

# Om narayani Nayak

## Curriculum Vitae

Space Telescope Science Institute • 3700 San Martin Drive • Baltimore, MD, USA  
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### Areas of Expertise

Star formation in low-metallicity environments, modeling young stellar objects, colliding HI flows, JWST MIRI and NIRCam data reduction, echelle spectroscopy, IFU spectroscopy, radio interferometric data processing, ALMA observation planning, HST observation planning, SOFIA observation planning

### Professional Positions Held

<b>NASA Goddard Space Flight Center</b> NASA Postdoctoral Program Prize Fellow	May 2023 -
<b>Space Telescope Science Institute</b> Postdoctoral Research Associate	January 2023 - April 2023
<b>Space Telescope Science Institute</b> STScI Prize Fellow	June 2019 - December 2022
<b>Johns Hopkins University</b> Postdoctoral Research Associate	June 2018 - May 2019

### Education

**Johns Hopkins University, Baltimore, MD**  
Doctor of Philosophy in Physics, May 2018  
Dissertation Adviser: Dr. Margaret Meixner

**Johns Hopkins University, Baltimore, MD**  
Masters of Arts in Physics, May 2014

**University of California Berkeley, Berkeley, CA**  
Bachelor of Arts in Physics and Astrophysics, May 2012

### Teaching Experience

**Spring 2014**  
Introduction to Thermal Physics for Undergraduates  
Radiative Astrophysics for Graduate Students

**Fall 2013**  
Introduction to Thermal Physics for Undergraduates  
General Physics Laboratory for Undergraduates

**Fall 2012**  
Introduction to Mechanics for Undergraduates  
General Physics Laboratory for Undergraduates

### Awards and Leadership Roles

AURA Achievement Award for the Data Visualization and Science Workflow Notebook Team  
AURA Achievement Award for the JWST Data Management Working Group  
AURA Outstanding Achievement Award for JWST Cycle 1  
JWST GTO program #1235 science lead for calibrating, testing, and publishing data  
MIRI team ReDCaT lead for delivering reference files before and during commissioning for JWST

## JWST Mission Support Work with Calibration and Commissioning Analysis Projects

*Title:* LRS Cross Calibration Check

*Objective:* Compare LRS simulated data of standard stars to MRS, Imager, and Coronagraphic simulated data to make sure flux measurements and wavelength centers are consistent between all the four modes of MIRI.

*Title:* MRS Glints

*Objective:* Simulate Jupiter and Saturn to check if MIRI PSF has prominent peaks due to scattered light of large planets.

*Title:* LRS External Flatfield

*Objective:* Determine external flat fields necessary during commissioning.

*Title:* LRS Absolute Flux Calibration

*Objective:* Build a spectrophotometric calibration for LRS by observing JWST flux standards (A dwarfs and Solar analogs) through the LRS slit and slitless modes.

*Title:* LRS PSF Characterization

*Objective:* Characterize the PSF as a function of wavelength in the LRS slit and slitless modes by scanning a point source across the two nod positions, the center of the slit, and across the nominal position in slitless mode. This will lead to better algorithms for extracting spectra from 2D spectral images.

*Title:* MRS Flux Conservation

*Objective:* Calculate the flux of a simulated source to see if the flux is being conserved in the 12 different MRS IFU bands, and trace possible reasons why flux conservation fails at longer wavelengths.

*Title:* MRS Outlier Detection

*Objective:* Determine if the pipeline is catching all outliers by inputting fake outliers with varying fluxes and at various wavelengths.

*Title:* MIRI IFU of Young Stellar Objects in the Large Magellanic Cloud

*Objective:* The objective of the notebook I created was to simulate working with an IFU cube, extracting point sources, and analyzing the infrared spectra of the point sources. I used ALMA data cubes and Spitzer IRS spectroscopy to showcase how we will process and analyze the MIRI MRS data. My notebook was successfully presented to Goddard in January 2021.

## JWST GTO Proposals

*Title:* “LMC-N79: Study of Most Massive Young Stellar Object Star Forming Region”

*Instrument:* MIRI Imaging, NIRCcam Imaging, MIRI MRS

*P.I.:* **M. Meixner**

*Science Lead:* **O. Nayak**

*Title:* “NGC346: Star Formation at Low Metallicity in the Large Magellanic Cloud”

*Instrument:* MIRI Imaging, NIRCcam Imaging, MIRI MRS, NIRSpec

*P.I.:* **M. Meixner**

*CoI(s):* **O. Nayak**, A. Hirschauer, O. Jones, et al.

*Title:* “Supernova 1987A: Formation and Evolution of Dust in Supernova Explosion”

*Instrument:* MIRI Imaging, NIRCcam Imaging, MIRI MRS, NIRSpec

*P.I.:* **M. Meixner**

*CoI(s):* **O. Nayak**, A. Hirschauer, O. Jones, et al.

*Title:* “NGC 6822: Dust Life Cycle of a Nearby Low Metallicity Galaxy”

*Instrument:* MIRI Imaging, NIRCcam Imaging

*P.I.:* **M. Meixner**

*CoI(s):* **O. Nayak**, A. Hirschauer, O. Jones, et al.

*Title:* “1 Zwicky 18: Dust Life Cycle at Very Low Metallicities”

*Instrument:* MIRI Imaging, NIRCcam Imaging

*P.I.:* **M. Meixner**

*CoI(s):* **O. Nayak**, A. Hirschauer, O. Jones, et al.

## Successful Observing Proposals

*Title:* “Studying Gas Heating Mechanisms of a Super Star Cluster with SOFIA”

*Instrument:* SOFIA

*P.I.:* **O. Nayak**

*CoI(s):* M. Y. Lee, Y. Okada, M. Chevance, A. Hirschauer, H. Zinnecker, M. Andersen

*Grant:* \$12,300

*Title:* “N79: The Once and Future 30 Doradus”

*Instrument:* ALMA

*P.I.:* **O. Nayak**

*CoI(s):* M. Meixner, B. Ochsendorf, C. Battersby, A. Rosen, H. Zinnecker

*Grant:* NA

*Title:* “A Superstar Cluster is Born: Probing the X-ray Emission of H72.97-69.39 in LMC-N79”

*Instrument:* Chandra

*P.I.:* L. Lopez

*CoI(s):* **O. Nayak**, A. Rosen, G. Olivier

*Grant:* \$68,000

*Title:* “A Spectroscopic Study of Young Candidate Intermediate-Mass Protostars in the Magellanic Clouds”

*Instrument:* Magellan FIRE Spectrometer

*P.I.:* M. Reiter

*CoI(s):* **O. Nayak**, M. Meixner

*Grant:* NA

*Title:* “Measuring the Outflows from Massive Young Stellar Objects in the Large Magellanic Cloud”

*Instrument:* SOFIA

*P.I.:* M. Meixner

*CoI(s):* **O. Nayak**, M. Y. Lee, M. Chevance, Y. Okada, J. Stutzki, Y. Fukui, T. Onishi

*Grant:* \$60,000

## Press Release and Publicity

“NASA’s Webb Uncovers Star Formation in Cluster’s Dusty Ribbons,” press release about solar-mass star formation in the low-metallicity environment NGC 346 located within the Small Magellanic Cloud. We are seeing conditions of possible planet formation in low-metallicity environments, indicating planet-formation could have taken place in similar low-metallicity conditions around cosmic noon.

*Link:* <https://www.nasa.gov/feature/goddard/2023/nasa-s-webb-uncovers-star-formation-in-cluster-s-dusty-ribbons>

## Invited Speaker

July 2022      Young Stellar Objects in CO Molecular Clouds in 30 Doradus  
Star Formation in 30 Doradus (San Jose, California)

## Conferences

April 2022      Extreme Star Formation in the Large Magellanic Cloud  
San Jose State University Monthly Physics Colloquia (San Jose, California)

September 2021      Multi-Wavelength Analysis of a Super Star Cluster  
NASA Ames Weekly Colloquia (San Jose, California)

August 2019      Multi-Wavelength Analysis of a Super Star Cluster with ALMA and SOFIA  
Space Telescope Science Institute Summer HotSci Colloquia (Baltimore, Maryland)

June 2019      Multi-Wavelength Analysis of a Super Star Cluster  
Linking the Milky Way and Nearby Galaxies (Helsinki, Finland)

January 2019      Massive Stars and Super Star Clusters  
UMass Amherst Local Galaxies Talk Series (Amherst, MA)

January 2019 SSC Candidate in the Large Magellanic Cloud  
Harvard Galaxies & Cosmology Talk Series (Cambridge, MA)

November 2018 ALMA in the Era of JWST  
NRAO Weekly TUNA Talk Series (Charlottesville, VA)

October 2018 Massive Star Formation – Using ALMA To Prepare for JWST  
Princeton University Star Formation/ISM Seminar (Princeton, NJ)

October 2018 Massive Star Formation  
NASA Goddard Weekly Star Formation Colloquia (Greenbelt, MD)

October 2018 Extreme Star Forming Environments in the Large Magellanic Cloud  
University of Maryland Center for Theory and Computation Seminar (College Park, MD)

August 2018 Sites of Massive Star Formation in the Large Magellanic Cloud  
Johns Hopkins Exoplanet, Star, and Planet Formation Colloquia (Baltimore, MD)

February 2018 Extreme Star Formation in the Large Magellanic Cloud  
NASA Ames Weekly Colloquia (San Jose, California)

January 2018 Analysis of Extreme Star Formation Environments in the LMC  
Nayak, O., 2018, AAS, 231, 313.02  
American Astronomical Society Conference (Washington, D.C.)

August 2017 The Most Luminous YSO in the LMC  
Star Formation in Different Environment Conference (Quy Nhon, Vietnam)

October 2016 Multi-Wavelength Analysis of the Most Luminous Young Stellar Object in the LMC  
Star-Formation and Feedback in the SOFIA Era Conference (Asilomar, California)

June 2016 The Relation Between Massive Star Formation and the Structure of CO Clumps in the LMC  
Space Telescope Science Institute Summer HotSci Colloquia (Baltimore, Maryland)

January 2016 30 Doradus – Relating Young Stars to the CO Molecular Gas Observed with ALMA  
Nayak, O., Meixner, M., Indebetouw, R., Sabbi, E., De Marchi, G., Panagia, N., 2016, AAS, 227, 205.01  
American Astronomical Society Conference (Orlando, Florida)

March 2015 ALMA Observations of the Large Magellanic Cloud  
Soul of High Mass Star Formation Conference (Puerto Varas, Chile)

April 2013 Modeling of Emission of Quasar Winds  
Pennsylvania State University Local Group Conference (College Park, Pennsylvania)

February 2012 Geometry of Spinor Condensates with Large Spins  
Nayak, O., Turner, A., 2012, APS, P4.002  
American Physics Society Conference (Boston, Massachusetts)

## Posters Presentations

- December 2022 JWST Reveals for the First Time Low-Mass Young Stellar Object in NGC 346  
JWST First Science Results Meeting (Baltimore, Maryland)
- August 2016 Relating Young Stellar Object to Molecular Clouds Observed with ALMA  
Star Formation Conference (Exeter, England)
- October 2015 Analyzing the Relation Between Young Stellar Objects and Molecular Clouds in 30 Doradus  
Feedback in the Magellanic Clouds Conference (Baltimore, Maryland)
- July 2015 The Structure and Mass of Molecular Cloud N159 in the LMC Using Dendrograms  
30 Years of Photodissociated Regions Conference (Asilomar, California)

## Outreach Activities

### **STSCI STEM Learning and Public Outreach (2019 - 2023)**

Engaging all ages to be curious about the Universe. Showcasing the highlights of Hubble and ALMA, as well as broadening the public's understanding of JWST science capabilities.

### **Johns Hopkins Physics and Astronomy Graduate Students Outreach (2012 - 2019)**

Volunteer to help local K-12 students in Baltimore get interested in astronomy. Help build a portable planetarium and work on planetarium shows for the general public. Develop lesson astronomy and physics lesson plans with teachers to promote STEM career tracks.

### **UC Berkeley Compass Project (2008 - 2012)**

Help coordinate talks and social events with the UC Berkeley physics department to promote interest in the physical sciences within the undergraduate community.