

DR. JOSEPH C. CARUANA

CONTACT INFORMATION

Department of Physics
Institute of Space Sciences & Astronomy
University of Malta
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Malta

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PERSONAL INFORMATION

Nationality: Maltese
Date of Birth: 13th February, 1987

EMPLOYMENT

- March 2016 - present:
Department of Physics and Institute of Space Sciences & Astronomy
UNIVERSITY OF MALTA
Lecturer
- November 2012 - January 2016:
LEIBNIZ-INSITUT FÜR ASTROPHYSIK POTSDAM (AIP)
Postdoctoral Researcher, Galaxies & Quasars Group

EDUCATION

- 2009-2012: UNIVERSITY OF OXFORD
D.Phil. Astrophysics, Marie Curie Fellow
- 2005-2009: UNIVERSITY OF MALTA
B.Sc. (Hons.) Physics & Mathematics

GRANTS & AWARDS

- EarLy UnIverse EXploration with NIRSpec (ELIXIR) Marie Curie Initial Training Network 3-year Research fellowship (2009-2012).
- Lindau Nobel Laureate Meeting alumnus; participated as young researcher representing the University of Malta (2016, dedicated to physics).
- Secondary Proposer of COST Action *Revealing the Milky Way with Gaia*

PUBLICATIONS

1. *The Formation of Compact Elliptical Galaxies in the Vicinity of a Massive Galaxy: The Role of Ram-Pressure Confinement.*
M. Du, V. P. Debattista, L. C. Ho, P. Côté, C. Spengler, P. Erwin, J. W. Wadsley, M. A. Norris, S. W. F. Earp, T. R. Quinn, K. Fiteni, J. Caruana, submitted to ApJ.
2. *The MUSE-Wide Survey: Survey Description and First Data Release.*
T. Urrutia, L. Wisotzki, J. Kerutt, K. B. Schmidt, E. C. Herenz, J. Klar, R. Saust, M. Werhahn,

- C. Diener, **J. Caruana**, D. Krajinovic, R. Bacon, L. Boogaard, J. Brinchman, H. Enke, M. Maseda, T. Nanayakkara, M. Steinmetz, P. M. Weilbacher, submitted to A&A.
3. *THESEUS: a key space mission concept for Multi-Messenger Astrophysics.*
G. Stratta et al. 2018, Advances in Space Research, 62, 662-682.
 4. *Recovering the systemic redshift of galaxies from their Lyman-alpha profile.*
A. Verhamme, T. Garel, E. Ventou, T. Contini, N. Bouche, E. C. Herenz, J. Richard, R. Bacon, K. B. Schmidt, M. Maseda, R. A. Marino, J. Brinchmann, S. Cantalupo, **J. Caruana**, B. Clement, C. Diener, A. B. Drake, T. Hashimoto, H. Inami, J. Kerutt, W. Kollatschny, F. Leclercq, V. Patricio, J. Schaye, L. Wisotzki, J. Zabl. 2018, MNRAS, 478, L60-L65.
 5. *The THESEUS space mission concept: science case, design and expected performances.*
L. Amati et al. 2018, Advances in Space Research, 62, 191.
 6. *Kinematics, Turbulence and Star Formation of $z \sim 1$ Strongly Lensed Galaxies seen with MUSE.*
V. Patricio, J. Richard, D. Carton, T. Contini, B. Epinat, J. Brinchmann, K. B. Schmidt, D. Krajinovic, N. Bouche, P. M. Weilbacher, R. Pello, **J. Caruana**, M. Maseda, H. Finley, F. E. Bauer, J. Martinez, G. Mahler, D. Lagattuta, B. Clement, G. Soucail, L. Wisotzki, 2018, MNRAS, 477, 18.
 7. *Dark Galaxy Candidates at Redshift 3.5 Detected with MUSE*
R. A. Marino, S. Cantalupo; S. Lilly, S.G. Gallego, L.A. Straka, E. Borisova, R. Bacon, J. Brinchmann, M.C. Carollo, **J. Caruana**, S. Conseil, T. Contini, C. Diener, H. Finley, H. Inami, F. Leclercq, S. Muzahid, J. Richard, J. Schaye, M. Wendt, L. Wisotzki, ApJ, 859, 53.
 8. *The MUSE-Wide survey: A measurement of the Ly α emitting fraction among $z > 3$ galaxies.*
J. Caruana, L. Wisotzki, E. C. Herenz, J. Kerutt, T. Urrutia, K. B. Schmidt, R. Bouwens, J. Brinchmann, S. Cantalupo, M. Carollo, C. Diener, A. Drake, T. Garel, R. A. Marino, J. Richard, R. Saust, J. Schaye, A. Verhamme, 2018, MNRAS, 473, 30-37.
 9. *The MUSE Hubble Ultra Deep Field Survey X: Ly α Equivalent Widths at $2.91 < z < 6.64$.*
T. Hashimoto, T. Garel, B. Guiderdoni, A.B. Drake, R. Bacon, J. Blaizot, J. Richard, F. Leclercq, H. Inami, A. Verhamme, R. Bouwens, J. Brinchmann, S. Cantalupo, M. Carollo, **J. Caruana**, E.C. Herenz, J. Kerutt, R.A. Marino, P. Mitchell, J. Schaye, 2017, A&A, 608, A10.
 10. *The MUSE Hubble Ultra Deep Field Survey VI: The Faint-End of the Ly α Luminosity function at $2.91 < z < 6.64$ and Implications for Reionization.*
A. B. Drake, T. Garel, L. Wisotzki, F. Leclercq, T. Hashimoto, J. Richard, R. Bacon, J. Blaizot, **J. Caruana**, S. Conseil, T. Contini, B. Guiderdoni, E.C. Herenz, H. Inami, J. Lewis, G. Mahler, R.A. Marino, R. Pello, J. Schaye, A. Verhamme, E. Ventou, P.M. Weilbacher, 2017, A&A, 608, A6.
 11. *The MUSE-Wide Survey: A first catalogue of 831 emission line galaxies*
E.C. Herenz, T. Urrutia, L. Wisotzki, J. Kerutt, R. Saust, M. Werhahn, K.B. Schmidt, **J. Caruana**, C. Diener, R. Bacon, J. Brinchman, J. Schaye, M. Maseda, P. M. Weilbacher, 2017, A&A, 606, A12.
 12. *The Lyman-Continuum Photon Production Efficiency ξ_{ion} of $z \sim 4-5$ Galaxies from IRAC-based H α Measurements: Implications for the Escape Fraction and Cosmic Reionization*
R.J. Bouwens, R. Smit, I. Labbe, M. Franx, **J. Caruana**, P. Oesch, M. Stefanon, N. Rasappu, 2016, ApJ, 831, 176.

13. *Ubiquitous giant Lyman α nebulae around the brightest quasars at $z \sim 3.5$ revealed with MUSE.*
E. Borisova, S. Cantalupo, S.J. Lilly, R.A. Marino, S.G. Gallego, R. Bacon,..., **J. Caruana**, et al., 2016, ApJ, 831, 39.
14. *Extended Lyman alpha haloes around individual high-redshift galaxies revealed by MUSE.*
L. Wisotzki, R. Bacon, J. Blaizot,..., **J. Caruana**, et al. 2015, A&A, 587, 98.
15. *Quantifying the UV continuum slopes of galaxies to $z \sim 10$ using deep Hubble+Spitzer/IRAC observations.*
S.M. Wilkins, R.J. Bouwens, P. Oesch, I. Labbe, M. Sargent, **J. Caruana**, J. Wardlow, S. Clay, W. Zheng, 2016, MNRAS, 455, 659.
16. *Cosmic reionization after Planck: The derived growth of the ionizing background now matches the growth of the galaxy UV luminosity density.*
R.J. Bouwens, R. J., G.D. Illingworth, P.A. Oesch, **J. Caruana**, B. Holwerda, R. Smit, S. Wilkins, 2015, ApJ, 811, 140.
17. *Spectroscopy of Galaxies in the Early Universe.*
J. Caruana, 2015, A&G, 56(3), 3.44-3.46.
18. *A MUSE map of the central Orion Nebula (M 42).*
P. Weilbacher, A. Monreal-Ibero, W. Kollatschny,..., **J. Caruana**, et al., 2015, A&A, 582, 114.
19. *The MUSE 3D view of the Hubble Deep Field South.*
R. Bacon, J. Brinchmann, J. Richard,..., **J. Caruana**, et al., 2015, A&A, 575, 75.
20. *Spectroscopy of $z \sim 7$ galaxies: Using Lyman-alpha to constrain the neutral fraction of hydrogen in the high-redshift universe.*
J. Caruana, A.J. Bunker, S.M. Wilkins, E.R. Stanway, S. Lorenzoni, M.J. Jarvis, & H.E. Elbert, 2014, MNRAS, 443, 2831.
21. *MUSE Commissioning.*
R. Bacon, J. Vernet, E. Borisova,..., **J. Caruana**, et al., 2014, The Messenger, 157, 13.
22. *Theoretical predictions for the effect of nebular emission on the broad band photometry of high-redshift galaxies.*
S.M. Wilkins, W. Coulton, **J. Caruana**, R. Croft, T. Di Matteo, N. Khandai, Y. Feng, A. J. Bunker, H. Elbert, 2013, MNRAS, 435, 2885.
23. *VLT/XSHOOTER & Subaru/MOIRCS Spectroscopy of HUDF-YD3: No Evidence for Lyman- α Emission at $z = 8.55$.*
A.J. Bunker, **J. Caruana**, S.M. Wilkins, E. R. Stanway, S. Lorenzoni, M. Lacy, M. J. Jarvis & S. Hickey, 2013, MNRAS, 430, 3314.
24. *Constraining the bright-end of the UV luminosity function for $z \approx 7 - 9$ galaxies: results from CANDELS/GOODS-South.*
S. Lorenzoni, A.J. Bunker, S.M. Wilkins, **J. Caruana**, E. R. Stanway, M. J. Jarvis, 2013, MNRAS, 429, 150.
25. *Spectroscopy of $z > 7$ sources using GEMINI/GNIRS and VLT/XSHOOTER.*
J. Caruana, A.J. Bunker, S.M. Wilkins, E.R. Stanway & S. Lorenzoni, 2012, MNRAS, 427, 3055.
26. *The UV Properties of Star Forming Galaxies I: HST WFC3 Observations of Very-high Redshift Galaxies.*
S. Wilkins, A. J. Bunker, E. Stanway, S. Lorenzoni, **J. Caruana**, 2011, MNRAS, 417, 717-729.

27. *Star-forming galaxies at $z \approx 8-9$ from Hubble Space Telescope/WFC3: implications for reionization.*
S. Lorenzoni, A. J. Bunker, S. Wilkins; E. Stanway; M. J. Jarvis; **J. Caruana**, 2011, MNRAS, 414, 1455.
28. *New star-forming galaxies at $z \approx 7$ from Wide Field Camera Three imaging.*
S. M. Wilkins, A. J. Bunker, S. Lorenzoni, **J. Caruana**, 2011, MNRAS, 411, 23-36.

AWARDED TELESCOPE TIME

- **Exploring Reionization and Interacting Systems at $z \sim 8$.**
ESO.0100.A-0870 (2017) 18 hours with XSHOOTER (VLT)
- **Probing the Chemical Composition of EELs.**
ESO.096.B-0632 (2016), XSHOOTER (VLT)
- **MUSE-Wide: A (not so) Shallow Survey in Deep Fields.**
(2012-2016) Bi-annual observing proposals for GTO with VLT/MUSE
- **MUSE-Deep: MUSE investigation of the Hubble Ultra Deep Field.**
(2012-2016) Bi-annual observing proposals for GTO with VLT/MUSE
- **HST/WFC3-GRISM Emission-Line Selected Galaxies - Ultra Metal Poor Galaxies at $z=0.5-1.5$**
GS-2012A-C-2 (through Gemini exchange time) (2012), 3 nights on Gemini South
- **Exploring reionization at $6 < z < 10$: Star Formation at the end of the dark ages.**
ESO.088.A-1013 (2011), 26 hours with FORS2 (VLT)
- **Exploring reionization at $6 < z < 10$: Star Formation at the end of the dark ages.**
ESO.086.A-0968 (2010), 13 hours with FORS2 (VLT), 18 hours with XSHOOTER (VLT)
- **Exploring reionization at $7 < z < 10$: Star Formation at the end of the dark ages.**
UK G/2010B/072 via Gemini exchange time (2010), 2 nights with MOIRCS (SUBARU)

ACADEMIC TALKS, CONFERENCES, MEETINGS & TRAINING SCHOOLS

- Participated in the forum *7th LE:NOTRE Landscape Forum: Gozo goes Landscape*, University of Malta (in cooperation with Anhalt University of Applied Sciences), Malta (March 2018) and contributed the talk: **Dwejra's skyscape.**
- Participated in the conference *The Role of Gas in Galaxy Dynamics*, University of Malta, Valletta, Malta (October 2017) and contributed the talk: **Probing galaxy formation and evolution with Lyman alpha emitters.**
- Participated in biannual/triannual MUSE consortium meetings (2013 - 2015) focused on both preparation for and exploitation of the MUSE instrument at the VLT and **contributed various specialised talks.**
- Participated in a high-redshift meeting at the University of Warwick, U.K. (April 2014) and contributed the talk: **Initial MUSE Results and Lyman-alpha at $z > 7$.**
- Participated in the conference *Lyman Alpha as an Astrophysical Tool*, NORDITA, Stockholm (September 2013) and contributed the talk: **Lyman-alpha at $z > 7$: Constraints on the Neutral fraction of Hydrogen.**
- Attended the EarLy UNiverse EXploration with NIRspec (ELIXIR) Network meeting 2011, Sterrenwachtlaan Leiden, Netherlands and contributed the talk: **Spectroscopic Analysis of Primeval Galaxy Candidates: Final Results** (November 2012).

- Attended the EarLy UnIverse EXploration with NIRSpec (ELIXIR) Network school ‘*Simulation of NIRSpec Observations*’, European Space Agency / European Space Research and Technology Centre (ESA/ESTEC), Noordwijk, Netherlands (September 2011).
- Attended the EarLy UnIverse EXploration with NIRSpec (ELIXIR) Network meeting 2011, Consejo Superior de Investigaciones Cientificas (CSIC), Madrid (October 2011) and contributed the talk:
Exploring the early universe through spectroscopy of distant galaxy candidates.
- Participated in the conference *Young & Bright*, Leibniz Institute for Astrophysics (AIP), Potsdam, Berlin (September 2011) and contributed the talk: **Spectroscopic Analysis of $z > 7$ galaxy candidates.**
- Participated in the *Feeding the Giants: ELTs in the ERA of Surveys* conference, Ischia, Naples (August 2011).
- Participated in the *New Horizons for High Redshifts* conference, Institute of Astronomy (IoA), Cambridge, UK (July 2011).
- Participated in the *Galaxy Formation* conference, University of Durham, UK (July 2011).
- Attended the EarLy UnIverse EXploration with NIRSpec (ELIXIR) Network school ‘*How does a Space Project Work?*’, European Space Agency / European Space Research and Technology Centre (ESA/ESTEC), Noordwijk, Netherlands (May 2011).
- Attended the EarLy UnIverse EXploration with NIRSpec (ELIXIR) Network meeting 2010 and NIRSpec Science Team meeting, Institut d’Astrophysique de Paris, France and contributed the talk: **Spectroscopic Analysis of Primeval Galaxy Candidates** (November 2010).
- Attended the 5th International Max Planck Research School for Astronomy and Cosmic Physics, University of Heidelberg (IMPRS-HD) on *The First Stars and Cosmic Reionization*, Heidelberg, Germany (September 2010).
- Attended the EarLy UnIverse EXploration with NIRSpec (ELIXIR) Network School ‘*JWST / NIRSpec Project*’, EADS/Astrium GmbH, Ottobrunn, Munich (May/June 2010).
- Attended the EarLy UnIverse EXploration with NIRSpec (ELIXIR) Network meeting 2009, Department of Astrophysics, University of Oxford and contributed the talk:
Non-supervised learning algorithms for spectroscopic analysis (December 2009).

TEACHING

- **Department of Physics, University of Malta:**
 - PHY3230: Nuclear Physics (2016)
 - PHY1160: Waves and Optics (2017-2018)
 - PHY3281: Introduction to Astronomy and Cosmology (2016 - present)
 - PHY1140: Electricity and Magnetism, and Optics (2017 - present)
 - PHY3110: Physical Optics (2018 -)
 - PHY3208: Short Review Paper and Philosophy of Science (2018 -)
 - PHY3289: Advanced Astrophysics & Cosmology (2020 -)
- **Mater Dei Hospital, Malta:**
 - Created and delivered a course on Decompression Theory for Hyperbaric Physicians (2017).

- **Christ Church, University of Oxford:**
Tutor in *Cosmology & General Relativity* (2011-2012).
- **MEDE, Malta:**
 - Lecture at the Continuous Professional Development (CPD) training course for teachers of Physics (2017-present).
 - Lectured at the In-Service Training Course for teachers of Physics, Mathematics and Science with the aim of gearing them in teaching astronomy to secondary school students. I delivered lectures and created accompanying workshops as part of the course (Malta, 2007-2008).

STUDENT SUPERVISION

- **Supervisor / Member of supervision panel** (University of Malta) for:
 - **Doctoral students:**
 - Gabriel Farrugia, *Modified Gravity: Cosmological Tests* (Oct 2015 - Sep 2019)
 - **MSc students:**
 - Karl Fiteni [Supervisor], *The impact of bars on stellar density profiles* (Oct 2017 - Oct 2018)
 - Filippos Nachmias, *Extended Theories of Gravity in Compact Stars* (Oct 2016 - Oct 2018)
 - Mark Pace, *Extreme Stars in Modified Gravity* (Oct 2015 - Mar 2017)
 - **Undergraduate Students (final-year project):**
 - Karl Fiteni [Supervisor]
Obtaining Variable Star Light-Curves with a View to Characterise Equipment Feasibility for Future Time Series Photometric Studies (2016 - 2017)
 - Ryan Vella [Supervisor]
Assessing the Night-Sky Brightness of the Maltese Islands (2017 - 2018)
- **Co-supervisor** for one semester of 1st year PhD student (data reduction using VLT/FORS2), AIP, Potsdam (2012-2013).

SCIENCE OUTREACH

- **Member of the Outreach Committee** of the Faculty of Science, University of Malta.
- **Supervisor / Mentor** of students participating in the *Go4Research* Summer Internship at the Department of Physics and ISSA, University of Malta (2017-).
- Over the past 5 years, I **have given several popular astronomy talks (in excess of 55)** for a number of societies and associations, and have contributed a number of articles for magazines, newspapers, and other public media.
- Was heavily involved in **teaching astronomy** for programs of the Oxford Department of Astrophysics outreach group. I have given talks as part of the outreach programme, served as telescope operator for some of the organized events (2009 - 2012), assisted with the annual *Stargazing Oxford* event, and written articles for the online department blog.
- **Videographer for *Lab, Camera, Action***, a series of physics outreach videos for the University of Oxford (videos available online on YouTube).

- Have **participated in the organization of the UNIQ Academic Physics Summer School at the University of Oxford** and delivered a talk as part of the school (2010).
- Have **participated in several news features** and other programme series in Malta to discuss and explain current research for a lay audience.
- Have **organised and participated in numerous night-sky viewing events** (both of my own initiative and in collaboration with societies/organisations, such as The Astronomical Society of Malta).
- Have **designed posters and artwork** for several popular astronomy events, professional conferences and talks.
- Experienced in **designing and implementing websites** using HTML and Adobe Flash.

EXAMINING BOARDS

- **Doctoral students:**
 - Deandra Cutajar (Examiner, 2017)
Bayesian Data Analysis Techniques in Noisy Environments
 - Ian Fenech Conti (Examiner, 2017)
Point spread function modelling and shear calibration for weak lensing surveys
- **Masters students:**
 - Julian Bonello (Examiner, 2018)
Effects of Temperature, Hydration and Perfusion on Biological Tissue Dielectric Properties
 - Bernard Costa (Examiner, 2018)
Identification & Reconstruction of Particle Collision Events in the ALICE Experiment at CERN
 - Filippos Nachmias (Examiner, 2018)
Modified Theories of Galaxies in Compact Stars
 - Mark Pace (Examiner, 2017)
Extreme Stars in Modified Gravity

REFEREEING WORK

- Referee for the *Astrophysical Journal (ApJ)*.
- Referee for the *Monthly Notices of the Royal Astronomical Society (MNRAS)*.
- Reviewer of grant applications of the Leverhulme Trust.

BOARD & COMMITTEE WORK

- **Academic**
 - **Member of the Board of Studies**, Faculty of Science, University of Malta (2016-present).
 - **Member of the Board**, Institute of Space Sciences & Astronomy (ISSA), University of Malta (2014-present).
 - **Coordinator** for the restructuring of the physics undergraduate programme & curriculum (2016-2017).

- **Member of the Local Organising Committee** for the international conference “Gravity@Malta 2018: COST Action “Gravitational Waves, Black Holes and Fundamental Physics” .
 - **Member of the Local Organising Committee** for the international conference “The Role of Gas in Galaxy Dynamics”, Malta (2017).
 - **Chair of the Scientific Organising Committee** for the international conference “Signals from the Deep Past: Unveiling Early Cosmic Structures”, Malta (2016).
 - **Co-chair of the European Week of Astronomy Special Session** “Theory and Observation of the First Galaxies”, Tenerife (2015).
 - **Member of the Local Organising Committee** for the international conference “Square Kilometre Array Design Studies (SKADS)”, Malta (2009).
 - **Member of the Local Organising Committee** for the international conference “Hunting for the Dark: The Hidden Side of Galaxy Formation”, Malta (2009).
 - **Committee member** of *The International Year of Astronomy 2009 (IYA2009)* Malta national node committee (2008-2010).
 - **Committee member** of *The Astronomical Society of Malta*, serving the roles of Assistant-PRO and webmaster (2004-2009).
- **Other**
 - **Committee chair** of Dwejra Stakeholders Forum (2016 - present).
 - **Observing member** of Dwejra Steering Committee (2016 - present).
 - **Committee member** of The Graduate Common Room of Christ Church, University of Oxford (2011).
 - **Committee member** of *Friends of the Earth* (Malta), serving the role of newsletter editor (2005-2007).

MEMBERSHIP OF PROFESSIONAL BODIES

- Fellow of the Royal Astronomical Society
- Associate Member of the Institute of Physics

LANGUAGES

- Maltese & English (both 1st languages)
- Italian (Fluent in reading, writing and speaking)
- German (Fair)

HOBBIES & INTERESTS

- Photography (extensively published in books, websites, and magazines, including in National Geographic Traveler)
- Cinematography (have produced numerous short features, including the (international) award-winning video *Diving Gozo*)
- Scuba Diving (Certifications: Rescue Diver, Advanced Nitrox & Decompression Procedures, JJ-CCR Air Diluent Decompression Diver, JJ-CCR Mixed Gas Diver)
- Piano playing

- Reading
- Website & computer graphic design (commissioned for various projects)

REFEREES

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