

# Jasleen Matharu

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## Research Interests

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GALAXY EVOLUTION • GALAXY CLUSTERS • HIGH-REDSHIFT GALAXIES • STAR FORMATION • QUENCH-  
ING • GALAXY GROWTH • COSMIC REIONISATION

## Computer Languages

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PYTHON • OBJECT ORIENTED PROGRAMMING • BASH • GIT • L<sup>A</sup>T<sub>E</sub>X • HTML • MARK-  
DOWN • RESTRUCTUREDTEXT

## Specialised Skills

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### GRISM REDSHIFT & LINE ANALYSIS SOFTWARE (GRIZLI)

- Creator, Author and Editor of “Grizli for Dummies”, an unofficial guide to using Grizli.

### GALFIT

- Experienced in two-dimensional model fitting of galaxy light profiles with GALFIT.

## Professional Appointments

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### DAWN Fellow

*Cosmic Dawn Center, Niels  
Bohr Institute, University of  
Copenhagen*

THE FIRST HIGH RESOLUTION VIEW OF GALAXY EVOLUTION IN THE  
EARLIEST GALAXIES WITH JWST SLITLESS SPECTROSCOPY

*Sep 2022 - present*

### Postdoctoral Research Associate

*Department of Physics &  
Astronomy, Texas A&M  
University*

FORMATION AND EVOLUTION OF GALAXIES AND COSMIC REIONISATION

*Sep 2019 - present*

- Supervisors: Prof. Casey Papovich & Prof. Robert Kennicutt

## Education

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### Institute of Astronomy, University of Cambridge

*Cambridgeshire, UK*

#### PHD ASTRONOMY

*Oct 2015 - Jul 2019*

*Awarded: 30th Nov 2019*

- Thesis title: *A Study on Quenching and Galaxy Growth in  $z \sim 1$  Clusters using HST WFC3 Grism Observations*
- Primary Supervisor: Dr. Adam Muzzin
- Primary Supervisor (Cambridge): Prof. Paul C. Hewett
- Secondary Supervisor (Cambridge): Dr. Matthew Auger

### University College London (UCL)

*Gower Street, London, UK*

#### MSci ASTROPHYSICS (FIRST CLASS HONOURS)

*Sep 2011 - Aug 2015*

- Masters Project: *Testing Cosmic Microwave Background Delensing*
- Primary Supervisor (nominal): Prof. Hiranya Peiris
- Secondary Supervisor: Dr Aurélien Benoit-Lévy

## Professional Experience

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### PEER REVIEW

- 2021- Referee for *Monthly Notices of the Royal Astronomical Society*, *The Astrophysical Journal*
- 2020- Referee for *Astronomy & Astrophysics*

### PROPOSAL REVIEW

- Cycle 9 Reviewer for ALMA observing proposals
- 2022B NOIRLab Time Allocation Committee Member (Extragalactic Astronomy)
- 2021B Referee for *Gemini* observing proposals
- Cycle 29 External Reviewer for *Hubble Space Telescope* observing proposals
- Cycle 8 Reviewer for ALMA observing proposals

## Publication Statistics

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### LAST UPDATED 7TH SEPTEMBER 2022

- Refereed first author publications: 3, total citations: 49
- Refereed total publications: 12, total citations: 183
- H-index: 7

## Publications

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### REFEREED

- Tan, V. Y. Y., Muzzin, A., Marsan, Z.C., Sok, V., Alcorn, L.Y., **Matharu, J.**, Shipley, H., Marchesini, D., Nedkova, K.V., Martis, N., van der Wel, A. and Whitaker, K.E. 2022, “Resolved stellar mass profiles of galaxies in the Hubble Frontier Fields”. Accepted for publication in *The Astrophysical Journal*. arXiv:2205.07913.
- Jung, I., Papovich, C., Finklestein, S.L., Simons, R.C., Estrada-Carpenter, V., Backhaus, B.E., Cleri, N. J., Finlator, K., Gialalisco, M., Ji, Z., **Matharu, J.**, Momcheva, I., Straughn, Amber N. and Trump, J.R. 2021, “CLEAR: Boosted Lyman-Alpha Transmission of the Intergalactic Medium in UV bright Galaxies”. Accepted for publication in *The Astrophysical Journal*. arXiv:2111.14863.
- Cleri, N. J., Trump, J.R., Backhaus, B.E., Momcheva, I., Papovich, C., Simons, R.C., Weiner, B., Estrada-Carpenter, V., Finklestein, S.L., Gialalisco, M., Ji, Z., Jung, I., **Matharu, J.**, Martinez, F. III. and Sturm, M.R. 2020, “CLEAR: Paschen-Beta Star Formation Rates and Dust Attenuation of Low Redshift Galaxies”. Published in *The Astrophysical Journal*, Volume 929, Issue 1, id.3.
- Backhaus, B.E., Trump, J.R., Cleri, N. J., Simons, R.C., Papovich, C., Momcheva, I., Estrada-Carpenter, V., Finklestein, S.L., **Matharu, J.**, Ji, Z., Weiner, B., Gialalisco, M. and Jung, I. 2021, “CLEAR: Emission Line Ratios at Cosmic High Noon”. Published in *The Astrophysical Journal*, Volume 926, Issue 2, id.161.
- Matharu, J.**, Muzzin, A., Brammer, G.B., Nelson, E.J., Auger, A.W., Hewett, P.C., van der Burg, R.F.J., Balogh, M., Demarco, R., Marchesini, D., Noble, A.G., Rudnick, G., van der Wel, A., Wilson, G. and Yee, H.K.C. 2021. “HST/WFC3 grism observations of  $z \sim 1$  clusters: Evidence for rapid outside-in environmental quenching from spatially resolved H-Alpha maps”. Published in *The Astrophysical Journal*, Volume 923, Issue 2, id.222.
- Simons, R.C., Papovich, C., Momcheva, I., Trump, J.R., Brammer, G.B., Estrada-Carpenter, V., Backhaus, B.E., Cleri, N. J., Finklestein, S.L., Gialalisco, M., Ji, Z., Jung, I., **Matharu, J.** and Weiner, B. 2020. “CLEAR: The Gas-Phase Metallicity Gradients of Star-Forming Galaxies at  $0.6 < z < 2.6$ ”. Accepted for Publication in *The Astrophysical Journal*, arXiv:2011.03553.

- Balogh, M., van der Burg, R.F.J., Muzzin, A., Rudnick, G., Wilson, G., Webb, K., Biviano, A., Boak, K., Cerulo, P., Chan, J.C.C., Cooper, M.C., Gilbank, D.G., Gwyn, S., Lidman, C., **Matharu, J.**, McGee, S.L., Old, L., Pintos-Castro, I., Reeves, A.M.M., Shipley, H., Vulcani, B., Yee, H.K.C., Alonso, M.V., Bellhouse, C., Cooke, K.C., Davidson, A., De Lucia, G., Demarco, R., Drakos, N., Fillingham, S.P., Finoguenov, A., Forrest, B., Golledge, C., Jablonka, P., Garcia, D.L., McNab, K., Muriel, H., Nantais, J.B., Noble, A., Parker, L.C., Petter, G., Poggianti, B.M., Townsend, M., Valotto, C., Webb, T., and Zaritsky, D. 2021, “The GOGREEN and GCLASS Surveys: First Data Release”. Published in *Monthly Notices of the Royal Astronomical Society*, Volume 500, Issue 1, Pages 358–387.
- Ni, Q., Brandt, W. N., Yang, G., Leja, J., Chen, C. -T. J., Luo, B., **Matharu, J.**, Sun, M., Vito, F., Xue, Y. Q., Zhang, K., 2020, “Revealing the relation between black-hole growth and host-galaxy compactness among star-forming galaxies”. Published in *Monthly Notices of the Royal Astronomical Society*, Volume 500, Issue 4, Pages 4989–5008.
- Estrada-Carpenter, V., Papovich, C., Momcheva, I., Brammer, G.B., Simons, R., Bridge, J., Cleri, N., Ferguson, H., Finklestein, S.L., Giavalisco, M., Jung, I., **Matharu, J.**, Trump, J. and Weiner, B. 2020, “CLEAR II: Evidence for Early Formation of the Most Compact Quiescent Galaxies at High Redshift”. Published in *The Astrophysical Journal*, Volume 898, Issue 2, article id. 171.
- Matharu, J.**, Muzzin, A., Brammer, G.B., van der Burg, R.F.J., Auger, M.W., Hewett, P.C., van der Wel, A., van Dokkum, P., Chan, J.C.C., Demarco, R., Marchesini, D., Nelson, E.J., Noble, A.G. and Wilson, G. 2020, “HST/WFC3 grism observations of  $z \sim 1$  clusters: evidence for evolution in the mass–size relation of quiescent galaxies from poststarburst galaxies”. Published in *Monthly Notices of the Royal Astronomical Society*, Volume 493, Issue 4, Pages 6011–6032.
- Matharu, J.**, Muzzin, A., Brammer, G.B., van der Burg, R.F.J., Auger, M.W., Hewett, P.C., van der Wel, A., van Dokkum, P., Balogh, M., Chan, J.C.C., Demarco, R., Marchesini, D., Nelson, E.J., Noble, A.G., Wilson, G. and Yee, H.K.C. 2019, “HST/WFC3 grism observations of  $z \sim 1$  clusters: The cluster versus field stellar mass–size relation and evidence for size growth of quiescent galaxies from minor mergers”. Published in *Monthly Notices of the Royal Astronomical Society*, Volume 484, Issue 1, Pages 595–617.
- Noble, A.G., Muzzin, A., McDonald, M., Rudnick, G., **Matharu, J.**, Cooper, M.C., Demarco, R., Lidman, C., Nantais, J., van Kampen, E., Webb, T.M.A., Wilson, G. and Yee, H.K.C. 2019, “Resolving CO(2-1) in  $z \sim 1.6$  Gas-Rich Cluster Galaxies with ALMA: Rotating Molecular Gas Disks with Possible Signatures of Gas Stripping”. Published in *The Astrophysical Journal*, Volume 870, Issue 2, article id. 56.

## SOFTWARE

- Brammer, G., Strait, V., **Matharu, J.** and Momcheva, I., 2022. “Grizli”. Published on Zenodo. DOI: 10.5281/zenodo.1146904.
- Brammer, Gabe and **Matharu, Jasleen**, 2021. “Grizli: Release 2021”. Published on Zenodo. DOI: 10.5281/zenodo.5012699.

## IN REVIEW

- Matharu, J.**, Papovich, C., Momcheva, I., Simons, R.C., Brammer, G.B., Ji, Z., Backhaus, B.E., Cleri, N. J., Estrada-Carpenter, V., Finklestein, S.L., Finlator, K., Giavalisco, M., Jung, I., Muzzin, A., Pillepich, A., Trump, J.R., Weiner, B. 2022 “CLEAR: The Evolution of Spatially Resolved Star Formation in Galaxies between  $0.5 \lesssim z \lesssim 1.7$  using H $\alpha$  Emission Line Maps”. Submitted for publication in *The Astrophysical Journal*. arXiv:2205.08543.
- Papovich, C., Simons, R.C., Estrada-Carpenter, V., **Matharu, J.**, Momcheva, I., Trump, J.R., Backhaus, B.E., Brammer, G.B., Cleri, N. J., Finklestein, S.L., Giavalisco, M., Ji, Z., Jung, I., Kewley, L.J., Nicholls, D.C., Pirzkal, N., Rafelski, M. and Weiner B. 2022 “CLEAR: The Ionization and Chemical-Enrichment Properties of Galaxies at  $1.1 < z < 2.3$ ”. Submitted for publication in *The Astrophysical Journal*. arXiv:2205.05090.

## Presentations

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### COLLOQUIA

- [COVID-19][Invited][Given in-person]** 6th Jun 2022. *Revealing how Star Formation and Quenching proceed in High Redshift Galaxies with Spatially Resolved Space-based Slitless Spectroscopy*. University of Oxford, Oxfordshire, UK.
- [COVID-19][Invited]** 22nd Oct 2021. *Revealing how Galaxy Growth, Star Formation and Quenching Proceed in High Redshift Galaxies with Spatially Resolved Space-based Slitless Spectroscopy*. University of Louisville, Kentucky, USA.
- [COVID-19][Invited][Given in-person]** 16th Sep 2021. *Revealing how Galaxy Growth, Star Formation and Quenching Proceed in High Redshift Galaxies with Spatially Resolved Space-based Slitless Spectroscopy*. Steward Observatory/NSF NOIR Lab, University of Arizona, Tucson, Arizona, USA.

### SEMINARS

- [COVID-19][Invited]** 24th Jun 2022. *Revealing how Star Formation and Quenching proceed in High Redshift Galaxies with Spatially Resolved Space-based Slitless Spectroscopy*. Seminar, Arizona State University, Tempe, USA.
- [COVID-19][Given in-person]** 25th Apr 2022. *Revealing how Star Formation and Quenching proceed in High Redshift Galaxies with Spatially Resolved Space-based Slitless Spectroscopy*. Seminar, University of California, San Diego, USA.
- [COVID-19]** 29th Sep 2021. *Revealing how Galaxy Growth, Star Formation and Quenching proceed in High Redshift Galaxies with Spatially Resolved Space-based Slitless Spectroscopy*. Seminar, University of Nottingham, UK.
- [COVID-19]** 21st Sep 2021. *Revealing how Galaxy Growth, Star Formation and Quenching proceed in High Redshift Galaxies with Spatially Resolved Space-based Slitless Spectroscopy*. Extragalactic Group Seminar, University of Edinburgh, UK.
- [COVID-19]** 9th Sep 2021. *Revealing how Galaxy Growth, Star Formation and Quenching Proceed in High Redshift Galaxies with Spatially Resolved Space-based Slitless Spectroscopy*. School of Physical Sciences Seminar, The Open University, Milton Keynes, UK.
- [COVID-19]** 17th Jun 2021. *The Role of Galaxy Clusters in Shaping the Size Growth and Quenching of Galaxies*. Galaxy Cluster Formation II Workshop, European Southern Observatory, Garching, Germany and Harvard-Smithsonian Centre for Astrophysics, Cambridge, USA.
- [COVID-19]** 18th May 2021. *Spatially resolved star formation in different environments between  $0.5 < z < 1.7$  with HST WFC3 slitless spectroscopy*. Multi-Object Spectroscopy for Statistical Measures of Galaxy Evolution Workshop, Space Telescope Science Institute, Baltimore, USA.
- [COVID-19][Invited]** 26th Feb 2021. *Tracing star formation in galaxies using spatially resolved H-Alpha emission line maps*. Joint Nuclear and Astrophysics Seminar, Texas A&M University, College Station, TX, USA.
- [COVID-19][Invited]** 25th Jan 2021. *The Role of Galaxy Clusters in Shaping the Size Growth and Quenching of Galaxies*. Extragalactic/Cosmology Seminar, University of Texas at Austin, TX, USA.
- [COVID-19]** 15th Jan 2021. *The Role of Galaxy Clusters in Shaping the Size Growth and Quenching of Galaxies*. 237th Meeting of the American Astronomical Society, virtually anywhere.
- [COVID-19][Invited]** 21st Sep 2020. *The Role of Galaxy Clusters in Shaping the Size Growth and Quenching of Galaxies*. Mitchell Institute Seminar, Mitchell Institute for Fundamental Physics and Astronomy, Texas A&M University, College Station, TX, USA.

- [COVID-19]** 17th Aug 2020. *New results from spatially resolved studies with space-based slitless spectroscopy*. Texas A&M Astrosymposium, Mitchell Institute for Fundamental Physics and Astronomy, Texas A&M University, College Station, TX, USA.
- [COVID-19]** 31st Jul 2020. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth and quenching*. Lunch talk, Space Telescope Science Institute, Baltimore, USA.
- [COVID-19]** 1st Jul 2020. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth and quenching*. European Astronomical Society Annual Meeting 2020, Leiden, The Netherlands (virtual conference).
- 10th Feb 2020. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth and quenching*. Aspen Winter Conference: Galaxy Quenching and Transformation Throughout Cosmic Time, Aspen Center for Physics, Aspen, Colorado, USA.
- Oct 2019. *Understanding Environmental Quenching at High-redshift*. Extragalactic Lunch, Mitchell Institute for Fundamental Physics and Astronomy, Texas A&M University, College Station, TX, USA.
- [Invited]** Jun 2019. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth and quenching*. CLEAR Collaboration meeting, Space Telescope Science Institute, Baltimore, USA.
- Oct 2018. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth with decreasing redshift*. Dunlap tea, Dunlap Institute for Astronomy & Astrophysics, University of Toronto, Canada.
- Oct 2018. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth with decreasing redshift*. Astrophysics Brown Bag Lunch talk, MIT Kavli Institute for Astrophysics and Space Research, Cambridge, USA.
- Oct 2018. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth with decreasing redshift*. Lars Hernquist's group meeting, Harvard-Smithsonian Center for Astrophysics, Cambridge, USA.
- Oct 2018. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth with decreasing redshift*. ITC Lunch, Institute for Theory and Computation, Harvard-Smithsonian Center for Astrophysics, Cambridge, USA.
- Oct 2018. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth with decreasing redshift*. Lunch talk, Yale University, New Haven, USA.
- Oct 2018. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth with decreasing redshift*. Lunch talk, Space Telescope Science Institute, Baltimore, USA.
- Sep 2018. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth with decreasing redshift*. Lunch talk, University of Nottingham, Nottingham, UK
- Sep 2018. *The cluster vs. field stellar mass-size relation at  $z \sim 1$ : implications for galaxy size growth with decreasing redshift*. Lunch talk, Leiden Observatory, Leiden, The Netherlands.
- Jun 2017. *Galaxy Evolution & the Mass-Size Relation in  $z \sim 1$  Clusters*. Galaxy Evolution Across Time Conference, Paris, France.
- Feb 2017. *The shut down of star formation in galaxies at  $z \sim 1$ : obtaining direct evidence for its environmental dependence*. Seminar, Institute of Astronomy, Cambridge, UK.

## Observing Experience

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- PAUCam, assisted Nina Hatch

## Awards & Grants

Oct 2018	<b>Churchill College Travel Grant Award</b> , Talks Tour to present PhD work, Nottingham (UK), Leiden (The Netherlands), Baltimore, New Haven, Cambridge (USA) and Toronto (Canada)	£ 250
May 2017	<b>Churchill College Travel Grant Award</b> , Conference on Galaxy Evolution Across Time, Paris (France)	£ 250
Oct 2015	<b>Science and Technology Facilities Council (STFC) Quota Award</b> , to undertake research in Astrophysics at the Institute of Astronomy, Cambridge for up to 3.5 years	

## Teaching Experience

2016- 2017	Maths IA Supervisor, Churchill College, University of Cambridge
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## Observing Proposals

Cycle 8	<b>Co-I</b> , (PI: Noble), Atacama Large Millimeter/submillimeter Array 2021.1.01257.S, <i>Toward a Spatially-resolved Molecular Kennicutt-Schmidt Law in High-z Cluster Galaxies with ALMA</i>	
Cycle 8	<b>Co-I</b> , (PI: Noble), Atacama Large Millimeter/submillimeter Array 2021.1.01002.S, <i>Detailed Gas Kinematics and Morphologies of the Highest-redshift Jellyfish Galaxy Candidates at <math>z=1.6</math></i>	
Cycle 8	<b>Co-I</b> , (PI: Simons), Atacama Large Millimeter/submillimeter Array 2021.1.01188.S, <i>CO Kinematics at Cosmic Noon: Timing the Redistribution of Metals Around Galaxies</i>	23.1 hrs
Cycle 1	<b>Co-I</b> , (PI: Finkelstein), James Webb Space Telescope GO #2079, <i>The Webb Deep Extragalactic Exploratory Public (WDEEP) Survey: Feedback in Low-Mass Galaxies from Cosmic Dawn to Dusk</i>	121.8 hrs
Cycle 28	<b>Co-I</b> , (PI: Noble), Hubble Space Telescope GO #16300, <i>Toward a Spatially-resolved Kennicutt-Schmidt Law in High-redshift Cluster Galaxies: the Interplay Between Molecular Gas, Star Formation, and Stellar Mass with ALMA and HST</i>	18 orbits
Cycle 28	<b>Co-I</b> , (PI: Simons), Hubble Space Telescope AR #16151, <i>On The Rapid Evolution of Galaxy Metallicity Gradients: A Bridge Between Theory and Observations</i>	
2020A	<b>Co-I</b> , (PI: Muzzin), Gemini North Telescope GN-2020A-Q-214, <i>Towards a Deeper Understanding of Galaxy Quenching: First Measurement of the Stellar Kinematics of Poststarburst Galaxies in Clusters at <math>z \sim 1</math></i>	20 hrs

## Professional Development & Outreach

### SERVICE



- Apr 2021-Feb 2022 **[COVID-19] Astronomy Postdoc Representative**, Attend Faculty Meetings, push for Diversity, Equity & Inclusion initiatives, Delegate tasks/responsibilities amongst Astronomy Postdocs.
- Jun-Aug 2020 **[COVID-19] Lead organiser of Texas A&M University's Astrosymposium 2020**, Prepared schedule for all-day virtual conference, Moderated and supported other organisers during the conference.
- May 2020- **[COVID-19] Creator, Author and Editor of Grizli for Dummies – an unofficial guide to using Grizli**, Open source such that other users can contribute to it, since Grizli is in active development.
- Nov 2019-Feb 2020 **Co-Chair of Central Texas James Webb Space Telescope (JWST) Workshops Committee**, Remotely attended a week-long Masterclass on the James Webb Space Telescope at the Space Telescope Science Institute, Co-organised two all-day JWST Proposal Planning Workshops with hands-on exercises at UT Austin and Texas A&M University.

## OUTREACH

- May 2020 **[COVID-19] Astronomy on Tap Bryan/College Station Virtual Edition #24, 25** minute talk on *Our Place in the Universe*, livestreamed on YouTube. College Station, TX, USA
- Jul 2018 Gave two lectures on the topic of *Our Place in the Universe* and the workings of the the Northumberland Telescope to two groups of local and overseas students aged between 13 - 14 and 15 - 18. Institute of Astronomy, University of Cambridge, UK
- Mar 2016 Organised an activity for the Cambridge Science Festival where by children can “build” a galaxy. Institute of Astronomy, University of Cambridge, UK

## Referees

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### Professor Casey Papovich

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### Professor Robert Kennicutt

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### Professor Adam Muzzin

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