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Education

- Ph.D., Astronomy & Astrophysics, University of Chicago, Chicago, IL, USA, 2010
- M.S., Astronomy & Astrophysics, University of Chicago, Chicago, IL, USA, 2006
- B.S., Astronomy and General Physics, University of Michigan, Ann Arbor, MI, USA, 2004
- B.S.E., Engineering Physics, University of Michigan, Ann Arbor, MI, USA, 2004

Research Experience

- Yale University, Department of Physics, Yale Center for Astronomy & Astrophysics
Associate Research Scientist, 2015–present
Postdoctoral Associate, 2011–2015
Advisor: Daisuke Nagai
Cosmological simulations of Galaxy Clusters
- Shanghai Astronomical Observatory, Key Laboratory for Research in Galaxies and Cosmology
Postdoctoral Fellow, 2010–2011
Advisor: Xiaohu Yang
Cosmological simulations of Galaxy Clusters
- University of Chicago, Department of Astronomy & Astrophysics
Graduate Research Assistant, 2005–2010
Advisor: Andrey V. Kravtsov
Cosmological simulations of Galaxy Clusters
- University of Michigan, Department of Physics
Undergraduate Research Assistant, 2003–2004
Advisor: Tim A. McKay
Analysis of SDSS Galaxy Clusters

References

Prof. Daisuke Nagai (Postdoc Advisor)	Yale University	daisuke.nagai@yale.edu
Prof. Andrey V. Kravtsov (Thesis Advisor)	University of Chicago	andrey@oddjob.uchicago.edu
Prof. Paolo Coppi (Collaborator)	Yale University	paolo.coppi@yale.edu

Professional Activities and Academic Services

Referee for:

- The Astrophysical Journal
- The Monthly Notices of the Royal Astronomical Society
- Astronomy & Astrophysics
- Research in Astronomy & Astrophysics

Organizer, Cosmology Seminar at Yale University, 2012/9–2014/5

Selected Invited Talks

- 2017/9 Yale University, CT, USA , Astrophysics Colloquium
- 2017/2 Rochester Institute of Technology, Rochester, NY, USA , Astrophysics Colloquium
- 2017/1 Kavli Institute for the Physics and Mathematics of the Universe, Kashiwa, Japan, Astrophysics Seminar
- 2017/1 Academia Sinica Institute of Astronomy and Astrophysics, Taipei, Taiwan, Special Seminar
- 2016/1 Shanghai Astronomical Observatory, Shanghai, China, Special Seminar
- 2016/1 Kavli Institute for Astronomy and Astrophysics, Peking University, Beijing, Lunch Seminar
- 2015/9 Kavli Institute for the Physics and Mathematics of the Universe, Kashiwa, Japan, Astrophysics Lunch Talk
- 2015/3 University of Hong Kong, Hong Kong, Physics Seminar
- 2014/3 University of Michigan, Ann Arbor, MI, USA, Cluster Seminar
- 2013/10 Brown University, Providence, RI, USA, Astrophysics Seminar
- 2012/8 Shanghai Astronomical Observatory, Shanghai, China, Cosmology Seminar
- 2012/4 Yale University, New Haven, CT, USA, Cosmology Seminar
- 2010/3 University of Colorado, Boulder, CO, USA, Cluster Seminar

Conference Presentations

- 2016/12 “Galaxy clusters: Physics Laboratories and Cosmological Probes”, Cambridge, UK
- 2015/6 “ICM Physics and Modelling”, Max Planck Institute for Astrophysics, Garching, Germany
- 2015/3 “Astroparticle View of Galaxy Clusters”, Hiroshima University, Hiroshima, Japan
- 2015/3 “SnowCluster 2015”, Snowmass, UT, USA
- 2014/6 “Cluster Paris 2014”, Paris, France
- 2013/3 “SnowCluster 2013”, Snowmass, UT, USA
- 2012/11 Galaxy Cluster Workshop, Ringberg, Germany
- 2012/8 28th IAU General Assembly, Beijing, China
- 2012/6 220th AAS Meeting, Anchorage, AK, USA
- 2012/3 “Turbulence in Cosmic Structure Formation”, ASU, Tempe, AZ, USA
- 2011/9 “Cosmology with X-ray and SZE Observations of Galaxy Clusters”, Huntsville, AL, USA
- 2011/3 “Astrophysics and Cosmology with Galaxy Clusters”, KITP, Santa Barbara, CA, USA
- 2010/7 “From Massive Galaxy Formation to Dark Energy”, IPMU, Kashiwa, Chiba, Japan
- 2010/6 10th “Great Lakes Cosmology Workshop”, Chicago, IL, USA
- 2010/1 215th AAS meeting, Washington, DC, USA
- 2007/2 “Clusters of Galaxies as Cosmological Probes”, Aspen, CO, USA

Mentoring and Teaching

Co-supervised undergraduate and graduate students with Prof. Daisuke Nagai at Yale University.

Luis Fernando: Yale Undergrad (2016 - current)

Junior Project: “Modeling HST-COS Observations of Galaxy Cluster Outskirts”

Emil Öhman: Yale Undergrad (2015 - 2017)

Junior Project: “High resolution modeling of gas properties in galaxy cluster outskirts”

Senior Project: “Nature of gas streams and cold fronts in cosmological simulations of galaxy clusters”

Mari Kawakatsu: Yale Undergrad (2016 - 2017)

Senior Project: “Improving Galaxy Cluster Mass Measurements with Machine Learning Techniques”

Julian Menzel: Yale Undergrad (2015 - 2016)

Senior Project: “Streaming gas motions in galaxy clusters”

Joshua Burt, Yale Grad Student, Physics (2014-2015)

Summer Project: “Finding Gas Filaments in the Outskirts of Galaxy Clusters”

Christopher Cappiello: Yale Undergrad (2013 - 2015)

Awarded DeForest Pioneer Prize in Physics, Yale University, 2015

Senior Project: “Shapes of Galaxy Clusters”

Maya Fishbach: Yale Undergrad (2013 - 2015)

Awarded Howard L. Schultz Prize in Physics, Yale University, 2015

Senior Project: “Evolution of the filamentary gas flows in simulated galaxy clusters”

Junior Project: “Cluster Merger Simulations with Self-Interacting Dark Matter”

Hendrik Kits van Heyningen: Yale Undergrad (2013-2014)

Awarded DeForest Pioneer Prize in Physics, Yale University, 2014

Senior Project: “Modified Gravity & Dark Energy in Spherical Collapse Model”

Benjamin Elder, Yale Grad Student, Physics (2012-2013)

First Year Project: “Cosmological Simulations with Self-Interacting Dark Matter”

Dan Steinbrook: Yale Undergrad (Summer 2012)

Summer Project: “Effects of $f(R)$ gravity on the Shapes of Galaxy Clusters”

Elizabeth Peng: Yale Undergrad (2011-2012)

Senior Project: “Mock ASTRO-H Simulations of Galaxy Clusters”

Graduate Teaching Assistant, University of Chicago, 2004–2005, 2007

Publications

1. **Lau, E. T.**, Gaspari, M., Nagai, D., Coppi, P., *Physical Origins of Gas Motions in Galaxy Cluster Cores: Interpreting Hitomi Observations of the Perseus Cluster*, 2017, ApJ, accepted arXiv:1705.06280
2. Zinger, E., Dekel, A., Birnboim, Y., Nagai, D., **Lau, E.**, Kravtsov, A. V., *Cold Fronts and Shocks Formed by Gas Streams in Galaxy Clusters*, 2016, MNRAS, submitted, arXiv:1609.05308
3. Tchernin, C., Eckert, D., Ettori, S., Pointecouteau, E., Paltani, S., Molendi, S., Hurier, G., Gastaldello, F., **Lau, E. T.**, Nagai, D., Roncarelli, M., Rossetti, M., *The XMM Cluster Outskirts Project (X-COP): Physical conditions to the virial radius of Abell 2142*, 2016, A&A, 595, A42, arXiv:1606.05657
4. Avestruz, C., Nagai, D., **Lau, E. T.**, *Stirred, not Clumped: Evolution of Temperature Profiles in the Outskirts of Galaxy Clusters*, 2016, ApJ, 833, 227, arXiv:1605.01723
5. Shirasaki, M., Nagai, D., **Lau, E. T.**, *Covariance in the Thermal SZ-Weak Lensing Mass Scaling Relation of Galaxy Clusters*, 2016, MNRAS, 460, 3913, arXiv:1603.08609
6. Shi, X., Komatsu, E., Nagai, D., **Lau, E. T.**, *Analytical model for non-thermal pressure in galaxy clusters - III. Removing the hydrostatic mass bias*, 2016, MNRAS, 455, 2936, arXiv:1507.04338
7. Sembolini, F., Yepes, G., Pearce, F. R., Knebe, A., Kay, S. T., Power, C., Cui, W., Beck, A. M., Borgani, S., Dalla Vecchia, C., Davé, R., Elahi, P. J., February, S., Huang, S., Hobbs, A., Katz, N., **Lau, E.**, McCarthy, I. G., Murante, G., Nagai, D., Nelson, K., Newton, R. D. A., Perret, V., Puchwein, E., Read, J. I., Saro, A., Schaye, J., Teyssier, R., Thacker, R. J., *nIFTy galaxy cluster simulations - I. Dark matter and non-radiative models*, 2016, MNRAS, 457, 2063, arXiv:1503.06065
8. Ota, N., Nagai, D., **Lau, E. T.**, *Testing ASTRO-H Measurements of Bulk and Turbulent Gas Motions in Galaxy Clusters*, 2015, PASJ, submitted, arXiv:1507.02730
9. **Lau, E. T.**, Nagai, D., Avestruz, C., Nelson, K., Vikhlinin, A., *Mass Accretion and its Effects on the Self-similarity of Gas Profiles in the Outskirts of Galaxy Clusters*, 2015, ApJ, 806, 86, arXiv:1411.5361
10. Avestruz, C., Nagai, D., **Lau, E. T.**, Nelson, K., *Non-Equilibrium Electrons in the Outskirts of Galaxy Clusters*, 2015, ApJ, 808, 176, arXiv:1410.8142
11. Rasia, E., **Lau, E. T.**, Borgani, S., Nagai, D., Dolag, K., Avestruz, C., Granato, G. L., Mazzotta, P., Murante, G., Nelson, K., Ragone-Figueroa, C., *Temperature Structure of the Intra-Cluster Medium from SPH and AMR simulation*, 2014, ApJ, 791, 96, arXiv:1406.4410
12. Zhuravleva, I., Churazov, E., Schekochihin, A. A., **Lau, E. T.**, Nagai, D., Gaspari, M., Allen, S. W., Nelson, K., Parrish, I. J. *The relation between gas density and velocity power spectra in galaxy clusters: qualitative treatment and cosmological simulations* 2014, ApJL, 788, L13, arXiv:1404.5306
13. Gaspari, M., Churazov, E., Nagai, D., **Lau, E. T.**, Zhuravleva, I., *The relation between gas density and velocity power spectra in galaxy clusters: high-resolution hydrodynamic simulations and the role of conduction*, 2014, A&A, 569, A67, arXiv:1404.5302
14. Nelson, K., **Lau, E. T.**, Nagai, D., *Universal Non-thermal Pressure Fraction Profile in Galaxy Clusters*, 2014, ApJ, 792, 25, arXiv:1404.4636
15. Avestruz, C., **Lau, E. T.**, Nagai, D., Vikhlinin, A., *Testing X-ray Measurements of Galaxy Cluster Outskirts with Cosmological Simulations*, 2014, ApJ, 797, 117, arXiv:1404.4634

16. Wang, L., Yang, X., Shen, S., Mo, H. J., van den Bosch, F. C., Luo, W., Wang, Y., **Lau, E. T.**, Wang, Q. D., Kang, X., Li, R., *Measuring the X-ray luminosities of SDSS DR7 clusters from RASS*, 2014, MNRAS, 439, 611, arXiv:1312.7417
17. Harvey, D., Tittley, E., Massey, R., Kitching, T. D., Taylor, A., Pike, S. R., Kay, S. T., **Lau, E. T.**, & Nagai, D., *On the cross-section of Dark Matter using substructure infall into galaxy clusters*, 2014, MNRAS, 441, 404, arXiv:1310.1731
18. Nelson, K., **Lau, E. T.**, Nagai, D., Rudd, D. H., & Yu, L., *Weighing Galaxy Clusters with Gas. II. On the Origins of Hydrostatic Mass Bias in Λ CDM Galaxy Clusters*, 2014, ApJ, 782, 107, arXiv:1308.6589
19. Nagai, D., **Lau, E. T.**, Avestruz, C., Nelson, K., & Rudd, D. H., *Predicting Merger-Induced Gas Motions in Λ CDM Galaxy Clusters*, 2013, ApJ, 777, 137, arXiv:1307.2251
20. **Lau, E. T.**, Nagai, D., & Nelson, K., *Weighing Galaxy Clusters with Gas. I. On the Methods of Computing Hydrostatic Mass Bias*, 2013, ApJ, 777, 151, arXiv:1306.3993
21. Khedekar, S., Churazov, E., Kravtsov, A., Zhuravleva, I., **Lau, E. T.**, Nagai, D., & Sunyaev, R., *Bias from gas inhomogeneities in the pressure profiles as measured from X-ray and Sunyaev-Zeldovich observations*, 2013, MNRAS, 431, 954, arXiv:1211.3358
22. Zhuravleva, I., Churazov, E., Kravtsov, A., **Lau, E. T.**, Nagai, D., & Sunyaev, R., *Quantifying properties of ICM inhomogeneities*, 2012, MNRAS, 428, 3274, arXiv:1210.6706
23. **Lau, E. T.**, Nagai, D., Kravtsov, A. V., Vikhlinin, A., & Zentner, A. R., *Constraining Cluster Physics with the Shape of X-Ray Clusters: Comparison of Local X-Ray Clusters Versus Λ CDM Clusters*, 2012, ApJ, 755, 116, arXiv:1201.2168
24. Eckert, D., Vazza, F., Ettori, S., Molendi, S., Nagai, D., **Lau, E. T.**, Roncarelli, M., Rossetti, M., Snowden, S. L., & Gastaldello, F., *The Gas Distribution in the Outer Regions of Galaxy Clusters*, 2012, A&A, 541, A75, arXiv:1111.0020
25. **Lau, E. T.**, *Characterizing Galaxy Clusters with Gravitational Potential*, 2011, ApJ, 736, 145, arXiv:1009.2124
26. Nagai, D., & **Lau, E. T.**, *Gas Clumping in the Outskirts of Λ CDM Clusters*, 2011, ApJL, 731 L10, arXiv:1103.0280
27. **Lau, E. T.**, Nagai, D., Kravtsov, A. V., & Zentner, A. R., *Shapes of Gas, Gravitational Potential and Dark Matter in Λ CDM Clusters*, 2011, ApJ, 734, 93, arXiv:1003.2270
28. Shaw, L. D., Nagai, D., Bhattacharya, S., **Lau, E. T.**, *Impact of Cluster Physics on the Sunyaev-Zel'dovich Power Spectrum*, 2010, ApJ, 725, 1452, arXiv:1006.1945
29. **Lau, E. T.**, Nagai, D., & Kravtsov, A. V., *Effects of Baryon Dissipation on the Dark Matter Virial Scaling Relation*, 2010, ApJ, 708, 1419, arXiv:0908.2133
30. **Lau, E. T.**, Kravtsov, A. V., & Nagai, D., *Residual Gas Motions in the Intracluster Medium and Bias on the Hydrostatic Mass Profile*, 2009, ApJ, 705, 1129, arXiv:0903.4895
31. Becker, M. R., McKay, T. A., Koester, B., Wechsler, R. H., Rozo, E., Evrard, A., Johnston, D., Sheldon, E., Annis, J., **Lau, E.**, Nichol, R., & Miller, C., *The Mean and Scatter of the Velocity Dispersion–Optical Richness Relation for maxBCG Galaxy Clusters*, 2007, ApJ, 669, 905, arXiv:0704.3614