

# **S. Roca-Fàbrega**

Curriculum Vitae

Racah Institute of Physics  
Hebrew University of Jerusalem  
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## Current position

Hebrew University of Jerusalem  
Post-doctoral researcher (3 years position)

October 2015 - present

## Education

Barcelona University  
IEEC research assistant (6 month position)

2014-2015

Universitat de Barcelona (Spain)  
PhD in Physics  
Thesis: Milky Way-like simulations in the Gaia era:  
disk large scale structures and baryonic content  
Supervisors: Dr. Francesca Figueras Siñol,  
Dr. Octavio Valenzuela Tijerino

2010-2014

Universitat de Barcelona (Spain)  
Msc in Astrophysics and particle physics  
Thesis: Tools to analyze the Galactic disk kinematics  
Supervisor: Dr. Francesca Figueras Siñol

2009-2010

Universitat de Barcelona (Spain)  
Degree in Physics

2005-2009

## Research experience

Postdoctoral research assistant on Milky Way-like galaxy simulations with Dr. Francesca Figueras Siñol and Dr. Octavio Valenzuela Tijerino (Barcelona University and UNAM-Mexico)

2014-2015

Postgraduate research with Dr. Francesca Figueras Siñol and Dr. Octavio Valenzuela Tijerino on the analysis of dynamics and kinematics of stars and large scale structures in Milky Way-like galaxy simulations

2010-2014

Postgraduate research with Dr. Francesca Figueras Siñol on the analysis of velocity ellipsoid properties in test particle simulations of galaxies with spiral arms and bars. 2009-2010

Research assistant with Dr Alejandro Vazdekis Vazdekis and Dr Jose Antonio Acosta (Instituto de Astronomía de Canarias, IAC), on the compilation of an empirical library of high resolution stellar spectra in the H band. 2009

## Research interests

-Numerical simulations:

Generation of disk galaxies using simulations in order to study dynamics and kinematics of stars and its relation with properties of the non-axisymmetric large scale structures (bars and spirals).

-Galaxies:

Formation and evolution, density profiles, environmental effects, spiral galaxies, satellites and streams, rotation curves.

-Cosmology:

Star formation histories, history of the Local Universe.

-Milky Way:

Mass, properties of stellar component, radial migration, metallicity gradients formation of large scale structures, observable properties, dark matter distribution.

-Surveys:

Stellar radial velocities, astrometry, morphology of external galaxies.

## Awards

FPU Spanish ministry Research Scholarship 2010-2014

Short visit ITN Research Scholarship (spent 15 days in Kapteyn Institute, Groningen, Netherlands) 2013

Short visit Research Scholarship (spent 3 months in UNAM and CRyA, Mexico) 2012

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| Short visit Research Scholarship (spent 3 months in UNAM, Mexico)          | 2010 |
| Postgraduate Studentship (spent 3 months in UNAM, Mexico)                  | 2010 |
| ICCUB fellowship   | 2010 |
| ASTROSIM Summer School fellowship  | 2010 |
| Special Postgraduate Studentship (spent 2.5 months in IAC, Canary Islands) | 2009 |

### **Recent invited colloquium and seminars**

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| UAM colloquium       | UAM, Madrid (Spain), February 2015             |
| Astronomy seminar    | CAB, Madrid (Spain), February 2015             |
| Astronomy seminar    | Kapteyn Institute (Netherlands), November 2013 |
| IA-UNAM colloquium   | IA-UNAM (Mexico), January 2013                 |
| CRyA-UNAM colloquium | CRyA-UNAM (Mexico), December 2012              |
| Astronomy seminar    | IAC, La Laguna (Spain), September 2009         |

### **Recent conferences and workshops**

SEA scientific meeting 2010; Highlights of Astronomy and Astrophysics  
Madrid, September 2010

REG: First meeting of “Red Española para la Explotación Científica de Gaia”  
San Fernando (Spain), June 2010

Reunión Regional Latinoamericana de la Unión Astronómica Internacional (LARIM)  
Morelia (Mexico), November 2010

Assembling the puzzle of the Milky Way  
Le Grand Bornand (France), April 2011

REG: Red Española para la Explotación Científica de Gaia  
Santillana del Mar (Spain), September 2011

SEA scientific meeting 2012; Highlights of Astronomy and Astrophysics  
Valencia (Spain), July 2012

1st Flash Talks Meeting of PhD students in Physics  
Barcelona (Spain), January 2012

GREAT-ITN: Galaxy Modeling with a Gaia Mock catalog  
Barcelona (Spain), March 2012

The Role of Bars in Galaxy Evolution  
Grananda (Spain), May 2013

Gaia Challenge 1  
Guildford (England), August 2013

XXV Congreso Nacional de Astronomía  
Mexico City (Mexico), November 2013

2nd Interdisciplinary Meeting of Predoctoral Researchers (JIPI 2014)  
Barcelona (Spain), February 2014

European Week of Astronomy and Space Science  
Geneve (Switzerland), July 2014

XI reunión científica de la Sociedad Española de Astronomía (SEA)  
Teruel (Spain), September 2014

Gaia Challenge 2  
Heidelberg (Germany), October 2014

GREAT-ITN conference: The Milky Way Unraveled by Gaia: GREAT Science from the Gaia  
Data Releases  
Barcelona (Spain), December 2014

Wednesday seminar in the Faculty of physics of the UAM  
Madrid (Spain), February 2015

Thursday colloquium in the CAB-CSIC  
Madrid (Spain), February 2015

2015 Santa Cruz Galaxy Workshop, UCSC  
Santa Cruz (California, USA), August 2015

4th AGORA workshop  
Santa Cruz (California, USA), August 2015

## **Teaching experience**

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| Teacher of summer physics camp, University of Barcelona                                   | July 2011 |
| Teaching assistant (Astronomia Observacional, degree on Physics), University of Barcelona | 2012-2015 |
| Teaching assistant (Astronomia Básica, degree on Physics), University of Barcelona        | 2012-2014 |

Substitute lecturer (Master in astrophysics: Galaxy formation and evolution), for Dr. Octavio Valenzuela Tijerino at IA-UNAM Fall 2012

Substitute lecturer (Master in astrophysics; Galactic Dynamics and kinematics) Spring 2013

## Public outreach

Invited talk to “Encontres amb el 3er cicle” 2013

Invited talk to “Afternoon of science in the Darde museum of Figueres” 2012

Contribution into the design of the exhibition "Mil milions d'ulls per a mil milions d'estrelles" and its contents: 2012  
<http://serviastro.am.ub.edu/twiki/bin/view/ServiAstro/ExpoGaia>

Contribution into the design of the exhibition “Les distàncies còsmiques” and its contents: 2012  
<http://serviastro.am.ub.edu/twiki/bin/view/ServiAstro/DistanciesCosmiques>

Contribution into the design of the calendar “Gaia Calendar” and its contents: 2013  
[http://serviastro.am.ub.edu/twiki/pub/ServiAstro/GaIa/pdf8\\_baixa.pdf](http://serviastro.am.ub.edu/twiki/pub/ServiAstro/GaIa/pdf8_baixa.pdf)

Contribution into the design of part of the contents in the mobile app “Gaia Mission”: 2012  
<https://itunes.apple.com/us/app/gaia-mission/id735128015>

Participation in the “Gaia live in school: inspiring the next generation of European space scientists” event: 2014  
<http://blogs.esa.int/gaia/2014/04/04/gaia-live-in-school-inspiring-the-next-generation-of-european-space-scientists/>

Invited conferences for undergrad students in the “Associació astronòmica de la garrotxa”. 2005-present

General public conferences in the “Associació astronòmica de la Garrotxa”. 2005-present

Conferences in high schools in the international week of science. 2010-2014

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| Participation in the conferences cycle “The biggest science unknowns” in Olot, with the oral contribution titled “Large scale structures of the Milky Way”.  | 2014      |
| Participation as a lecturer in the Summer Campus of Physics of the University of Barcelona ( <a href="http://www.ub.edu/futursinousestudiants/physics.html">http://www.ub.edu/futursinousestudiants/physics.html</a> ) | 2010-2013 |
| Participation as a lecturer in the “Visiting day” for high school students in the Faculty of Physics of the University of Barcelona.   | 2010-2014 |
| Participation in “Noche de las Estrellas” in Mexico City   | 2010-2013 |
| Participation in “2015 meeting of amateur astronomical community of Girona”  | 2015      |
| Participation as a main lecturer in the “2015 Joves i Ciència” astrophysics program (15 days) for High school students   | 2015      |

### Specialized Equipment and Systems used

Pirineus system in "Centro de Supercomputación de Cataluña (CESCA)"

Cluster Abassi, Instituto de Astronomía UNAM, Sede Ensenada, México

Cluster Abassi2, Instituto de Astronomía de la UNAM, Sede Ensenada, México

Cluster Pakal, Instituto de Astronomía de la UNAM, Sede Ciudad Universitaria, México DF, México

Cluster Atócatl (Instituto de Astronomía – UNAM)

Miztli, UNAM supercomputer

Astric, HUJI cluster

NERSC cluster (USA)

### Refereed publications

*On galaxy spiral arms' nature as revealed by rotation frequencies*

**Roca-Fàbrega, S.;** Valenzuela, O.; Figueras, F.; Romero-Gómez, M.; Velázquez, H.; Antoja, T.; Pichardo, B. 2013, MNRAS, 432, 2878R

*A novel method to bracket the corotation radius in galaxy discs: vertex deviation maps*

**Roca-Fàbrega, S.;** Antoja, T.; Figueras, F.; Valenzuela, O.; Romero-Gómez, M.; Pichardo, B., 2014, MNRAS, 440, 1950R

## Submitted publications and publications in preparation

*GARROTXA Cosmological Simulations of Milky Way Size Galaxies - I. Hot Gas and the Missing Baryons*

**Roca-Fàbrega, S.;** Valenzuela, O.; Figueras, F.; Colin, P.; Krongold, Y. In preparation

## Unrefereed conference proceedings and poster presentations

*Kinematic structures in galactic disc simulations*

**Roca-Fàbrega, S.;** Romero-Gómez, M.; Figueras, F.; Antoja, T.; Valenzuela, O., 2011, Proceedings for “III Latin American Regional IAU Meeting” in Morelia, Mexico.

*Tools for searching resonant moving groups in galactic disc simulations*

**Roca-Fàbrega, S.;** Romero-Gómez, M.; Antoja, T.; Figueras, F.; Monguió, M., 2010, Poster in “X reunión de la Sociedad Española de Astronomía (SEA)”, in Madrid, Spain.

*Study of the resonant streams in the galactic disk through N-body and test particle simulations*

**Roca-Fàbrega, S.;** Antoja, T.; Romero-Gómez, M.; Valenzuela, O.; Figueras, F., 2010, Poster in “Primera Reunión Científica de la Red Española de GAIA (REG)” in San Fernando, Spain.

*Large scale characterization of the stellar velocity distribution in the galactic disk*

**Roca-Fàbrega, S.;** Valenzuela, O.; Figueras, F.; Romero-Gómez, M.; Antoja, T., 2011, Poster in “Assembling the puzzle of the Milky Way” in Le Grand Bornand, France

*Large scale characterization of the stellar velocity distribution in the galactic disk*

**Roca-Fàbrega, S.;** Valenzuela, O.; Figueras, F.; Romero-Gómez, M.; Antoja, T., 2011, Poster in “Assembling the puzzle of the Milky Way” in Le Grand Bornand, France.

*Galaxy spiral arms' rotation frequencies as a function of bar strength*

**Roca-Fàbrega, S.;** Valenzuela, O.; Figueras, F.; Romero-Gómez, M.; Velázquez, H.; Antoja, T.; Pichardo, B., 2013, Poster in “The Role of Bars in Galaxy Evolution” in Granada, Spain.

*A new cosmological N-body simulation of a Milky Way like galaxy using ART + hydrodynamics code*

**Roca-Fàbrega, S.;** Valenzuela, O.; Figueras, F., 2014, Poster in “European Week of Astronomy and Space Science” in Geneve, Switzerland.

*Vertex deviation maps to bracket the Milky Way resonant radius*

**Roca-Fàbrega, S.;** Antoja, T.; Figueras, F.; Valenzuela, O.; Romero-Gómez, M.; Pichardo, B., 2014, Poster in “XI reunión científica de la Sociedad Española de Astronomía (SEA)”, Teruel, Spain

*Novel kinematic methods to trace the Spiral Arms nature using Gaia data*

**Roca-Fàbrega, S.;** Figueras, F.; Valenzuela, O.; Romero-Gómez, M.; Antoja, T.; Pichardo, B., 2014, Poster in “GREAT-ITN conference: the Milky Way Unraveled by Gaia” in Barcelona, Spain



## **Oral contributions in national and international meetings**

*On the galactic spiral arms nature as revealed by the kinematics of the stellar component*

**Roca-Fàbrega, S.**; Valenzuela, O.; Figueras, F., 2012, Oral contribution at “Reunión Científica 2012; Highlights of Astronomy and Astrophysics” in Valencia, Spain.

*Analyzing dynamics of Milky Way like, N-body simulations*

**Roca-Fàbrega, S.**, 2012, Oral contribution at “1st Flash Talks Meeting of PhD students in Physics of the University of Barcelona” in Barcelona, Spain.

*On galaxy spiral arms' nature as revealed by rotation frequencies and vertex deviation*

**Roca-Fàbrega, S.**; Valenzuela, O.; Figueras, F.; Romero-Gómez, M.; Antoja, T.; Pichardo, B., 2013, Oral contribution at “1st Gaia Challenge”, Guildford, England.

*Vertex deviation as a tracer of Spiral Arms' density perturbation and resonance radius*

**Roca-Fàbrega, S.**; Valenzuela, O.; Figueras, F., 2013, Oral contribution at “XXV Congreso Nacional de Astronomía”, Mexico City, Mexico.

*N-body simulations to study the Galaxy structure*

**Roca-Fàbrega, S.**, 2013, Oral contribution at “Jornada d'Investigadors Predoctorals Interdisciplinària”, Barcelona, Spain.

*A novel method to bracket the corotation radius in spiral galaxies: vertex deviation maps*

**Roca-Fàbrega, S.**; Antoja, T.; Figueras, F.; Valenzuela, O.; Romero-Gómez, M.; Pichardo, B., 2014, Oral contribution at “European Week of Astronomy and Space Science”, Geneva, Switzerland.

*Towards a new cosmological Milky Way like galaxy simulation in the Gaia Era*

**Roca Fàbrega, S.**; Valenzuela, O.; Figueras, F., 2014, Oral contribution at “XI reunión científica de la Sociedad Española de Astronomía (SEA)”, Teruel, Spain.

*Hot gas in simulations of Milky Way-like galaxies: Missing baryons and observational biases*

**Roca Fàbrega, S.**; Valenzuela, O.; Colín, P.; Krongold, Y.; Figueras, F., 2015, Oral contribution at “2015 Santa Cruz Galaxy Workshop”, California, USA

## **Participation in research projects**

*Contribución al desarrollo científico y tecnológico de la misión Gaia*

PI: Jorge Torra Roca, 2010-2012, AYA2009-14648-C02-01, MICINN (Subprograma ESP).

*Contribución al desarrollo científico y tecnológico de la misión Gaia II*

PI: Jorge Torra Roca, 2013, AYA2012-39551-C02-01, Ministerio de Economía y Competitividad.

*El Tránsito de Venus 2012 y las distancias cósmicas*

PI: Carme Jordi Nebot, 2011-2012, Fundación Española para la Ciencia y la Tecnología (FECYT).

## **Scientific and departmental activities**

Weekly Gaia science meeting organizer, Universitat de Barcelona

Member, Sociedad Española de Astronomía (SEA)

## **Languages**

Spanish and Catalan (native), basic proficiency in English, spoken French

## **Referees**

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Instituto de Astronomia, UNAM  
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