

# MARUŠA BRADAC

Professor of Physics

## CONTACT

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## PROFILE

Originally from Slovenia, Maruša is now a physics professor at UC Davis. Her research includes studying the composition of the Universe, her specialty being properties of dark matter, the elusive "stuff" that makes up a quarter of the universe. . Maruša also studies first galaxies that formed in the Universe. The tools of her trade are telescopes in space (James Webb Space Telescope, Hubble Space Telescope, Spitzer Space Telescope) and on the ground in Hawaii (Keck).

Maruša uniquely combines her passion for the Universe with her outdoor loves of skiing, surfing and mountain biking. She is passionate about her research and is committed to provide the best possible education for her students. The one thing that excites her even more than her own research and the outdoors is seeing young and bright minds excited about the world around them.



## WORK EXPERIENCE

**Full Professor** 07/2019-present  
*UC DAVIS DEPARTMENT OF PHYSICS AND ASTRONOMY*

**Associate Professor** 07/2013-06/2019  
*UC DAVIS DEPARTMENT OF PHYSICS AND ASTRONOMY*  
07/2009-06/2013

**Assistant Professor**  
*UC DAVIS DEPARTMENT OF PHYSICS AND ASTRONOMY*

**Hubble Fellow** 09/2007-07/2009  
*UC SANTA BARBARA, SANTA BARBARA*

**Postdoc position** 11/2004-08/2007  
*KIPAC, STANFORD*

**Ph.D. Research Assistant** 11/2002-10/2004  
*UNIVERSITY OF BONN, MAX PLANCK RESEARCH SCHOOL*



## EDUCATION

**PhD in Physics/Astronomy (Prof. Peter Schneider)** 2001-2004  
*University of Bonn, Germany*

**Masters Degree in Physics** 1998-2001  
*University of Bonn, Germany*

**Bachelors Degree in Physics** 1996-1998  
*University of Ljubljana*



## AWARDS

**UC Davis Chancellor Fellowship** 2015-present

**UC Davis Hellman Fellowship Program Award** 2011-2012

**Hubble Postdoctoral Fellowship (major postdoctoral award in the field of Astrophysics and Cosmology)** 2007-2009

**IMPRS Fellow (PhD program at MPIfR in Bonn)** 2002-2004

**BIPP scholarship (Bonn International Physics Program)** 1999-2001

**ZOISS scholarship (scholarship awarded by Slovenian Government)** 1992-2001



## SELECTED PUBLICATIONS

1. **M. Bradač**. The high-redshift Universe with Spitzer. *Nature Astronomy Review*, 4:478-485, May 2020. doi: 10.1038/s41550-020-1104-5
2. **V. Strait\***, **M. Bradač**, D. Coe, L. Bradley, B. Salmon, B. Lemaux, K.-H. Huang, A. Zitrin, K. Sharon, A. Acebron, F. Andrade-Santos, R. Avila, B. Frye, A. Hoag, G. Mahler, M. Nonino, S. Ogaz, M. Oguri, M. Ouchi, and D. Pelliccia. Stellar properties of  $z \approx 8$  galaxies in the reionization lensing cluster survey. *The Astrophysical Journal*, 888:124, 01 2020. doi: 10.3847/1538-4357/ab5daf.
3. **M. Bradač**, K.-H. Huang, A. Fontana, M. Castellano, E. Merlin, R. Amorn, A. Hoag, V., Strait, P. Santini, R. E. Ryan, S. Casertano, B. C. Lemaux, L. M. Lubin, K. B. Schmidt, T. Schrabback, T. Treu, A. von der Linden, C., A. Mason, and X. Wang.: Hubble Frontier Field photometric catalogues of Abell 370 and RXC J2248.7-4431: *MNRAS*, 489 (1):99107, Oct 2019. doi: 10.1093/mnras/stz2119
4. **A. Hoag\***, **M. Bradač**, M. Trenti, T. Treu, K. B. Schmidt, K.-H. Huang, B. C. Lemaux, J. He, S. R. Bernard, L. E. Abramson, C. A. Mason, T. Morishita, L. Pentericci, and T. Schrabback. Spectroscopic confirmation of an ultra-faint galaxy at the epoch of reionization. *Nature Astronomy*, 1:0091, April 2017. doi: 10.1038/s41550-017-0091
5. **M. Bradač**, D. Garcia-Appadoo, K.-H. Huang, L. Vallini, E. Quinn Finney, A. Hoag, B. C. Lemaux, K. Borello Schmidt, T. Treu, C. Carilli, M. Dijkstra, A. Ferrara, A. Fontana, T. Jones, R. Ryan, J. Wagg, and A. H. Gonzalez. ALMA [C II] 158m Detection of a Redshift 7 Lensed Galaxy behind RXJ1347.1-1145. *ApJ Letters*, 836:L2, February 2017. doi: 10.3847/2041-8213/836/1/L2
6. **M. Bradač**, R. Ryan, S. Casertano, K. H. Huang, B. C. Lemaux, T. Schrabback, A. H. Gonzalez, S. Allen, B. Cain, M. Gladders, N. Hall, H. Hildebrandt, J. Hinz, A. von der Linden, L. Lubin, T. Treu, and D. Zaritsky. Spitzer Ultra Faint SURvey Program (SURFS UP) I: An Overview. *ApJ*, 785:108, April 2014
7. **M. Bradač**, E. Vanzella, N. Hall, T. Treu, A. Fontana, A. H. Gonzalez, D. Clowe, D. Zaritsky, M. Stiavelli, and B. Clement. Spectroscopic Confirmation of a  $z = 6.74$  Galaxy behind the Bullet Cluster. *ApJ Letters*, 755:L7, Aug 2012
8. **M. Bradač**, T. Treu, D. Applegate, A. H. Gonzalez, D. Clowe, W. Forman, C. Jones, P. Marshall, P. Schneider, and D. Zaritsky. Focusing Cosmic Telescopes: Exploring Redshift  $z \sim 5 - 6$  Galaxies with the Bullet Cluster. *ApJ*, 706:1201-1212, Dec 2009.
9. **M. Bradač**, S. W. Allen, T. Treu, H. Ebeling, R. Massey, R. G. Morris, A. von der Linden, and D. Applegate. Revealing the Properties of Dark Matter in the Merging Cluster MACS J0025.4-1222. *ApJ*, 687:959-967, November 2008
10. **M. Bradač**, D. Clowe, A. Gonzalez, P. Marshall, W. Forman, C. Jones, M. Markevitch, S. Randall, T. Schrabback, and D. Zaritsky. Strong and weak lensing united III: the cluster mass distribution of the merging cluster 1E0657-56. *ApJ*, 652:937-951, December 2006
11. D. Clowe, **M. Bradač**, A. H. Gonzalez, M. Markevitch, S. W. Randall, C. Jones, and D. Zaritsky. A Direct Empirical Proof of the Existence of Dark Matter. *ApJ Letters*, 648:L109-L113, Sep 2006

## CURRENT RESEARCH

Among the most critical questions facing science right now concern the history and the future of our Universe. Chief among them, what is dark matter? What are its physical properties? How does it fit into the particle physics model? Furthermore, how and when did the first galaxies form? How did they evolve into our galaxy, the Milky Way? The simple answer is that we still do not know. To close these knowledge gaps in the past ten years I have used a comprehensive study of galaxy clusters; that serve both as dark matter laboratories and as cosmic telescopes that magnify the most distant galaxies formed at the cosmic dawn.

I use the best space telescopes, Spitzer, Hubble Space Telescope HST, and the new James Webb Space Telescope JWST. I have been awarded many large projects, including a large Spitzer Exploration Science Program, National Science Foundation (NSF) project and NASA/ADAP program. I am also part of the JWST guaranteed observing time team, where I have developed a science case for one of the four instruments (NIRISS) on-board JWST. It will be a prime future facility in the study of the first galaxies.

## PUBLICATIONS

- 86 papers published in the top refereed journals in the field (Nature Astronomy, Science, Astrophysical Journal Letters, Astrophysical Journal, Monthly Notices of Royal Astronomical Society, Astronomy and Astrophysics)
- 24 papers were "first author" by myself or my graduate students.
- H-index 38 (source NASA ADS)

## MEDIA COVERAGE, INVITED TALKS

My results have been covered in high visibility media, among others the New York Times (including editorial), National Geographic, and BBC. Several press releases have been made with the latest results using Keck Telescopes, Spitzer, and HST. The iconic picture of the Bullet Cluster is now seen in the many mainstream media outlets, from the cover image in National Geographic to the appearance in the popular comedy "The Big Bang Theory". The result remains the most important direct evidence that dark matter exists to date. I have had several invited speaking engagements at two TEDx events and the most prestigious universities and conferences. In the last ten years I have given 85 invited talks all over the world.



## ACTIVE GRANTS

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1. PI: COLLABORATIVE RESEARCH: The Final Frontier: Spectroscopic Probes of Galaxies at the Epoch of Reionization, National Science Foundation, \$351,938, 08/15/2018 - 07/31/2021
2. PI: SRELICS of the Cosmic Dawn, NASA ADAP Program, \$299,733, 07/01/2018 - 6/30/2021
3. co-PI: RELICS: Unveiling the Most Distant Lensed Arc at  $z \sim 10$ , NASA STScI, \$55,244, 06/01/2020 - 05/31/2021
4. PI: Conference for Undergraduate Women in Physics (CUWiP) at UC Davis, Heising Simons Foundation, \$34,960, 11/1/2018 to 6/30/2020
5. co-PI: RELICS: Reionization Lensing Cluster Survey, Space Telescope Science Institute, \$65,386, 12/01/2015 - 11/30/2019
6. PI: RELICS of the Cosmic Dawn, Jet Propulsion Laboratory, \$100,000, 03/19/2019 to 9/20/2020



## TELESCOPE TIME

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1. Spitzer DDT proposals PI Cycle 13-14: SRELICS: Reionization Lensing Cluster Survey, 900 hours with Spitzer Space Telescope
2. Spitzer Cycle 9 PI: Spitzer UltraFaint Survey {SURF's Up}: 550 hours with Spitzer Space Telescope
3. Spitzer Cycle 12: PI RELICS: Reionization Lensing Cluster Survey, Spitzer Space Telescope
4. ALMA Cycle 3: PI: ALMA: CII at  $z \sim 7$ , National Radio Astronomy Observatory, 3 hours
5. HST Cycle 21 proposal 13235: Breaking Cosmic Dawn: Focusing Cosmic Telescopes To Observe The  $z > \sim 7$  Universe 6 Orbits
6. HST Cycle 20 proposal 13177: Spitzer UltraFaint Survey {SURF'S Up}: Cluster Lensing and Spitzer Extreme Imaging Reaching Out to  $z \sim 7$  13 prime + 13 parallel orbits
7. HST Cycle 16 proposal 11099: A silver bullet for the sources of reionization, 45 Orbits
8. HST Cycle 16 proposal 11100: Two new 'bullets' for MOND: revealing the properties of dark matter in massive merging clusters, 16 prime + 16 parallel orbits
9. 2012A-2020B: KECK; consistent award of 2-5 nights per semester

\*only current grants are listed

\*\*only recent large allocations are listed