



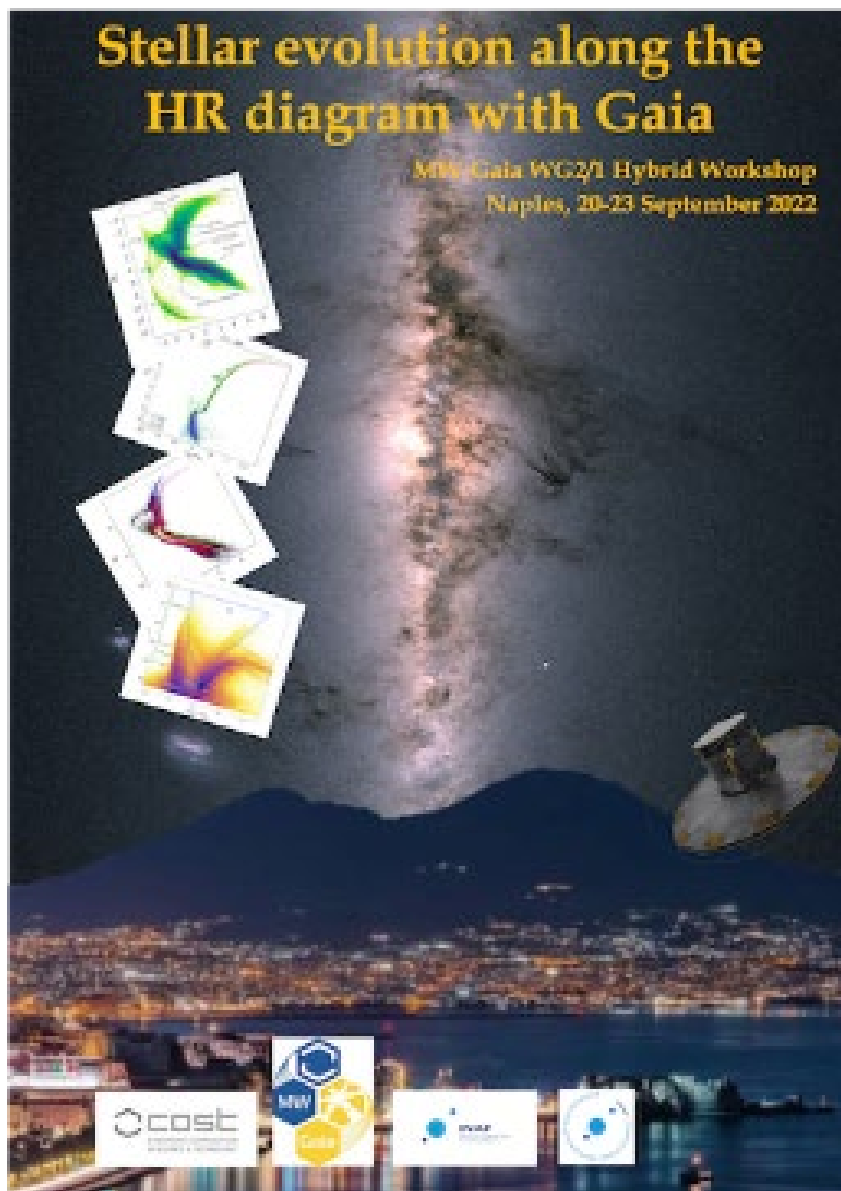
MW-Gaia WG2-WG1 Workshop

Stellar evolution across the HR diagram with Gaia

Naples (Italy), 20th-23rd September 2022

The workshop [Stellar evolution across the HR diagram with Gaia](#) took place in the auditorium of the INAF-Osservatorio Astronomico di Capodimonte, Naples, from 20th to 23rd September 2022.

This was the tenth workshop of the CA18104 COST Action MW-Gaia and the third workshop of the Working Group 1 and 3 (WG1/2). The format of the workshop was based on invited reviews and contributed talks.



Scientific motivation of the workshop

The meeting focussed on the Gaia crucial contribution to stellar evolution and our capability of modelling different stellar evolutionary phases, through the interpretation of excellent quality observational HR diagrams of star clusters and stellar populations from the Solar neighbourhood to the Milky Way halo and its neighbours, where distances, stellar absolute luminosities, and colours are available thanks to the improved photometry and astrometry published with Gaia EDR3.

The meeting specifically addressed the impact on stellar models of new data products released with Gaia DR3 on 13 June 2022, such as binaries and non-single stars, time series data and characterization for more than 11 million variable stars/sources of 25 different types, astrophysical parameters (abundances, temperatures and gravities) for about 500 million objects, mean radial velocities for about 33 million stars and RVS spectra for about 1-million sources.

There were 3.5 full days for science. After an initial overview by members of the Gaia Data Processing and Analysis Consortium on main data products published with Gaia DR3 and how to use them, the meeting discussed the constraints that Gaia data can set on:

- stellar evolution models;
- selected phases of stellar evolution;
- stellar pulsation models;
- asteroseismology;
- binary star evolution;

On the last day, synergies between Gaia and on-going/future spectroscopic surveys were addressed.

Day One

After the welcome by M. Marconi - G. Clementini - I. Musella, there was an overview on Gaia data/products and their use (session chair: G. Clementini) with two invited talks and a contributed one:

- ✓ “The Gaia mission and stellar physics” Anthony Brown (Leiden)
- ✓ “Gaia stellar parameters in Data Release 3” Rene Andrae (Heidelberg)
- ✓ “Transferring spectroscopic stellar labels to Gaia DR3 stars with supervised learning” Friedrich Anders (Barcelona)

After a coffee break a session II: Overview on Gaia data/products and their use (chair: S. Randich) presented two invited talks and a contributed talk:

- ✓ “Gaia chemical abundances from the Radial Velocity Spectrograph” Alejandra Recio-Blanco (Nice)
- ✓ “Variable stars in Gaia Data Release 3” Vincenzo Ripepi (Naples)
- ✓ “Absolute calibration of Type II Cepheid and RR Lyrae distance scales using Gaia DR3” Anupam Bhardway (Naples)

The III Session (chair L. Eyer) Overview on Gaia data/products and their use: III Session, had two invited talks:

- ✓ “Multiple stellar systems in Gaia DR3” Martin Barstow (Leicester)
- ✓ “White dwarfs and the Gaia revolution” Nicola Gentile Fusilo (Garching)

And two contributed ones:

- ✓ “Gaia: An efficient black-hole hunter” Chirag Chawla (Mumbai)
- ✓ “The white dwarf population within 100pc as seen by Gaia-DR3 and the VO” Fran Jiménez-Esteban (Madrid)

And the IV Session, Overview on Gaia data/products and their use: IV Session and as Chair: Sophie Van Eck (Brussels) presented two invited talks and a contribution one:

- ✓ “Star clusters as laboratories for stellar evolution” Tristan Cantat-Gaudin (Heidelberg)
- ✓ “OB stars and associations with Gaia” Jesús Maíz Apellániz (Madrid)
- ✓ “A Gaia 4D panoramic of the clustered star formation in the solar neighbourhood” Emilio Alfaro (Granada)

Day Two

Began with a session dedicated to “Stellar evolution and pulsation models” with Josefina Montalban (Bologna) as chair and two invited and two contributed talks:

- ✓ “The galaxy in your preferred colour: synthetic photometry from Gaia XP spectra” Michele Bellazzini (Bologna)
- ✓ “Low-mass star modelling: constraints from Gaia” Santi Cassisi (Teramo)
- ✓ “Single star sequences of the Hyades and Pleiades open clusters” Wolfgang Brandner (Heidelberg)
- ✓ “Solving the puzzle of mixing in giant stars with the Besançon Galaxy Model” Nadege Lagarde (Besançon)

After coffee-break the second session Stellar evolution and pulsation models with Marco Limongi (Roma) as chair, presented three invited talks:

- ✓ “Constraints on AGB stellar models from Gaia” Sophie Van Eck (Brussels)
- ✓ “Constraining the Evolution of Milky Way AGB stars and Their White Dwarf Progeny with Gaia” Paola Marigo (Padova)
- ✓ “Stellar models of Massive Stars and Gaia” Georges Meynet (Geneva)

After the lunch-break the third Session on Stellar evolution and pulsation model with the chair: Jordi Isern (Barcelona), and two contributed talks:

- ✓ “Mind the gaps: a massive empirical approach to high-mass stellar evolution with the aid of IACOB, WEAVE, Gaia and TESS” Sergio Simón-Díaz (Tenerife)
- ✓ “On the s-elements content of the Milky Way as revealed by Gaia/DR3 data” Gabriele Contursi (Nice)

And an invited talk:

- ✓ “Classical Cepheids as Distance Indicators and Stellar Population Tracers in the Gaia Era” Giulia de Somma (Naples)

After the coffee break the fourth session Stellar evolution and pulsation models chaired by Marcella Marconi (Naples) presented one invited talks plus two contributions:

- ✓ “RR Lyrae pulsation and evolutionary models tested against Gaia EDR3” Geza Kovacs (Konkoly)
- ✓ “Ultra Long Period Cepheids in the HR diagram: new insights from Gaia DR3” Ilaria Musella (Naples)
- ✓ “Gaia distances: an opportunity for gauging the asteroseismic accuracy of beta Cephei pulsators” Sebastien Salmon (Geneva)

Day Three

The first session of White dwarfs - Asteroseismology – Binaries began the third day of the conference with Sergio Simón-Díaz (Tenerife) as chair and two invited followed by two contributed talks:

- ✓ “Understanding binary stars with Gaia” Rob Izzard (Surrey)
- ✓ “White dwarf cosmochronology” Jordi Isern (Barcelona)
- ✓ “Accurate masses of Hyades White Dwarfs” Luca Pasquini (Garching)
- ✓ Seismic cartography of white-dwarf interiors: how well can we constrain convective mixing? Noemi Giammichele (Toulouse)

After the coffee-break, the second session on White dwarfs - Asteroseismology – Binaries chaired by Leo Girardi (Padova) with four contributed talks:

- ✓ “Photometric Determination of Main-Sequence Binaries” Alexander Wallace (Monash)
- ✓ “Hunting for massive degenerate binaries with a black hole using Gaia” Soetkin Janssens (Leuven)
- ✓ “Triage of Gaia astrometric binaries” Sahar Shahaf (Israel)
- ✓ “Gaia Spectroscopic Orbits Validation with external Radial Velocity Surveys” Dolev Bashi (Tel Aviv)

After lunch, the third session on White dwarfs - Asteroseismology - Binaries chaired by Ignacio Negueruela (Alicante) with an invited talk followed by three contributed ones:

- ✓ “Asteroseismology and Gaia: pulsators on the main sequence and red-giant stars” Josefina Montalban (Bologna)
- ✓ “Milky Way helium enrichment constrained by red clump stars” Emma Willett (Birmingham)
- ✓ “Precise asteroseismic ages from pulsating pre-main-sequence stars” Simon Murphy (Cambera)
- ✓ “Very young low mass stars in the Milky Way unveiled by DBSCAN and Gaia EDR3. Mapping the young clusters within 1.5 Kpc” Loredana Prisinzano (Palermo)

After the coffee-break, the fourth session on White dwarfs - Asteroseismology - Binaries chaired by Paola Marigo (Padova) presented one invited talk:

- ✓ “Testing models of ultimate stages of stellar evolution with asteroseismology of evolved compact pulsators: achievements and prospects in the Gaia era” Stéphane Charpinet (Toulouse)

and the poster session with twelve pitch talks:

- ✓ “Refined Ephemeris for Four Hot Jupiters using Ground-Based and TESS Observations” Rahimeh Foroughi (Bushehr)
- ✓ “3D Time-dependent convection model for asteroseismology” Stéphane Lizin (Liège)
- ✓ “The evolution of the Galactic discs revealed by the Gaia-APOGEE-Kepler giant stars” Nadege Lagarde (Besançon)
- ✓ “3D static models of close binaries in hydrostatic equilibrium with MoBiDICT” Loïc Fellay (Liège)
- ✓ “Spectroscopic VUES and photometric TESS survey of single and binary variable stars” Ruta Urbonaviciute (Vilnius)
- ✓ “Spectroscopic analysis of A- and F-type stars observed by Kepler” Joachim Krüger (Poznan)
- ✓ “H-R diagrams of 1,656 CWNu new star clusters” Zhihong He (Nanchong)

- ✓ “The electron scattering on H₂⁺ and HD⁺ molecular cations: Dissociative recombination and ro-vibrational transitions. Application in astrophysics” Nicolina Pop (Timisoara)
- ✓ “VO tools and services for Gaia and the stellar evolution” Enrique Solano (Madrid)
- ✓ “The upper HR diagram of young clusters is dominated by binary interaction” Ignacio Negueruela (Alicante)
- ✓ “Star Formation in Serpens” Priya Hasan (Hyderabad)
- ✓ “Detection of double-lined spectroscopic binaries in LAMOST-MRS using vsini variation” Mikhail Kovalev (Yunnan)

Day four

The last day session was dedicated to Synergies chaired by Alejandra Recio-Blanco (Nice) presenting two invited and one contributed talks:

- ✓ “The impact of the Gaia-ESO Survey on Stellar Physics and Evolution” Sofia Randich (Arcetri)
- ✓ “Coupling WEAVE observations with Gaia” Georges Kordopatis (Nice)
- ✓ “X-Shooter characterization of YSOs selected with Gaia DR2” Fatemeh Z. Majidi (Padova)

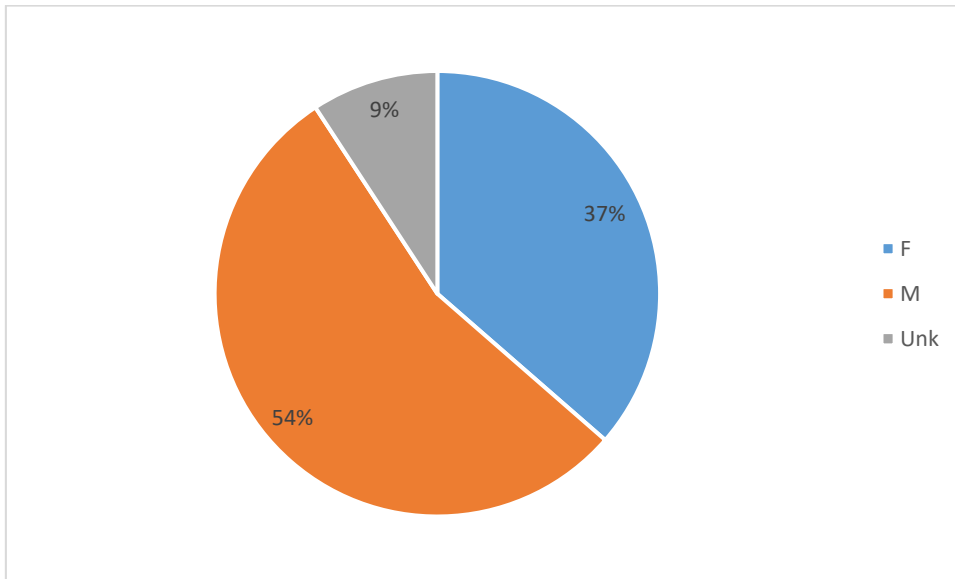
After the coffee-break, the last session dedicated to Synergies chaired by Georges Meynet (Geneva) presented two invited and one contributed talks:

- ✓ “4MOST revolution and the synergy with Gaia” Maria Bergemann (Heidelberg)
- ✓ “VLT-MOONS: near-IR multi-object spectroscopy with the VLT and synergies with Gaia” Oscar González (Edinburgh)
- ✓ Gaia and the upcoming WEAVE Cygnus-X Survey: disentangling the evolutionary status of one of the most massive star-forming regions of the Galaxy” Sara R. Berlanas (Alicante)

And the conference finished by “Final Remarks” by Laurent Eyer (Geneva).



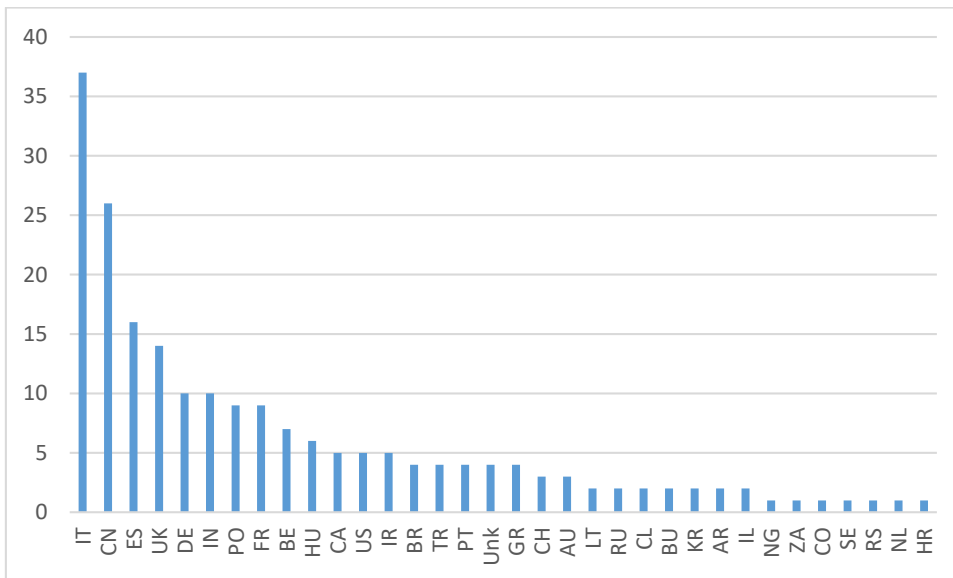
The workshop in numbers



The workshop was attended by 206 researchers (140 remotely, 68%), 37% of them female.

The SOC and LOC had a 40 (6 out of 15) and a 75% (6 out of 8) of female researchers respectively.

From the total, 9 participants (4%, including invited speakers) had financial support by the COST Action.



There were researchers from 33 different countries in Europe (mostly Italy), China, India, US, Canada, Chile, Colombia, Argentina, Brazil, Korea, Israel, Nigeria, South Africa and Australia.

There were 58 presentations. 27% of female participants presented while 34% of male participants did. There were 24 Invited talks (33% female), 22 Contributed talks (32% female) and 12 pitch talks (42%female).

Report prepared by Lola Balaguer-Núñez.