

QING LIU

Department of Astronomy & Astrophysics
University of Toronto
50 St. George, Toronto, M5S3H4 ON, Canada

<http://www.astro.utoronto.ca/~qliu>
Email: qliu@astro.utoronto.ca

RESEARCH INTERESTS

Low surface brightness imaging; dwarf galaxies; Diffuse Galactic light; galaxy formation and evolution; spatially resolved spectroscopy; instrumentation.

EDUCATION

PhD in Astronomy & Astrophysics, University of Toronto (UofT) 2018 - 2024

Advisors: Prof. Roberto Abraham

Thesis: Systematics Control in the Era of Ultra-Low Surface Brightness Imaging

BSc in Astronomy, University of Science and Technology of China (USTC) 2014 - 2018

Advisors: Prof. Xu Kong

Thesis: Parameter Estimation of molecular cloud-star cluster evolutions on the BPT Diagram

EMPLOYMENT

PhD Candidate, Research Assistant 2018 - 2024

David Dunlap Institute for Astronomy & Astrophysics

Research Assistant 2017 - 2018

Key Laboratory for Research in Galaxies and Cosmology, Department of Astronomy (USTC)

OBSERVATIONAL EXPERIENCE

The Dragonfly Telephoto Array, a robotic telescope optimized for low surface brightness imaging

Operational Observer (2019-2024), responsibilities and contributions include:

- Observing queue management and project definition (with AstroPlanner)
- Night-time monitoring under circumstances (trouble-shooting cameras, guiders, focusers, etc.)
- Communications (with other team members and staff at the New Mexico Skies Observatories)
- Maintenance of observing protocols (training new observers)
- Image diagnostics and data reduction pipeline development

Gemini-North 2022B GMOS

PI: Follow-ups for M33 Dwarf Satellite Galaxies Search

Hubble Space Telescope (HST) Cycle 31 ACS

Co-I: Two Extremely Faint Candidate Satellites of M33 Identified in Diffuse Light (PI: E. Patel)

Canada-France-Hawaii Telescope (CFHT) 2019/2020B, 2021/2022A, SITELLE

Co-I: Mapping H-alpha Emission in Star Forming Galaxies in Rich Galaxy Clusters (PI: H. Yee)

INSTRUMENTAL EXPERIENCE

Operation and maintenance of the 48-lens Dragonfly Telephoto Array

Image quality control, guider calibration, focuser calibration, zero-point calibration

Construction of the (forthcoming) 180-lens Dragonfly Narrowband Array

Camera assembly, filter-tilter assembly, cable connection, Arduino controller assembly, focusing tests

PROFESSIONAL TALKS

AAS 244 Oral Presentation

Madison, WI, 2024

Diffuse Optical Galactic Cirrus in Dragonfly's Deep Imaging

Diffuse Cosmic Background and Low Surface Brightness Universe

Aspen, CO, 2024

Optical Galactic Cirrus in Deep Wide-field Imaging from Dragonfly

CASCA Annual General Meeting 2023

Penticton, BC, 2023

Controlling Background Systematics in Low Surface Brightness Imaging using Dragonfly

CITA Astro-coffee Talk

CITA, ON, 2023

A Recipe for Unbiased Background Modeling in Deep Wide-Field Astronomical Images

Rubin-DECaLS-HSC Joint Group Seminar (invited)

Princeton University, NJ, 2022

Controlling Background Systematics in Low Surface Brightness Imaging

Galaxy Journal Club

Univ. of Toronto, ON, 2021

A Method to Characterize the Wide-angle Point-Spread Function of Astronomical Images

Astro-ph Talk

Univ. of Toronto, ON, 2021

Wide-angle PSF Modeling in Deep Wide-field Images

Galaxy Day

Univ. of Toronto, ON, 2019

SITELLE H α Imaging Spectroscopy of Emission-line Galaxies in Clusters at $z \sim 0.25$

Astro-lunch

Shanghai Normal Univ., CHN, 2018

The Effect of Star-forming Histories on Stellar Population Properties in SED-fitting

CANDELS Collaboration Meeting

UC Santa Cruz, CA, 2018

Properties of Stellar Populations in Star-forming Galaxies Based on SED-fitting

TEACHING EXPERIENCE

AST201 (UofT): Stars and Galaxies (1500 students)

2019, 2020, 2021, 2022 Spring

AST101 (UofT): The Sun and its Neighbours (1500 students)

2018 Autumn

AY14204 (USTC): Galactic Astronomy (40 students)

2018 Spring

02217001 (USTC): Astronomical Labs (34 students)

2017 Fall

MENTORING EXPERIENCE

Samir Singh (U of Toronto Undergraduate): undergraduate thesis project

2022

Rebecca Ceppas de Castro (U of Toronto Undergraduate): undergraduate thesis project

2022

HONORS & AWARDS

Thesis Research Travel Award	2023
Ontario Graduate Scholarship for International Student	2022-2023
University Program Level Fellowship	2022
Ontario Trillium Scholarship	2018-2022
Connaught Scholarship	2018
Best Undergraduate Thesis in Astronomy	2018
National Observatory of China Scholarship	2017
USTC Excellence Scholarship	2015, 2016, 2017

SERVICE & OUTREACH

Volunteer for U of T Amateur Astronomer Association (UTAAA): meteor shower trip co-organization, guidance in stargazing, and astrophotography	2018-2020
Volunteer for AstroTour: outreach program organized by Department of Astronomy	2019, 2020
Assistant for Student Observing Projects at Campus Observatory	2018 Autumn

PUBLICATIONS

■ First-Author Publications (5 in total)

- [1] **Liu, Q.**, Abraham, R.G., Martin P., et al.(2024) “Fuzzy Galaxies or Cirrus? Decomposition of Galactic Cirrus in Deep Wide-Field Images”, ApJ submitted
- [2] **Liu, Q.**, Abraham, R.G., Martin P., et al.(2023) “A Recipe for Unbiased Background Modeling in Deep Wide-Field Astronomical Images”, ApJ, 953, 7. doi:10.3847/1538-4357/acdee3 [ADS link]
- [3] **Liu, Q.**, Abraham, R.G., Gilhuly C., et al.(2022) “A Method to Characterize the Wide-angle Point-Spread Function of Astronomical Images”, ApJ, 925(2), 219. doi:10.3847/1538-4357/ac32c6 [ADS link]
- [4] **Liu, Q.**, Yee, H.K.C., Drissen, L., et al. (2021) “SITELE H α Imaging Spectroscopy of $z \sim 0.25$ Clusters: Emission-line Galaxy Detection and Ionized Gas Offset in Abell 2390 and Abell 2465”, ApJ, 908(2), 228. doi:10.3847/1538-4357/abd71e [ADS link]
- [5] **Liu, Q.**, Wang, E.C., et al.(2018) “Elevation or Suppression? The Resolved Star Formation Main Sequence of Galaxies with Two Different Assembly Modes”, ApJ, 857(1), 17. doi:10.3847/1538-4357/aab3d5 [ADS link]

■ Co-author Publications (18 in total)

- [1] Pasha, I. van Dokkum, P., **Liu, Q.**, et al. (2024) ”The Bullseye: HST, Keck/KCWI, and Dragonfly Characterization of a Collisional Ring Galaxy with Ten Rings”, ApJL submitted.
- [2] Shen, Z. et al. (including **Liu, Q.**) (2024) ”First Results from the Dragonfly Ultrawide Survey: the Largest Eleven Quenched Diffuse Dwarf Galaxies in 3100 deg² with Spectroscopic Confirmation”, ApJ submitted. [arXiv link]

- [3] Lokhorst, D. et al. (including **Liu, Q.**) (2024) "Realizing the potential of the Dragonfly Spectral Line Mapper: Calibration methods and on-sky performance", SPIE 2024. [\[arXiv link\]](#)
- [4] Pash, I. et al. (including **Liu, Q.**) (2024) "Software infrastructure for the highly-distributed semi-autonomous Dragonfly Spectral Line Mapper", SPIE 2024. [\[arXiv link\]](#)
- [5] Seery, C. et al. (including **Liu, Q.**) (2024) "The Dragonfly Spectral Line Mapper: Completion of the 120-lens array", SPIE 2024. [\[arXiv link\]](#)
- [6] Alcorn, L. et al. (including **Liu, Q.**) (2023) "Extended line emission in the BCG of Abell 2390", MNRAS, 522(1), 1521–1534. doi:10.1093/mnras/stad948 [\[ADS link\]](#)
- [7] Abraham, R.G., et al. (including **Liu, Q.**) (2022), "Distributed aperture telescopes and the Dragonfly Telephoto Array", Proceeding of SPIE Conference Series, 12182, 121821W. doi:10.1117/12.2629585 [\[ADS link\]](#)
- [8] Keim, M.A., et al. (including **Liu, Q.**) (2022) "Tidal Distortions in NGC1052-DF2 and NGC1052-DF4: Independent Evidence for a Lack of Dark Matter", ApJ, 935(2), 160. doi:10.3847/1538-4357/ac7dab [\[ADS link\]](#)
- [9] Gilhuly, C., et al. (including **Liu, Q.**) (2022) "Stellar Halos from the The Dragonfly Edge-on Galaxies Survey", ApJ, 932(1), 44. doi:10.3847/1538-4357/ac6750 [\[ADS link\]](#)
- [10] Pasha, I., et al. (including **Liu, Q.**) (2021) "A Nascent Tidal Dwarf Galaxy Forming within the Northern H I Streamer of M82", ApJL, 923(2), L21. doi:10.3847/2041-8213/ac3ca6 [\[ADS link\]](#)
- [11] Miller, T.B., et al. (including **Liu, Q.**) (2021) "The Dragonfly Wide Field Survey. II. Accurate Total Luminosities and Colors of Nearby Massive Galaxies and Implications for the Galaxy Stellar-mass Function", ApJ, 909(1), 74. doi:10.3847/1538-4357/abd7f8 [\[ADS link\]](#)
- [12] Gilhuly, C., et al. (including **Liu, Q.**) (2020) "The Dragonfly Edge-on Galaxies Survey: Shaping the Outer disk of NGC 4565 via Accretion", ApJ, 897(2), 108. doi:10.3847/1538-4357/ab9b25 [\[ADS link\]](#)
- [13] van Dokkum, P., et al. (including **Liu, Q.**) (2020) "Multi-resolution Filtering: An Empirical Method for Isolating Faint, Extended Emission in Dragonfly Data and Other Low Resolution Images", PASP, 132(1013), 074503. doi:10.1088/1538-3873/ab9416 [\[ADS link\]](#)
- [14] Danieli, S., et al. (including **Liu, Q.**) (2020) "The Dragonfly Wide Field Survey. I. Telescope, Survey Design, and Data Characterization", ApJ, 894(2), 119. doi:10.3847/1538-4357/ab88a8 [\[ADS link\]](#)
- [15] Teklu, B.B., et al. (including **Liu, Q.**) (2020) "Dust Attenuation Curve for Local Subgalactic Star-forming Regions", ApJ, 893(2), 94. doi:10.3847/1538-4357/ab7f27 [\[ADS link\]](#)
- [16] SIGNALS collaboration (2019) "SIGNALS: I. Survey description", MNRAS, 489(4), 5530–5546. doi:10.1093/mnras/stz2455 [\[ADS link\]](#)
- [17] Gao, Y.L., et al. (including **Liu, Q.**) (2018) "What Determines the Local Metallicity of Galaxies: Global Stellar Mass, Local Stellar Mass Surface Density, or Star Formation Rate?", ApJ, 868(2), 89. doi:10.3847/1538-4357/aae9fi [\[ADS link\]](#)

[18] Wang, E.C., et al. (including **Liu, Q.**) (2017) “The Properties of the Massive Star-forming Galaxies with an Outside-in Assembly Mode”, *ApJ*, 844(2), 144. doi:[10.3847/1538-4357/aa7bed](https://doi.org/10.3847/1538-4357/aa7bed) [[ADS link](#)]