

Stanford



Simon Birrer

Postdoctoral Scholar, Physics

Bio

BIO

I am a KIPAC Postdoctoral Fellow at Stanford University since Fall 2019. Before joining Stanford I was a Postdoctoral Researcher at the University of California, Los Angeles (UCLA) in the department of Physics and Astronomy and did my PhD at ETH Zurich in the cosmology research group.

PROFESSIONAL EDUCATION

- Doctor of Science, Eidgenössische Technische Hochschule (ETH Zurich) (2017)
- Master of Science, Eidgenössische Technische Hochschule (ETH Zurich) (2013)
- Bachelor of Science, Eidgenössische Technische Hochschule (ETH Zurich) (2011)

STANFORD ADVISORS

- Risa Wechsler, Postdoctoral Faculty Sponsor

LINKS

- My personal website: <https://sibirrer.github.io>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My current research focus on dark matter and dark energy. I am using strong gravitational lensing to probe the imprint of dark matter on the structure in our universe and measuring the expansion rate of our universe with time-delay cosmography to probe dark energy.

Publications

PUBLICATIONS

- **TOCOSMO VIII. A key test of systematics in the hierarchical method of time-delay cosmography** *ASTRONOMY & ASTROPHYSICS*
Gomer, M. R., Sluse, D., Van de Vyvere, L., Birrer, S., Courbin, F.
2022; 667
- **Constraints on Sterile Neutrino Models from Strong Gravitational Lensing, MilkyWay Satellites, and the Lyman-alpha Forest.** *Physical review letters*
Zelko, I. A., Treu, T., Abazajian, K. N., Gilman, D., Benson, A. J., Birrer, S., Nierenberg, A. M., Kusenko, A.
2022; 129 (19): 191301
- **Early Results from GLASS-JWST. II. NIRCam Extragalactic Imaging and Photometric Catalog** *ASTROPHYSICAL JOURNAL LETTERS*
Merlin, E., Bonchi, A., Paris, D., Belfiori, D., Fontana, A., Castellano, M., Nonino, M., Polenta, G., Santini, P., Yang, L., Glazebrook, K., Treu, T., Roberts-Borsani, et al
2022; 938 (2)

- **Early Results from GLASS-JWST. V: The First Rest-frame Optical Size-Luminosity Relation of Galaxies at $z > 7$** *ASTROPHYSICAL JOURNAL LETTERS*
Yang, L., Morishita, T., Leethochawalit, N., Castellano, M., Calabro, A., Treu, T., Bonchi, A., Fontana, A., Mason, C., Merlin, E., Paris, D., Trenti, M., Roberts-Borsani, et al
2022; 938 (2)
- **The size-luminosity relation of lensed galaxies at z similar to 6-9 in the Hubble Frontier Fields** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Yang, L., Leethochawalit, N., Treu, T., Roberts-Borsani, G., Bradac, M., Birrer, S., Castellano, M., Merlin, E., Fontana, A., Amorin, R., Trenti, M.
2022; 514 (1): 1148-1161
- **The primordial matter power spectrum on sub-galactic scales** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Gilman, D., Benson, A., Bovy, J., Birrer, S., Treu, T., Nierenberg, A.
2022; 512 (3): 3163-3188
- **TDCOSMO VII. Boxyness/discyness in lensing galaxies: Detectability and impact on H_0** *ASTRONOMY & ASTROPHYSICS*
Van de Vyvere, L., Gomer, M. R., Sluse, D., Xu, D., Birrer, S., Galan, A., Vernardos, G.
2022; 659
- **The Dark Energy Survey Bright Arcs Survey: Candidate Strongly Lensed Galaxy Systems from the Dark Energy Survey 5000 Square Degree Footprint** *ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES*
O'Donnell, J. H., Wilkinson, R. D., Diehl, H. T., Aros-Bunster, C., Bechtol, K., Birrer, S., Buckley-Geer, E. J., Rosell, A., Kind, M., da Costa, L. N., Lozano, S., Gruendl, R. A., Hilton, et al
2022; 259 (1)
- **DeepZipper: A Novel Deep-learning Architecture for Lensed Supernovae Identification** *ASTROPHYSICAL JOURNAL*
Morgan, R., Nord, B., Bechtol, K., Gonzalez, S. J., Buckley-Geer, E., Moller, A., Park, J. W., Kim, A. G., Birrer, S., Aguena, M., Annis, J., Bocquet, S., Brooks, et al
2022; 927 (1)
- **The Hubble Constant from Strongly Lensed Supernovae with Standardizable Magnifications** *ASTROPHYSICAL JOURNAL*
Birrer, S., Dhawan, S., Shajib, A. J.
2022; 924 (1)
- **Synchronized Coevolution between Supermassive Black Holes and Galaxies over the Last Seven Billion Years as Revealed by Hyper Suprime-Cam** *ASTROPHYSICAL JOURNAL*
Li, J., Silverman, J. D., Ding, X., Strauss, M. A., Goulding, A., Schramm, M., Yesuf, H. M., Sun, M., Xue, Y., Birrer, S., Shi, J., Toba, Y., Nagao, et al
2021; 922 (2)
- **A Local Baseline of the Black Hole Mass Scaling Relations for Active Galaxies. IV. Correlations Between M (BH) and Host Galaxy σ , Stellar Mass, and Luminosity** *ASTROPHYSICAL JOURNAL*
Bennert, V. N., Treu, T., Ding, X., Stomberg, I., Birrer, S., Snyder, T., Malkan, M. A., Stephens, A. W., Auger, M. W.
2021; 921 (1)
- **Hyper Suprime-Cam Subaru Strategic Program: A Mass-dependent Slope of the Galaxy Size-Mass Relation at $z < 1$** *ASTROPHYSICAL JOURNAL*
Kawinwanichakij, L., Silverman, J. D., Ding, X., George, A., Damjanov, I., Sawicki, M., Tanaka, M., Taranu, D. S., Birrer, S., Huang, S., Li, J., Onodera, M., Shibuya, et al
2021; 921 (1)
- **Strong lensing signatures of self-interacting dark matter in low-mass haloes** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Gilman, D., Bovy, J., Treu, T., Nierenberg, A., Birrer, S., Benson, A., Sameie, O.
2021; 507 (2): 2432-2447
- **Gravitational Lensing Formalism in a Curved Arc Basis: A Continuous Description of Observables and Degeneracies from the Weak to the Strong Lensing Regime** *ASTROPHYSICAL JOURNAL*
Birrer, S.
2021; 919 (1)
- **Snowmass2021-Letter of interest cosmology intertwined IV: The age of the universe and its curvature** *ASTROPARTICLE PHYSICS*
Di Valentino, E., Anchordoqui, L. A., Akarsu, O., Ali-Haimoud, Y., Amendola, L., Arendse, N., Asgari, M., Ballardini, M., Basilakos, S., Battistelli, E., Benetti, M., Birrer, S., Bouchet, et al
2021; 131

- **Snowmass2021-Letter of interest cosmology intertwined I: Perspectives for the next decade** *ASTROPARTICLE PHYSICS*
Di Valentino, E., Anchordoqui, L. A., Akarsu, O., Ali-Haimoud, Y., Amendola, L., Arendse, N., Asgari, M., Ballardini, M., Basilakos, S., Battistelli, E., Benetti, M., Birrer, S., Bouchet, et al
2021; 131
- **Cosmology intertwined III: $f\sigma_8$ and S-8** *ASTROPARTICLE PHYSICS*
Di Valentino, E., Anchordoqui, L. A., Akarsu, O., Ali-Haimoud, Y., Amendola, L., Arendse, N., Asgari, M., Ballardini, M., Basilakos, S., Battistelli, E., Benetti, M., Birrer, S., Bouchet, et al
2021; 131
- **Snowmass2021-Letter of interest cosmology intertwined II: The hubble constant tension** *ASTROPARTICLE PHYSICS*
Di Valentino, E., Anchordoqui, L. A., Akarsu, O., Ali-Haimoud, Y., Amendola, L., Arendse, N., Asgari, M., Ballardini, M., Basilakos, S., Battistelli, E., Benetti, M., Birrer, S., Bouchet, et al
2021; 131
- **The Sizes of Quasar Host Galaxies in the Hyper Suprime-Cam Subaru Strategic Program** *ASTROPHYSICAL JOURNAL*
Li, J., Silverman, J. D., Ding, X., Strauss, M. A., Goulding, A., Birrer, S., Yesuf, H. M., Xue, Y., Kawinwanichakij, L., Matsuoka, Y., Toba, Y., Nagao, T., Schramm, et al
2021; 918 (1)
- **Dark Matter Constraints from a Unified Analysis of Strong Gravitational Lenses and Milky Way Satellite Galaxies** *ASTROPHYSICAL JOURNAL*
Nadler, E. O., Birrer, S., Gilman, D., Wechsler, R. H., Du, X., Benson, A., Nierenberg, A. M., Treu, T.
2021; 917 (1)
- **Improved time-delay lens modelling and H-0 inference with transient sources** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Ding, X., Liao, K., Birrer, S., Shajib, A. J., Treu, T., Yang, L.
2021; 504 (4): 5621-5628
- **TDCOSMO: V. Strategies for precise and accurate measurements of the Hubble constant with strong lensing** *ASTRONOMY & ASTROPHYSICS*
Birrer, S., Treu, T.
2021; 649
- **Dark matter haloes of massive elliptical galaxies at z similar to 0.2 are well described by the Navarro-Frenk-White profile** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Shajib, A. J., Treu, T., Birrer, S., Sonnenfeld, A.
2021; 503 (2): 2380-2405
- **High-resolution imaging follow-up of doubly imaged quasars** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Shajib, A. J., Molina, E., Agnello, A., Williams, P. R., Birrer, S., Treu, T., Fassnacht, C. D., Morishita, T., Abramson, L., Schechter, P. L., Wisotzki, L.
2021; 503 (2): 1557-1567
- **Combining strong and weak lensing estimates in the COSMOS field** *JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS*
Kuhn, F., Birrer, S., Bruderer, C., Amara, A., Refregier, A.
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- **Large-scale Gravitational Lens Modeling with Bayesian Neural Networks for Accurate and Precise Inference of the Hubble Constant** *ASTROPHYSICAL JOURNAL*
Park, J., Wagner-Carena, S., Birrer, S., Marshall, P. J., Lin, J., Roodman, A.
2021; 910 (1)
- **Hierarchical Inference with Bayesian Neural Networks: An Application to Strong Gravitational Lensing** *ASTROPHYSICAL JOURNAL*
Wagner-Carena, S., Park, J., Birrer, S., Marshall, P. J., Roodman, A., Wechsler, R. H., LSST Dark Energy Sci Collaboration
2021; 909 (2)
- **Testing the evolution of correlations between supermassive black holes and their host galaxies using eight strongly lensed quasars** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Ding, X., Treu, T., Birrer, S., Agnello, A., Sluse, D., Fassnacht, C., Auger, M. W., Wong, K. C., Suyu, S. H., Morishita, T., Rusu, C. E., Galan, A.
2021; 501 (1): 269–80
- **The evolution of the size-mass relation at z=1-3 derived from the complete Hubble Frontier Fields data set** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*

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- Yang, L., Roberts-Borsani, G., Treu, T., Birrer, S., Morishita, T., Bradac, M.
2021; 501 (1): 1028–37
- **The impact of mass map truncation on strong lensing simulations** *ASTRONOMY & ASTROPHYSICS*
Van de Vyvere, L., Sluse, D., Mukherjee, S., Xu, D., Birrer, S.
2020; 644
 - **H0LiCOW XII. Lens mass model of WFI2033–4723 and blind measurement of its time-delay distance and H-0** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Rusu, C. E., Wong, K. C., Bonvin, V., Sluse, D., Suyu, S. H., Fassnacht, C. D., Chan, J. H., Hilbert, S., Auger, M. W., Sonnenfeld, A., Birrer, S., Courbin, F., Treu, et al
2020; 498 (1): 1440–68
 - **H0LiCOW-XIII. A 2.4 per cent measurement of H-0 from lensed quasars: 5.3 sigma tension between early- and late-Universe probes** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Wong, K. C., Suyu, S. H., Chen, G., Rusu, C. E., Millon, M., Sluse, D., Bonvin, V., Fassnacht, C. D., Taubenberger, S., Auger, M. W., Birrer, S., Chan, J. H., Courbin, et al
2020; 498 (1): 1420–39
 - **The first simultaneous measurement of Hubble constant and post-Newtonian parameter from time-delay strong lensing** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Yang, T., Birrer, S., Hu, B.
2020; 497 (1): L56–L61
 - **A versatile tool for cluster lensing source reconstruction - I. Methodology and illustration on sources in the Hubble Frontier Field Cluster MACS J0717.5+3745** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Yang, L., Birrer, S., Treu, T.
2020; 496 (3): 2648–62
 - **Cosmic dissonance: are new physics or systematics behind a short sound horizon?** *ASTRONOMY & ASTROPHYSICS*
Arendse, N., Wojtak, R. J., Agnello, A., Chen, G., Fassnacht, C. D., Sluse, D., Hilbert, S., Millon, M., Bonvin, V., Wong, K. C., Courbin, F., Suyu, S. H., Birrer, et al
2020; 639
 - **Core or Cusps: The Central Dark Matter Profile of a Strong Lensing Cluster with a Bright Central Image at Redshift 1** *ASTROPHYSICAL JOURNAL*
Collett, T. E., Buckley-Geer, E., Lin, H., Bacon, D., Nichol, R. C., Nord, B., Morice-Atkinson, X., Amara, A., Birrer, S., Kuropatkin, N., More, A., Papovich, C., Romer, et al
2017; 843 (2)