

Kailash Chandra Sahu

Current position

- Tenured Astronomer, Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, Tel. (410) 338-4930, E-mail: ksahu@stsci.edu, webpage: <http://www.stsci.edu/~ksahu>

Education

- Ph.D. (Astronomy): 1985, Physical Research Laboratory, India
- M.Sc. (Physics): 1977, Berhampur University (Gold Medalist for 1st position in the University)

Professional Positions

- 1995 – present: Staff Astronomer at STScI (current position: Astronomer with tenure, WFC3 Instrument Scientist).
- 1994 – 1995: Associate at European Southern Observatory, Munich, Germany
- 1992 – 1994: Support Astronomer at Institute of Astrophysics, Tenerife, Spain
- 1987 – 1992: Postdoc at Kapteyn Laboratory, Groningen, The Netherlands (including one and half years as support astronomer at La Palma Observatory)
- 1985 – 1987: Postdoc at Institute of Astrophysics, Paris, France

Academic Memberships

- International Astronomical Union
- American Astronomical Society
- Astronomical Society of India (Life member)

Scientific Collaborations and Related Activities

- Member of the ROMAN microlensing science team
- Founder of the PLANET (Probing Lensing Anomalies NETwork) Microlensing collaboration
- PI of the HST/SWEEPS (Sagittarius Window Eclipsing Extrasolar Planet Search) program
- PI of the HST large program (HST-GO 12586) “Detecting and Measuring the Masses of Isolated Neutron Stars and Black Holes through Astrometric Microlensing”

Awards, Editorial Positions

- STScI BRAVO award for WFC3 Data Handbook, 2021
- STScI BRAVO Award for Calibration of WFC3, 2020
- STScI Outstanding Achievement award for recovery of cycle 15 science operations in 2007
- Certificate of Excellence for fast recovery of ACS operations in 2006
- GSFC/NASA Group Achievement award in 2005
- STScI science-merit award in 2001
- STScI science-merit award in 2000
- Gold Medal for highest rank in the University in M.Sc.(Physics)
- Member of the NSF review panel on Exoplanets
- Editorial Board Member for Journal of Astrophysics and Astronomy (Springer)

Current Research Interests

- Detecting isolated stellar-mass black holes through astrometric microlensing
- Search for extra-solar planets through transits and microlensing
- Gravitational microlensing and implications on dark matter
- Astrometric microlensing by nearby high-proper-motion stars
- Gamma-Ray Bursts
- Stellar Populations in the Galactic Bulge
- Planetary Nebulae

Publications

- 362 scientific publications which include:
 - 155 publications in refereed journals (including 9 papers in Nature, 4 of them as first author; 1 first-author Article in Science)
- 3 edited books
- 10 invited reviews
- 1 STIS Instrument Handbook (v3.0)
- 1 WFC3 Data Handbook (V5.0)
- 40 HST-related articles and Instrument Science Reports/Technical Instrument Reports

Teaching and Mentorship Activities

- Served as Adjunct professor at Morgan State University, Baltimore.
- Regularly supervised post-doctoral fellows working on the HST projects
- Currently supervise 4 Research and Instrument Analysts (2 working on our HST projects, and 2 working on the calibration of WFC3)
- Regularly supervised summer students at STScI
- Supervised graduate students at JHU/STScI
- Taught undergraduate/graduate classes at IIT, Kapteyn Lab and JHU
- Served as a Ph.D. thesis committee member at JHU
- Served as the referee for Ph.D. students from USA, New Zealand and Australia

Languages

English, Hindi, Oriya, Spanish

Visiting Appointments

2020 Institute for Advanced Study, Princeton
2019 European Southern Observatory, Munich, Germany
2013 Institute for Advanced Study, Princeton
2012 Center for Astrophysics, Harvard
2012 European Southern Observatory, Munich, Germany
2009 ARIES national Observatory, Nainital, India
2007 University of Tasmania, Australia
2003 European Southern Observatory, Munich, Germany

List of research grants currently held

- JWST-GO-2692 (multi-cycle program), “Accurate Mass Determination of the Nearby Single White Dwarf L845-70 through Astrometric Microlensing, PI: Sahu, \$127,654
- HST-SNAP-16716: “Snapshot Survey of Historical Microlensing Events”, PI: Sahu, \$155,485
- HST-GO-16782 (multi-cycle program): “Discovering Isolated Stellar-Mass Black Holes Using Astrometric Microlensing”, PI: Sahu, \$157,896
- HST-GO-15318 “Detecting Isolated Black Holes through Astrometric Microlensing”, PI: Sahu, \$197,897
- HST-GO-15705 “Accurate Mass Determination of the Nearby Single White Dwarf L145-141 (LAWD 37) through Astrometric Microlensing”, PI: Sahu, \$193,674
- HST-GO-15956 “Mass determination of an extreme halo M subdwarf through astrometric and photometric microlensing”, PI: Sahu, \$137,029

(Recent) Science-related Service Activities

- Regularly reviewed articles for ApJ, AJ, A&A and Nature.
- Active in giving public talks
- Served in the editorial board for the Journal of Astrophysics and Astronomy (Springer)
- Organized the STScI colloquium series for a year
- Served in the Scientific Organizing Committee of 3 STScI May symposia (“A Decade of Extrasolar Planets around Normal Stars”, “Supernovae and Gamma Ray Bursts”, and “The Dark Universe: Matter, Energy and Gravitation”)
- Served in the Organizing committee for the ICAC 2012 Kathmandu conference on “Astrophysics and Cosmology”
- Wrote a section for the science case for the proposed ATLAST mission
- Submitted a white paper to the National Academy's Exoplanet Task Force, for strategy to detect and characterize exoplanets
- Co-founded and organized PLANET Collaboration activities, including many observing programs
- Served as organizer of the Antarctica Session for the AAS meeting
- Organized the Monday Lunch talks at Kapteyn Laboratory, Groningen, for one year
- Served on several NASA Proposal Review processes
- Served as Panel Support Scientist for HST phase-I proposal reviews in 2 cycles
- Worked as a Support Astronomer at La Palma Observatory for 2 years
- Worked as a Support Astronomer at Teide Observatory (Tenerife) for 1.5 years

Some Recent Colloquia/Seminars/Invited Talks

1. *Detection and Mass Measurement of the First Isolated Stellar-Mass Black Hole Using HST*, Hot-Sci talk, STScI, June 29, 22
2. *An Isolated Stellar-Mass Black Hole Detected Through Astrometric Microlensing*, ESO Lunch Talk, Invited talk, Iran National Observatory Symposium, Tehran, July 27-29, 2022
3. *The First Rogue Black Hole Detected with Hubble Space Telescope*, Invited talk, New York Local Amateur Astronomy Club, July 24, 2022

4. *An Isolated Stellar-Mass Black Hole Detected Through Astrometric Microlensing*, Tata Institute of Fundamental Research, Mumbai, India, June 17, 2022
5. *An Isolated Stellar-Mass Black Hole Detected Through Astrometric Microlensing*, ESO Lunch Talk, April 12, 2022
6. *Detection and Mass Measurement of the First Isolated Stellar-Mass Black Hole Using HST*, Presentation to NASA Astrophysics Advisory Committee, March 31, 2022
7. *Detection of an Isolated Stellar-Mass Black Hole Isolated Stellar-Mass Black Hole*, Science Staff Meeting, STScI, March 14, 2022
8. *Detecting Stellar-Mass Black Holes through Astrometric Microlensing and Transits*, Roman Telescope Virtual Series, July 15, 2021
9. *A Census of Exoplanets in the Milky Way through Gravitational Microlensing*, McMaster University, Nov 2, 2020
10. *Study of White Dwarfs and Black Holes through Astrometric Microlensing*, Institute for Advanced Study, Mar 20, 2020
11. *Study of White Dwarfs and Black Holes through Relativistic Bending of Light*, University of Washington, Jan 16, 2020
12. *Study of White Dwarfs and Black Holes through Relativistic Bending of Light*, University of Maryland at Baltimore County, Nov 13, 2019
13. *Measuring Masses of Single Stars through Relativistic Deflection*, Presentation at the Informal Discussion in ESO, Munich, for the 100th anniversary of the famous 1919 solar-eclipse that confirmed General Relativity, May 29, 2019
14. *Study of Exoplanets and Stellar Remnants through Gravitational Microlensing*, Colloquium at the Department of Physics and Astronomy, California State University Northridge, Apr 10, 2019
15. *Astrometric Microlensing with HST*, invited talk at the 23rd International Microlensing Conference, held at New York City, Jan 28-30, 2019
16. *Recent Advances in the Study of Extra-Solar Planets*, Physics Colloquium at National Institute of Science Education and Research (NISER), Odisha, India, Nov 9, 2018
17. *A Census of Planets in the Milky Way*, Plenary talk in the conference "Exploring the Universe: Near Earth Space Science to Extra-galactic Astronomy", held at N. Bose National Centre for Basic Sciences, Kolkata, India, November 14 - 17, 2018.
18. *Study of white dwarfs, neutron stars and black holes through astrometric Microlensing*, Invited talk at the IWARA2018 8th International Workshop on Astronomy and Relativistic Astrophysics, held at Ollantaytambo/ Cusco, Peru, Sep 9-14, 2018
19. *Detecting Isolated, Stellar-Mass Black Holes Through Astrometric Microlensing*, Talk at IAU General Assembly, held at Vienna, Austria, Aug 16-27, 2018
20. *Detecting Isolated Stellar-Mass Black Holes through Astrometric Microlensing Using HST*, Invited talk at the International Microlensing Conference held at Auckland, New Zealand, Jan 25-28, 2018.
21. *Study of Exoplanets and Stellar Remnants through Gravitational Microlensing*, Subaru Telescope Center, Hilo, Jan 31, 2018
22. *Study of Exoplanets and Stellar Remnants through Gravitational Microlensing*, Embry Riddle Aeronautical University, Feb 8, 2018
23. *Study of Exoplanets and Stellar Remnants through Gravitational Microlensing*, Penn State University, Feb 14, 2018

24. *Detecting Isolated Stellar-Mass Black Holes through Astrometric Microlensing Using HST*, contributed talk at the workshop on Science with Precision Astrometry, held at STScI, March 13-15, 2018
25. *HST measures the mass of a nearby white dwarf through relativistic deflection of background starlight*, July 26, 2017, STScI Hot Sci talk.
26. *Proper Motions with WFIRST*, Invited talk at Sagan Exoplanet Summer School on Microlensing in the Era of WFIRST, held at NASA Exoplanet Sci. Institute, Cal Tech, Pasadena, CA, August 7-11, 2017
27. *The Deepest H-R Diagram of the Stars in the Galactic Bulge*, contributed talk at STScI Spring Symposium on *The 21st Century H-R Diagram*, STScI, April 23-26, 2018.
28. **Transiting Planets with WFIRST**, Invited talk at the WFIRST Meeting held at Simons Institute, New York, Jan 13, 2017.
29. HST measures the mass of a white dwarf through astrometric microlensing, Invited Talk at the 21st International Microlensing Conference, Feb 1-3, 2017
30. *Hubble Space Telescope measures relativistic deflection of starlight by nearby white dwarf*, STScI Science Talk, Dec 16, 2016
31. Detecting Black Holes through Astrometric Microlensing, Invited Talk at the conference on “Black Holes” held at Kathmandu, Nepal, Oct 16-21, 2016
32. Planets Near and Far, School of Earth and Space Exploration, Arizona State University, March 27, 2015
33. Search for Other Worlds, Morgan State University, February 10, 2015
34. Detecting Isolated Black Holes through Astrometric Microlensing Using HST, TIFR, Mumbai, April 15, 2014
35. Detecting Isolated Black Holes through Astrometric Microlensing Using HST , Invited talk at the International conference on “Black Holes”, Kathmandu, Nepal, October 2013
36. Determination of the mass of Proxima Centauri, and possible detection of its planets, Invited talk at the Gaia conference, IAP, Paris, July 2013
37. Detecting Isolated, Stellar-Mass Black Holes through Astrometric Microlensing using HST, colloquium at GMRT, Pune, on May 15, 2013
38. Using HST to detect isolated, stellar-mass black holes and neutron stars through microlensing, Invited Talk at Doha Microlensing Workshop, February, 2013
39. Detecting Stellar Remnants through Astrometric Microlensing Using HST, Talk at IAS, Princeton, January, 2013
40. Seminar on "Planet Detection via Lensing: Where have monitoring programs been, where they are going?", CfA, October 16, 2012
41. Seminar on “Detecting Isolated, Stellar-Mass Black Holes through Astrometric Microlensing using HST,” CfA, Sep 27, 2012
42. Luncheon talk on "Frequency of Planets across the Milky Way" at CfA/ITC, Sep 27, 2012
43. “Using HST to detect isolated, stellar-mass black holes through microlensing,” colloquium at Goddard Space Flight Center, May 8, 2012
44. “Detecting isolated black holes through astrometric microlensing”, Informal talk at ESO, Munich, April 11, 2012
45. “A Census of Planets in the Milky Way”, colloquium at NASA Ames Research Center, March, 9, 2012
46. “Using HST to detecting isolated, stellar-mass black hole through microlensing,” Invited talk at the conference on “Microlensing: Past and Future,” Doha, Qatar, Jan, 2012

47. "Spectroscopy of microlensed sources", Invited Talk at the conference on "Spectral Classification of Stars", held at Delhi, Dec 2011
48. "Study of Extra-solar Planets with the Hubble Space Telescope," Univ. of Tasmania, Hobart, August 12th, 2010
49. "Limits from SWEEPS data on substellar and planetary-mass objects through microlensing" invited talk at Microlensing workshop held at Auckland, New Zealand, Jan 21, 2010
50. "Isolated Black Holes through Astrometric Microlensing Using HST," invited talk at Microlensing workshop held at Auckland, New Zealand, Jan 21, 2010
51. "Search for other worlds using the Hubble Space Telescope", Nainital Observatory, Nainital, India, December 22, 2009
52. "A kaleidoscopic view through gravity's microlenses", Nainital Observatory, Nainital, India, December 18, 2009
53. "A kaleidoscopic view through gravity's microlenses", Physical Research Laboratory, Ahmedabad, India, December 15, 2009
54. "Search for other worlds using the Hubble Space Telescope", Physical Research Laboratory, Ahmedabad, India, December 14, 2009
55. "Methods for detecting and characterizing Extrasolar Planets," Talk to 2009 STScI summer students, August 11, 2009
56. "Limits on Substellar and Planetary-Mass Objects through Microlensing from SWEEPS Data" SAAO, July 2008
57. "Worlds in Transit" Univ. Arizona, March 2008

Selected Recent Observing with HST and Ground-based Telescopes

- Principal Investigator of more than 20 HST proposals, including two large proposals
- Principal Investigator of a multi-cycle JWST proposal
- Observed with several large ground-based telescopes (VLT, Gemini) for photometric and spectroscopic observations. Some examples:
 - Gemini telescope, 3 nights, May 2014, for spectroscopic confirmation of WD and CV candidates towards the Galactic Bulge, discovered through HST
 - ESO Very large Telescope, 4 nights in June, 2004 at the 8m telescope, "Radial Velocity spectroscopic observations of SWEEPS Exoplanet Candidates"
- Co-founded the PLANET collaboration, where we conducted continuous, 24-hour monitoring of microlensing events using 4 different telescopes at appropriately spaced longitudes for several years from 1995, to look for exoplanets. Some examples:
 - ESO Danish 1.5m Telescope, 10 nights in August 2007
 - Sutherland Observatory, 2 weeks in July, 2006 at the 1m telescope,

(As a support astronomer at different observatories, I had numerous observing runs with ground-based optical telescopes, which are not listed here.)

Outreach Activities

Some of our scientific results (10 of which are published in Nature/Science) have generated considerable interest in the media, a few recent examples of which are listed below.

- Our recent result on the “first detection and mass measurement of an isolated black hole” generated more than 1000 news items in international media. This result was used as a science highlight in the recent HST Senior Review proposal.
- Our results on the mass measurement of Stein 2051B (published in Science) has generated about 700 news items in different newspapers, and TV/radio shows around the world.
 - This has also been selected as one of the top 100 science results of 2017 by Discover magazine.
- Our results on “Microlensing Events by Proxima Centauri in 2014 and 2016: Opportunities for Mass Determination and Possible Planet Detection” (Sahu et al. ApJ, 782, 89, 2014) were featured in:
 - A STScI press release (STScI-2013-22): “Rare Stellar Alignment Offers Opportunity to Hunt for Planets”
 - A press event at the AAS meeting #222, held at Indianapolis in June 2013
 - Articles in several popular science magazines including Sky & Telescope, and the online version of Scientific American
- Our recent results on detection of planets through Microlensing (Cassan et al. 2012) generated:
 - A STScI press release (STScI-2012-07): “The Milky Way Contains at Least 100 Billion Planets According to Survey”
 - Several hundred articles in international newspapers
- Our discovery of 16 exoplanet candidates towards the Galactic bulge through HST observations of the SWEEPS field was reported as an article in Nature (Sahu et al. 2006). Based on this result, there was a NASA Science Update (NSU) on October 4, 2006, titled "Hubble Finds Extrasolar Planets Far Across Galaxy" (with Jennifer Wiseman of NASA Headquarters as the moderator, and Mario Livio and Alan Boss as the other co-panelists.) The result announced in this NSU:
 - Generated articles in >1,000 newspapers and magazines (as per the list produced by the STScI OPO division) all over the world in English language alone. It also appeared in Spanish, Dutch, French, Polish, German, Hindi, Oriya, and many other language newspapers.
 - Highlighted the SWEEPS image which was voted "the picture of the week" in Time magazine.
 - Was rated by Astronomy magazine as one of the top 10 astronomical results of 2006.