



5-7/09/2023

Report WG1: The Milky Way as a Galaxy

Despina Hatzidimitriou,
NKUA, Athens, Greece

WG1: The Milky Way as a Galaxy

Objectives

- ✓ Address open questions on the formation and evolution of our Galaxy
 - structure
 - star formation history
 - dynamical evolution (secular and by accretion)
- ✓ Specific areas of study
 - halo and disk substructures
 - open and globular clusters (and their contribution to the field)
 - structure and dynamics of the bar/bulge region
 - the interstellar medium link
 - development of novel data analysis techniques

WG1 Tasks

✓WGT1a

- global structure
- history of the MW
- clusters as probes of the disk and halo formation history.

✓WGT1b

- synergies between ground and space based follow-up facilities and Gaia
- survey strategy requirements for upcoming spectroscopic and near infrared surveys

✓WGT1c

- development of detailed MW (chemo) dynamical models.

WG1 Team

✓ WG1 Leader

Despina Hatzidimitriou, National Kapodistrian University of Athens, Greece

✓ WG1 Deputy Leader

Lia Athanassoula, Marseille Astrophysical Laboratory, Marseille, France

✓ WG1a Leader

Santi Roca-Fabrega, Complutense University of Madrid, Spain

✓ WG1b Leader

Antonella Vallenari, INAF, Padova Astronomical Observatory

✓ WG1c Leader

Andreas Just, University of Heidelberg, Center for Astronomy

✓ Members ~180

WG1 Workshops and School

GP1

WG1 Workshop

The Gaia Treasure Hunt

Cambridge 09/2019

Participants: 40 (7 invited speakers)

<https://www.mw-gaia.org/participate/cambridge-wg1/>

The Galactic Bulge and Bar

- structure
- pattern speed
- proper motions and the X-shaped structure
- the role of ages and chemical data in the modelling

The Galactic Disk

- local dark matter density
- How should the kinematics of the local disk be modelled
- origin of the phase space spiral
- the role of mergers
- the mechanisms that drive the warp and bending modes in the disk

The Galactic Halo

- best statistical measures of substructure in configuration/phase space to describe the clustering in the stellar halo and disk
- How to compare data to simulations
- the mass of the Milky Way, and its escape speed

Milky Way size galaxy formation and High performance computing
Faculty of Physics, Barcelona/Spain
14-17 January, 2020
COST Milky Way Gaia School

Main topics

- N-body simulations
- Cosmological zoom-in + hydrodynamics: Milky Way size galaxy simulations
- Comparison of simulations/theory vs observations
- High performance computing

Hands-on sessions

- Globular clusters
M. Gieles, L. Martinez
- Halo-Galaxy connection
D. Ceverino, A. Di Cintio, O. Valenzuela
- Mock catalogues, simulations vs observations
Anders, T. Antoja, S. Roca-Fabrega
- HPC/Data tools
R. Bialik, X. Luri, R. Mosser

Lecturers

- Rosa Badia (Barcelona Supercomputing Center)
- Daniel Ceverino (IAAM-Madrid)
- Aitana Di Cintio (IAC, Spain)
- Santi Roca-Fabrega (UCM-Madrid)
- Octavio Valenzuela (IA-UNAM, Mexico)

Scientific Organizing Committee

- Teresa Antoja (ICCUB-Barcelona)
- Rosa Badia (Barcelona Supercomputing Center)
- Daniel Ceverino (IAAM-Madrid)
- Aitana Di Cintio (IAC, Spain)
- Francesca Figueras (Co-chair, UB-Barcelona)
- Mark Gieles (ICCUB-Barcelona)
- Santi Roca-Fabrega (Chair, UCM-Madrid)
- Octavio Valenzuela (Co-chair, IA-UNAM, Mexico)

Important Dates

- Open early registration: 10 October
- Deadline for funding support applications: 15 November
- Communication of funding grants: 22 November
- Deadline early registration: 20 November
- Deadline for registration: 15 December

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<https://indico.icc.uib.edu/e/GaiaSchoolBCN2020>

WG1 Workshops and School

GP1

WG1 School

Milky Way size galaxy formation and high performance computing,

Barcelona 01/2020 5 lecturers, 12 tutors for hands-on sessions

Participants: 38

<https://indico.icc.ub.edu/event/52/page/42-topics-and-lecturers>

- N-body simulations
- Cosmological zoom-in + hydrodynamics: Milky Way size galaxy simulations
- Comparison of simulations/theory vs observations
- High Performance Computing and Data Science tools

Milky Way size galaxy formation and High performance computing
Faculty of Physics, Barcelona/ Spain
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Main topics

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Hands-on sessions

- Globular clusters
M. Gieles, L. Martinez
- Halo- Galaxy connection
D. Ceverino, A. Di Cintio, O. Valenzuela
- Mock catalogues, simulations vs observations
F. Anders, T. Antoja, S. Roca-Fabrega
- HPC/Data tools
R. Badia, X. Luri, R. Mor

Lecturers

- Rosa Badia (Barcelona Supercomputing Center)
- Daniel Ceverino (IAM-Madrid)
- Albino Di Cintio (IAC, Spain)
- Santi Roca-Fabrega (UCM-Madrid)
- Octavio Valenzuela (IA-UNAM, Mexico)

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Logos at the bottom: UNIVERSITAT DE BARCELONA, IECC, ICCUB, Institut de Ciències del Cosmos UNIVERSITAT DE BARCELONA, COST, and the URL <https://indico.icc.ub.edu/e/GaiaSchoolBCN2020>

Hands-on sessions

- Globular clusters
- Halo-Galaxy connection in hydro simulations
- Mock catalogues, simulations vs observations
- High Performance Computing /Data tool

WG1 Workshops and School

WG1/WG4 Workshop

The Galactic Centre and the Inner Galaxy:

Heidelberg (**virtual**) 02/2021

Participants (online)

<https://www.zah.uni-heidelberg.de/mw-gaia2021>

GP2



The poster features a dark space background with a starry field and a satellite (Gaia) in the upper right. On the left, there is a logo with 'MW' and 'Gaia' inside a blue hexagonal shape. The main text is in white and yellow. The word 'online!' is written in a yellow, handwritten-style font.

**REVEALING
THE MILKY WAY
WITH GAIA**

HEIDELBERG WORKSHOP
FEBRUARY 10-12, 2021

online!

ONLINE GUEST OF THE HEIDELBERG MW-GAIA WORKSHOP

**HEIDELBERG GERMAN HOTSPOT
FOR ASTROPHYSICS AND
FUNDAMENTAL PHYSICS**

- Gaia EDR3: overview, completeness
- Gaia Ref Frame: zero points in parallax and proper motion, fundamental physics and relativistic effects using Gaia and VLBI, Sgr A* and testing GR
- Bulge, Bar and Inner Halo: kinematics, dynamics, mass distribution
- Bulge, Bar, Inner Halo: metallicity-orbit distribution and stellar ages
- Bulge, Bar, Inner Halo: critical discussion on stellar ages in Bulge, assembly history from (hydro-)dynamical and cosmological simulations
- Nuclear Disk, Gas Inflow and Star Formation

WG1 Workshops and School

GP2

WG1/WG2

Star Clusters: the Gaia Revolution

Barcelona (**virtual**) 10/2021

Participants: 365

<https://indico.icc.ub.edu/event/114/>

- Young stars and star forming regions
- Stellar evolution and asteroseismology
- Data mining in the Gaia catalogue
- Cluster dynamics
- Chemistry and synergies with ground-based surveys
- Clusters as tracers of the Galactic structure and history

Star Clusters: the Gaia Revolution
MW-Gaia WG1/2 online workshop
5-6-7 October 2021

Invited Speakers:
Angela Bragaglia
Laia Casamiquela
Phillip Galli
Marina Kounkel
Andrea Miglio
Eugene Vasiliev

Scientific Organising Committee
Tristan Cantat-Gaudin
Alfred Castro-Ginard
Nadège Lagarde
Marco Limongi
Sarūnas Mikolaitis
Núria Miret Roig
Elena Pancino
Róbert Szabó

Local Organising Committee
Lola Balaguer-Núñez
Juan Carbajo
Carme Jordi
Esther Pallarés

MW Gaia
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ICCUB
Institut de Ciències del Cosmos
UNIVERSITAT DE BARCELONA
IEEC^R
Institut d'Estudis
Espacials de Catalunya

WG1 Workshops

GP3

WG2/WG1 Workshop

Stellar evolution across the HR diagram with Gaia

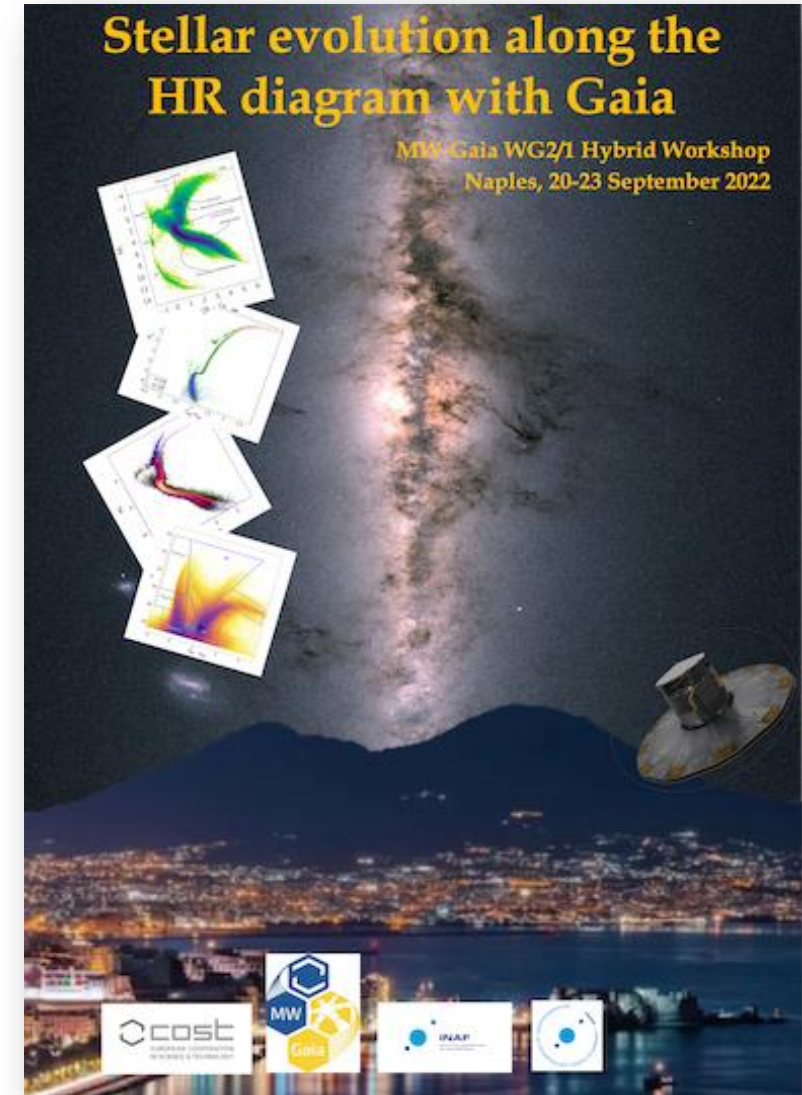
Naples (**hybrid**), 09/2022

Participants: 206

<https://indico.ict.inaf.it/event/2023/page/731-mw-gaia>

Constraints that Gaia data can set on:

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



WG1 Workshops

GP3

WG4/WG1

Gaia – Beyond the Milky Way

Athens (**hybrid**), 09/2022

Participants: 67

<https://gaia2022.ia.forth.gr/>

Impact of the Gaia mission, and especially of Gaia Data Release 3 (DR3), on extragalactic science:

- Distance scale
- Local group galaxies
- Unresolved Galaxies and quasars

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

COST MW-Gaia WG1/WG4 Workshop

Gaia – Beyond the Milky Way

Athens, 27-28-29 September 2022

Invited Speakers

- A. Bombrun, European Space Astronomy Centre, Spain.
- C. Ducourant, Univ. de Bordeaux, France.
- X. Luri, University of Barcelona, Spain.
- N. Martin, Observatoire Astronomique de Strasbourg, France.
- F. Mignard, Observatoire de la Cote d'Azur, CNRS, France.
- V. Ripepi, INAF, Osservatorio Astronomico di Capodimonte, Italy.
- G. Thomas, Instituto de Astrofísica de Canarias, Spain.
- A. Vallenari, INAF, Padova Astronomical Observatory, Italy.
- E. Vasiliev, Institute of Astronomy, Cambridge, UK.

Venue
Historic Building of the National and Kapodistrian University of Athens (NKUA)

Scientific Organizing Committee

- D. Hatzidimitriou, NKUA, Greece
- S. Anton, University of Coimbra, Portugal
- C.A.L. Bailer-Jones, MPA, Heidelberg, Germany
- G. Clementini, INAF, Bologna, Italy
- L. Dechambre, University of Liège, Belgium
- N. Walton, IoA, University of Cambridge, UK

Local Organizing Committee

- D. Hatzidimitriou, NKUA, Greece
- I. Bellas-Velidis, NOA, Greece
- E. Livanou, NKUA, Greece
- A. Strantzalis, NKUA, Greece
- E. Chrysafeli, NKUA, Greece
- Ch. Tsakonas, NKUA, Greece

FORTH INSTITUTE OF ASTRONOMICAL SCIENCE

HELLENIC REPUBLIC
National and Kapodistrian
University of Athens
EST. 1837

WG1 Workshop

Revealed by Gaia: the central halo of the Milky Way

Cambridge (**in person**), 11-13/09/2023



<https://www.ast.cam.ac.uk/meetings/2023/revealed.gaia.central.halo.milky.way>

- Accreted halo
- In-situ halo
- Bar-halo interactions
- Central MW tracers
(RR Lyrae, Red Clump stars, LPVs. Metal-poor stars)

7 invited speakers
24 talks
Several discussion sessions