038/s41467-022-32882-0

Conferences/workshops

In the post-covid era many in-person conferences and workshops are being organized, the

- IV edition of the RRL meetings *RR Lyrae/Cepheids 2022 - Large-scale surveys as bridges between spectroscopy and photometry* that took place in the island of La Palma (Canary Islands, Spain) from 26 to 30 September, 2022, and the
- TASC6 / KASC13 Workshop *Asteroseismology in the Era of Surveys from Space and the Ground: Stars, Planets*, and the Milky Way that took place in Leuven (Belgium) from 11 to 15 July, 2022
  https://fys.kuleuven.be/ster/events/conferences/2020/tasc6

were particularly in line with the Comissions’s goals and topics.

Awards/prizes

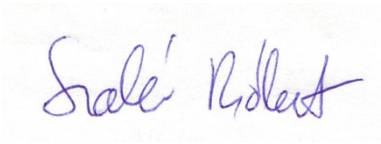
The **2022 Kavli Prize in Astrophysics** has been awarded to Conny Aerts, Jørgen Christensen-Dalsgaard (both are Comm G4 members) and Roger Ulrich for the development of methods that allow precise study of the interiors of stars, i.e. for their pioneering work on helio- and asteroseismology.

The **European Research Council (ERC)** awarded a prestigious **Synergy Grant** to KU Leuven astrophysicist Conny Aerts. As coordinating principal investigator, she joins forces with Stéphane Mathis (CEA Paris-Saclay) and Michel Rieutord (University of Toulouse) from France and with Aaron Dotter (Dartmouth College) from the USA. The four principal investigators received almost 10 million euros for their project 4D-STAR, which will develop and deliver innovative numerical models of rotating magnetic stars in three spatial dimensions throughout their evolution.

An **ERC Starting Grant** was awarded for Dominic Bowman to investigate massive stars using asteroseismology in the project called SYMPHONY.

Other

In November 2022 the ESA Science Programme Committee (SPC) selected the space mission HAYDN for further study for the M7 mission opportunity. HAYDN (PI. A. Miglio, L. Girardi) is an asteroseismological mission focused on homogenous, controlled large samples of stars to provide calibrators for several aspects of fundamental astrophysics, fostering the understanding of stellar physics and the internal structure of stars, inaccessible with other techniques.



Róbert Szabó
president
on behalf of the Commission G4 Organizing Committee