

## FOREWORD

The meeting *Large-scale surveys as bridges between spectroscopy and photometry* (La Palma, Canary Islands, from September 26 to 30, 2022) belongs to the *RR Lyr and Cepheid stars* series. Previous editions were held in Visegrad (Hungary) in 2015, in Niepolomice (Poland) in 2017, in Cloudcroft (USA) in 2019. This fourth event was scheduled for 2021, but the pandemic forced its postponement by one year. The community had spoken in favour of a meeting to be held mainly in presence in the Canary Islands, and more precisely in La Palma. The *Fundaci3n Galileo Galilei-INAF* (FGG-INAF) and the *Instituto de Astrofísica de Canarias* (IAC) have proudly resumed the tradition of face-to-face meetings.

The purpose of the series is to bring together the specialists of stellar pulsations in the classical instability strip (i.e., variables like  $\delta$  Sct, SX Phe, RR Lyr, Cepheids, Long-Period and Mira). These pulsating stars are used both as distance indicators and as laboratories for the study of stellar interiors. Large photometric surveys such as OGLE and MACHO have strongly contributed to the massive detection of RR Lyr in different stellar systems. They improved the Period-Luminosity relations and enhanced the variety of the physical properties supplied by the classical Petersen diagrams of radial modes. The surveys by *CoRoT*, *Kepler*, *TESS* satellites made it possible to detect non-radial modes, unveiling an unexpected mode mixture. RR Lyr and Cepheids are thus entering the domain of the ensemble asteroseismology, opened by  $\delta$  Sct and long-period variables. Other more complex phenomena such as the Blazhko effect and cycle-to-cycle variations are challenging our knowledge of the stellar atmospheres. The all-sky survey made by *Gaia* puts all our variables at the right place in the Galaxy, largely improving their use as distance ladders.

Spectroscopic surveys produced homogeneous sets of catalogs and databases very helpful to define the environments where our variables are located. On the other hand, high-resolution spectroscopy is essential to investigate the projection factor to solve the  $H_0$  tension, to check the differences between the behaviours of photosphere and chromosphere induced by pulsations, and to certify cycle-to-cycle variations. In this context, the choice of La Palma for the fourth meeting of the series was justified by the presence of the *Observatorio del Roque de Los Muchachos* (ORM), at the top (2400 m) of this volcanic island. The ORM hosts the *Telescopio Nazionale Galileo* (TNG), equipped with the HARPS-N instrument, well suited to perform high-resolution spectroscopy of key-targets, and the William Herschel Telescope (WHT), where the WEAVE multifiber spectrograph is now able to contribute to large-scale surveys. Not only the TNG and the WHT, but the whole battery of the ORM telescopes (Gran Telescopio Canarias, Nordic Optical Telescope, Mercator, ...) are very suitable to study pulsating variables.

The meeting offered the possibility to revisit all the aspects described above in the light of recent observational data and improvements in the stellar models. Furthermore, the impact of the *Gaia* DR3 has been a fil-rouge all along the meeting. The interpretation of the results from ground-based surveys took great benefit from this astrometric, photometric and spectroscopic space mission. The investigation of pulsating variables in the Milky Way, in the Magellanic Clouds and in the whole Local Group prepared the final reviews on the distance scale and how future projects, like the Vera Rubin Observatory, can answer the crucial questions still on the floor.

Organizing a face-to-face conference after the pandemic on an island hit a year earlier by a volcanic eruption was not easy. Both left tangible wounds on the territory and, above all, in the hearts of its inhabitants. However, the desire for recovery must always prevail over misfortune.

We also note that the start of the meeting was made difficult by the tropical storm Hermine, forcing the cancellation of many flights between the continent and La Palma on 25 September. Nonetheless, practically all the participants, around one hundred, were able to reach La Palma one day later. The schedule was changed accordingly so that all the talks took place. The organizers thank the participants for the efforts made in overcoming the unforeseen difficulties and hope that the week spent in La Palma will remain among their most vivid memories.

Ennio Poretti on behalf of the Editors



Picture of the RRL2022CEP participants.

# **RRL2022CEP: Large-scale surveys as bridges between spectroscopy and photometry**

**The members of the organizing committee are as follows:**

## **Scientific Organizing Committee**

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