

EDA GJERGO, Ph.D.

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EMPLOYMENT

Wuhan University <i>Postdoctoral Scholar</i>	October 2019 - Present <i>Wuhan, China</i>
Università degli Studi di Trieste <i>Research Assistant</i>	2015 - 2019 <i>Trieste, Italy</i>
Argonne National Laboratory <i>Co-op and Junior Team Member</i>	2011 - 2015 <i>Chicago, IL</i>
Sperling & Kupfer <i>Popular Science Co-writer</i>	2007 <i>Milan, Italy</i>

EDUCATION

Università degli Studi di Trieste <i>Doctor of Philosophy in Physics</i>	Thesis defense: Feb 15 th 2019 <i>Trieste, Italy</i>
<ul style="list-style-type: none">· Thesis Title: Dust Evolution in Galaxy Cluster Simulations· National Institute for Astrophysics (INAF) fellowship	
Illinois Institute of Technology <i>Bachelor of Science in Applied Mathematics</i>	Degree conferred on: May 2014 <i>Chicago, IL</i>
<ul style="list-style-type: none">· International Scholarship	
Illinois Institute of Technology <i>Bachelor of Science in Physics</i>	Degree conferred on: May 2014 <i>Chicago, IL</i>
<ul style="list-style-type: none">· International Scholarship	
United World College of the Adriatic <i>International Baccalaureate Diploma</i>	Degree conferred on: May 2008 <i>Duino, Italy</i>
<ul style="list-style-type: none">· Italian Ministry of Foreign Affairs Full Scholarship (3.5% acceptance rate)	

RESEARCH INTERESTS

Galactic chemical evolution, dust modeling, cosmological simulations, interstellar and intracluster medium, supernova cosmology, dark energy models.

RESEARCH AND WORK EXPERIENCE

Wuhan University <i>Postdoctoral Scholar</i>	October 2019 - Present <i>Wuhan University</i>
<ul style="list-style-type: none">· I have developed a detailed, modular, and flexible galactic chemical evolution code which tracks the abundance of all stable isotopes in galaxies of varying morphologies. I am presently in the debugging phase.	

- Elements from Carbon to Zinc are primarily enriched through contributions from AGB, Supernovae Type Ia, and Supernovae Core Collapse (SNCC), as it has been extensively investigated in literature. For such elements, I include these 3 enrichment channels in my code.
- For the treatment of heavy elements – beyond the iron-peak – on top s-process contributions from updated AGB and SNCC yield tabulations, I include r-process elements. To achieve the aim, I introduced novel rate computations of Neutron Star Mergers, Collapsars, neutrino-driven winds, and Magnetohydrodynamic SN jets, along with their corresponding yields which, to date, have never been used in chemical evolution modeling.
- Two papers are in preparation: the code presentation paper and the heavy elements production paper.

Osservatorio Astronomico di Trieste

Research Assistant

February 2019 - September 2019

Trieste, Italy

- I employed analytical methods to compute dust abundances in galaxy clusters at low-to-intermediate redshift, by means of sophisticated chemical evolution models.
 - Through the use of luminosity functions, I confirmed that chemical evolution models are consistent with identifying spiral galaxies as the main sources of dust in galaxy clusters.
 - I've shown that minor galaxies or filamentary structures ~ 1 dex smaller than the break of the Schechter functions cannot be major sources of galaxy cluster dust.

Università degli Studi di Trieste

Doctor Philosophiae in Physics

November 2015 - January 2019

Trieste, Italy

- I adapted a one-zone dust evolution model to cosmological zoom-in simulations of galaxy clusters.
 - My work is the first ever implementation of dust evolution within cosmological simulations of galaxy clusters.
 - I converted the theoretical dust evolution model of Hirashita (2015) into a numerical algorithm written in C. I embedded this algorithm into GADGET-3, a private simulation code which runs Tree-Particle-Mesh dynamics, smoothed particle hydrodynamics, radiative cooling, star formation and feedback, AGN feedback, and chemical evolution.
 - I tested the consistency of our dust distribution against other common dust distribution models. I verified that our method falls within a small margin of the predictions by said models.
 - I tested a handful of dust production methods into the simulation, including a novel stoichiometry-preserving one (adopted as fiducial production), because it is representative to first order of the characteristic chemical makeup of astrophysical dust in stellar envelopes and dense environments.
 - I investigated the impact of different chemical evolution yields on dust abundances.
 - I included and tested thermal sputtering as the main destruction mechanism in the Intracluster Medium.
 - I became comfortable with running and editing complex parallel codes designed for supercomputers.
 - The work appeared in the journal *Monthly Notices of the Royal Astronomical Society*. It was presented at ESO (Garching, Germany), and in several Italian venues.
 - I compared the output of our simulation to observational data:

- The simulated dust abundances are in agreement with local galaxy data, including galaxies of low-metallicity.
- The simulation slightly underproduces dust masses compared to Planck SED observations at low-to-intermediate redshift. I am currently solving the cause of the discrepancy, but in the paper the problem was approached by relaxing the sputtering timescale.
- I developed a post-processing analysis package written in **Python** to extract and manipulate the simulation's data across cosmic history. The package will be fully accessible to the group and can be customized beyond the end of my PhD program.
 - I wrote an algorithm to trace the evolution history of individual gas particles, as well as special subsets of the simulated particles across cosmic time.
 - I wrote automated python scripts to submit my post-processing routines to the supercomputer's queue, on top of the standard queuing procedure.
 - I learned about special structures which form in smoothed particle hydrodynamical simulations, such as Kaufmann blobs, and the bona fide gas arising from ram pressure stripping. I verified that the sites of dust evolution are not numerical artefacts, but are consistent with the physics we aimed to simulate.
- I analyzed the Spectral Energy Distribution (SED) and the $\text{IRX-}\beta$ relation of simulated high redshift galaxies. I imposed *SPace Infrared telescope for Cosmology and Astrophysics* (SPICA) specifications on flux thresholds and passbands to the post-processing radiative transfer analysis of *MUlti-Phase Particle Integrator* (MUPPI) cosmological zoom-in simulations of galaxies.

Argonne National Laboratory

Junior Team Member

September 2011 - June 2015

Argonne, IL

- Worked on the forecast of cosmology constraints for the Dark Energy Survey (DES) through the photometric selection of Type Ia supernovae, and aided to the coding the analysis framework of upcoming observations.
 - Published in the journal *Astroparticle Physics*, and was presented at the April 2012 APS Meeting, as well as the 221st AAS 2013 Meeting.
 - Contributed to the coding of an improved Figure of Merit (FoM), first advocated by the Dark Energy Task Force, which is a Fisher Matrix quantification of the impact of data sets on cosmology parameters.
 - Improved the accuracy of the FoM by including the systematic error for core collapse supernovae.
- Initiated a preliminary study of the six optical ugrizy4 filters for the Large Synoptic Survey Telescope (LSST), and their impact on supernova science.
 - Provided, on behalf of the DESC supernova group, the filter analysis of the candidate filter vendors able to meet LSST's specifications. The study played a major role in the vendor choice by the LSST committee.
 - Explored the effects of ripple amplitude, tapering, leakage of the filters and host-galaxy prior to photo-z supernovae studies.
 - Presented our results at the LSST / Dark Energy Science Collaboration (DESC) Meeting in Pittsburgh.
 - Represented the LSST project with this work at the 223rd AAS Meeting.

- Explored alternatives to vacuum energy.
 - Selected a model for quintessence and a model for modified gravity, and evaluated the constraints to three supernova data sets. Presented our results as a poster at the AAS 222nd Meeting,
 - Was awarded with the 2013 Chambliss Astronomy Achievement Student Award for the work.
- Communicated science to a range of audiences, from experts to high school students.
 - Presented monthly research progress during the LSST Supernova Science Working group webinars in 2013.
 - Explained peer-reviewed cosmology papers during weekly journal clubs at Argonne National Lab.
 - Coached new students in the use of the Linux operating system. Taught background knowledge on cosmology, big bang theory, supernovae as standard candles, and cosmic microwave background.
 - Co-wrote, co-produced, and hosted 11 Youtube videos on cosmology for the general audience. <http://www.youtube.com/TheCosmicWeb>, and presented this material to 4 classes of high school students.

Illinois Institute of Technology

June 2010 - August 2011

Independent study

Chicago, IL

- Independent reading of a variety of peer-reviewed papers, and attended weekly seminars of the IIT Meshfree Methods group.
- The topics included the MOND paradigm, the Saari conjecture, dark matter models, functional analysis, and positive definite kernels.

Sperling & Kupfer, branch of Mondadori

July 2006 - April 2007

*Co-author of *Così parlano le stelle**

Milan, Italy

- Co-authored a best-seller book for the general public on the fundamental forces of physics, with renowned Italian astrophysicist Margherita Hack. <https://amzn.to/2Kj0FwV>
- Won *Frascati Scienza: La scienza per tutti*, 2010, awarded for communicating science to the general public. The book was selected for this award jointly by 4 National Institutes of Physics in Italy.
- In May '07 the book ranked #10 in the national bestseller list across all categories, and #2 for the non-fiction category.
- Invited to present the book in many venues across Italy, including Milan, Florence, Rome, and Trieste.

Summer Science Program

June 2007 - August 2007

Research Project Student

Ojai, CA

- Determined the orbit of a near-earth asteroid from scratch: from data collection with both photographic plates and CCD optical images on 11" and 14" telescopes respectively, to the computation of the asteroid's orbit using spherical trigonometry and numerical differentiation on Python. Submitted observations to the Minor Planet Center.
- Conducted additional research on Messier Objects and Jupiter's satellites. Coded a VPython model of the Solar System.
- Sponsored by the California Institute of Technology, Stanford University, Harvey Mudd College, UCLA, and NASA's Jet Propulsion Laboratory. Competitive admission with a ~17% rate of acceptance.
- <http://www.summerscience.org/home/index.php>

PUBLICATIONS

The MAGPI Survey – science goals, design, observing strategy, early results and theoretical framework 2021

Foster C., et al.

The MAGPI Collaboration

- Accepted by the Publications of the Astronomical Society of Australia.

On the Origin of the Galaxy Cluster Dust at low to intermediate redshift. 2020

Gjergo Eda, Matteucci Francesca, Palla Marco, Lacchin Elena, Biviano Andrea

Osservatorio Astronomico di Trieste INAF, Università di Trieste, Istituto Nazionale di Fisica Nucleare (INFN)

- Monthly Notices of the Royal Astronomical Society, Volume 493, Issue 2, p.2782-2792.

Dust Evolution in Galaxy Cluster Simulations

June 2018

Gjergo Eda, Granato Gian Luigi, Murante Giuseppe, Ragone-Figueroa Cinthia, Tornatore Luca, Borgani Stefano.

Osservatorio Astronomico di Trieste INAF, Università di Trieste, Instituto de Astronomia Teorica y Experimental (IATE), Consejo Nacional de Investigaciones Cientificas y Tecnicas de la Republica Argentina (CONICET), Observatorio Astronomico, Universidad Nacional de Cordoba

- Monthly Notices of the Royal Astronomical Society, Volume 479, Issue 2, p.2588-2606.

Analytic photometric redshift estimator for Type Ia supernovae from the Large Synoptic Survey Telescope June 2015

Wang Yun, Gjergo Eda, Kuhlmann Stephen

Argonne National Laboratory, California Institute of Technology, University of Oklahoma

- Monthly Notices of the Royal Astronomical Society, Volume 451, Issue 2, p.1955-1963.

Type Ia supernovae selection and forecast of cosmology constraints for the Dark Energy Survey

February 2013

Gjergo Eda, Duggan Jefferson, Cunningham John, Kuhlmann Stephen, Biswas Rahul, Kovacs Eve, Bernstein Joseph, Spinka Harold

Argonne National Laboratory, Illinois Institute of Technology, Loyola University Chicago

- Astroparticle Physics, Volume 42, p. 52-61.

REPORTS

Filter Study for LSST using supernovae simulations and photo-z host galaxy bias 2014

Gjergo Eda, Kuhlmann Stephen, Gilmore D. Kirk, Kessler Richard

Argonne National Laboratory, Illinois Institute of Technology,

Kavli Institute for Cosmological Physics, SLAC National Accelerator Laboratory AAS 223 Poster

- Honorable Mention for the AAS Chambliss Student Achievement Award

Comparison of Supernova Data Sets with Modified Gravity and Dark Energy Models 2013

Pedersen Keith, Gjergo Eda, Shylnov Yurii, Kuhlmann Steve

Argonne National Laboratory, Illinois Institute of Technology

AAS 222 Poster

- Winner of the AAS Chambliss Student Achievement Award
- <http://aas.org/posts/news/2013/06/congratulations-aas-222-chambliss-student-award-winners>

Cosmology Biases in the Analysis of Future Supernova Surveys

2013

Stanwyck Lynn, Gjergo Eda, Kuhlmann Stephen, Biswas Rahul, Kovacs Eve

Argonne National Lab, Illinois Institute of Technology, Johns Hopkins University AAS 222 Poster

Type Ia Supernovae Selection and Forecast of Cosmology Constraints for the Dark Energy Survey 2012

Gjergo Eda, Duggan J., Cunningham J., Kuhlmann S., Biswas R., Kovacs E., Bernstein J. P., Spinka H.

Argonne National Laboratory, Loyola University Chicago, Illinois Tech

AAS 221 Poster

Uncertainties in Core Collapse Supernovae Simulations

2012

Duggan, Jefferson; Cunningham, J.; Kuhlmann, S.; Biswas, R.; Kovacs, E.; Spinka, H.

Argonne National Laboratory, Loyola University Chicago, Illinois Tech

AAS 221 Poster

TECHNICAL TALKS

MAGPI Busyweek

June 2021

Participant and Oral Presenter

Webinar

- <https://magpisurvey.org/>

HydroSim Meeting

September 13-16, 2016

Participant and Oral Presenter

Trieste, Italy

- <https://indico.ict.inaf.it/event/440/contributions/>

LSST-DESC Collaboration Meeting

December 4-6, 2013

Participant and oral presenter

Pittsburgh, PA

- <https://indico.bnl.gov/conferenceDisplay.py?confId=691>

LSST DESC SN Working Group

June, July, August, September, October, November 2013

Participant and presenter

Restricted 1-hour webinar

- Presenter of filter studies for LSST using supernovae simulations and photo-z host galaxy bias.

DESSN Workshop

July 15-19, 2013

Participant

KICP at the University of Chicago, Chicago, IL

- https://cdcvs.fnal.gov/redmine/projects/des-sn/wiki/DESSN_Worshop_at_UofC_KICP

CLASSES

Classical Mechanics

September 2020

Invited Lecturer

Wuhan University, China

- Two-Hour class on the hydrostatic equilibrium in stars, and on the Virial theorem for undergraduate students enrolled in a Classical Mechanics course at Wuhan University. I prepared homework and solutions as well as in-class activities.

Introduction to Astrophysics

April 2017, April 2018

Invited Lecturer

University of Trieste, Italy

- Two-Hour class on general relativity and cosmology for undergraduate students enrolled in the Introduction to Astrophysics course at the University of Trieste.

Yerkes Observatory High School Summer Program

July 29, 2013

Invited Lecturer

Yerkes Observatory, WI

- Hour-long seminar on cosmology (big bang theory, DM, DE, and CMB) for high school students selected to the program.
- http://prezi.com/1ytyie0rvdtb/?utm_campaign=share&utm_medium=copy

SEMINARS

The Galactic Chemical Evolution of Heavy Elements Jan 12, 2022
Invited Speaker *GW NEXT 22 online conference, Kavli Institue at PKU, Beijing, China*

- 45-minute introduction designed for early-career gravitational wave scientists.

The Galactic Chemical Evolution of Heavy Elements May 28, 2021
Invited Speaker *NAO group meeting, Beijing, China*

- Hour-long seminar introducing LAMOST observers to galactic chemical evolution.

On the Origin of Dust at low-to-intermediate Redshifts November 2020
Invited Speaker *Kavli Institue at PKU, Beijing, China*

- Hour-long seminar on my PhD work as well as 2020 publication.

Dust Evolution in Galaxy Cluster Simulations December 2019
Invited Speaker *Beijing Normal University, China*

- Hour-long seminar on my PhD work.

Third International Workshop on recent LHC results and related topics October 10-12, 2018
Invited Speaker *Faculty of Natural Sciences, University of Tirana, Albania*

- Hour-long seminar on cosmology and cosmological simulations, presented to an audience of CERN researchers and Albanian graduate students.

Second International Workshop on recent LHC results and related topics Semptember 26-27, 2016
Invited Speaker *Faculty of Natural Sciences, University of Tirana, Albania*

- Hour-long seminar on dark matter and dark energy frontiers, presented to an audience of CERN researchers and Albanian graduate students.

SKILLS

Languages	(native) Italian, English, Albanian, (studying/elementary) Chinese
Computing	Mathematica, MATLAB, Octave, ROOT, Maple,
Astronomy codes	GADGET-2/3, CosmoMC, SNANA, SNCosmo
Programming	Python , Fortran90/77, C, IDL
OS	Linux, macOS, Microsoft Windows
Editor/Misc.	Emacs, Vi, SVN, TotalView, Anaconda.
Markup	HTML/CSS, L ^A T _E X

AWARDS

- National Institute of Astrophysics (INAF) Fellowship (2015-2018)
- Winner of the Chambliss Astronomy Achievement Student Award for the American Astronomical Society, Summer 2013.

- Honorable Mention for the Chambliss Astronomy Achievement Student Award for the American Astronomical Society, Winter 2014.
- College of Science and Letters Dean's List for excellent scholarly achievement. (Spring 2010, Fall 2014).
- IIT Undergraduate Research Day Award, 2nd place, 2011.
- IIT SIAM Math Problem Competition Award, 2010.
- Best Seller, Italy, Summer 2007, 10th place nationwide and 2nd place in the non-fiction category, for the book *Così parlano le stelle*.
- Winner of *Frascati Scienza: La scienza per tutti*, 2010, awarded for *Così parlano le stelle*.
- 2-year merit based full scholarship for the United World College of the Adriatic (3.5% rate of admission in Italy, academic year 2006-2008).
- 1st place winner of the *Concorso Liceale di Scrittura in Astronomia dell'Osservatorio di Arcetri*, 2006.
- Participated in the Regional Olympiads in Mathematics, Friuli-Venezia-Giulia Region, Italy, 2007.
- Participated in the Regional Olympiads in Physics, Friuli-Venezia-Giulia Region, Italy, 2007.
- Participated in the Regional Olympiads in Mathematics, Toscana, Italy, 2005.
- Participated in the National Olympiads in Astronomy, Italy, 2004.

TALKS

Interstellar Physics and Chemistry

Online Participant and Oral Presenter

January, 2022

Zhuhai, China

• <https://ism.dust.fan/ism2021/>

Origin of Elements and Cosmic Evolution: From Big-Bang to Supernovae and Mergers

December, 2019

Participant and Oral Presenter

Beihang University, Beijing, China

• <http://oece2019.csp.escience.cn/>

The Milky Way 2019: LAMOST and Other Leading Surveys

Participant and Oral Presenter

October, 2019

YiChang, China

• <http://mw2019.csp.escience.cn/dct/page/65585>

Italian Cluster II

Participant and Oral Presenter

Sept 10-13, 2018

Naples, Italy

• <https://sites.google.com/view/cluster2/>

Early Stages of Galaxy Cluster Formation

Participant and Oral Presenter

July 17-21, 2017

Garching, Germany

• <https://www.eso.org/sci/meetings/2017/GCF2017/program.html>

Beyond the Solar Neighborhood

Participant and Oral Presenter

January 22-27, 2017

Sexten, Italy

• <http://adsabs.harvard.edu/abs/2017bsne.confE..25G>

23rd Annual Argonne Symposium

Participant and Oral Presenter

November 1, 2013

Argonne, IL

- Website: http://www.dep.anl.gov/p_undergrad/ugsymp/
- Presentation: http://prezi.com/opbnxxw0syr1/?utm_campaign=share&utm_medium=copy

23rd Midwest Relativity Meeting

October 25-27, 2013

Participant and Oral Presenter

University of Wisconsin-Milwaukee, Milwaukee, WI

- Meeting's website: <http://www.gravity.phys.uwm.edu/conferences/mwrm2013/index.html>
- Talk (Presented by Eda Gjergo): <http://tinyurl.com/23RelativityMtgMilwaukeeGjergo>
- Talk (Presented by Yurii Shylnov): <http://tinyurl.com/23RelativityMtgMilwaukeeShylnov>

KICP Supernova Hub Workshop

March 2012

Participant and oral presenter

Kavli Institute of the University of Chicago, Chicago, IL

- Technical talk on "Photometric Identification of Supernova"
- Talk: http://kicp-workshops.uchicago.edu/SNphotID_2012/depot/talk-gjergo-eda.pdf

POSTERS AND MISCELLANEOUS CONFERENCES

Italian Cluster I

Feb 27 - March 1, 2017

Participant and Poster Presenter

Turin, Italy

- <https://sites.google.com/view/cluster1/>

KROME Computational school

September 19-21, 2016

Participant

Florence, Italy

- <http://www.kromepackage.org/bootcamp/index.php>

ICTP Workshop on Large-Scale Structure

June 2016

Participant

Trieste, Italy

- <http://indico.ictp.it/event/7630/>

ICTP Summer School of Cosmology

June 2016

Participant and Poster Presenter

Trieste, Italy

- <http://indico.ictp.it/event/7626/>

Lucchin school 2016

May 2016

Participant

Naples, Italy

- <http://eventi.na.astro.it/en/scuola-lucchin/>

Santa Fe Cosmology Workshop

July 1-19, 2013

Participant and oral presenter

Santa Fe, NM

- <http://press3.mcs.anl.gov/santa-fe-cosmology-workshops/sf13-main/>
- Presentation: http://prezi.com/ayvf8jzx3p9y/?utm_campaign=share&utm_medium=copy.

Chicago Area Undergraduate Research Symposium

March 2013

Oral Presenter

Chicago, IL

- Event's website: <http://www.caurs.com/>
- Poster and Presentation to be found on my website, referenced on the first page's header.

AAS 221st Meeting

January 2013

Participant and poster presenter

Long Beach, CA

- http://aas.org/files/resources/aas_221_program_book.pdf

ICTP Summer School of Cosmology*Participant and poster presenter*

July 2012

Trieste, Italy

- Poster can be found on my website, referenced on the first page's header.
- http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a11178

ICTP Workshop on Large-Scale Structure*Participant*

July 2012

Trieste, Italy

- http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a11314

Chicagoland and Midwest 1-Day Dark Matter Workshop*Participant*April 6th 2012*Fermilab, Batavia, IL*

- <http://www.hep.anl.gov/byrum/DM/ChicagolandDM.htm>

APS April Meeting*Oral presenter*

April 2012

Atlanta, GA

- Optimization of Type Ia Supernovae Selection, Photometric Typing, and Cosmology Constraints
- Talk: <http://meetings.aps.org/Meeting/APR12/Event/169557>