

CHARA Year in Review

Douglas Gies

CHARA Director, Regents' Professor
Department of Physics and Astronomy
Georgia State University, Atlanta, Georgia, USA
dgies@gsu.edu

1. Introduction



- Welcome
- Telescopes & Instruments
- Operations
- Science News
- Tribute to a Friend
- Summary & Thanks

ANNUAL CHARA SCIENCE MEETINGS

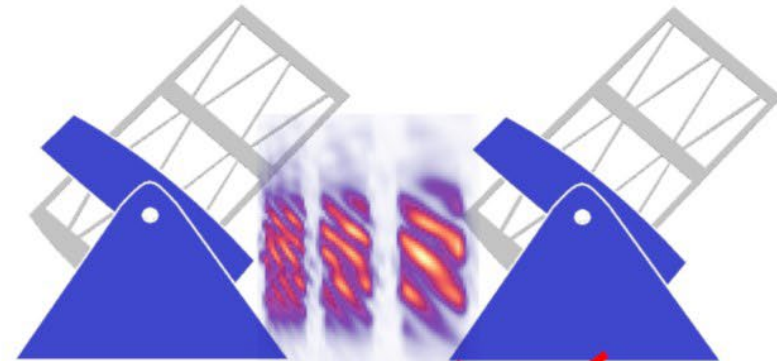
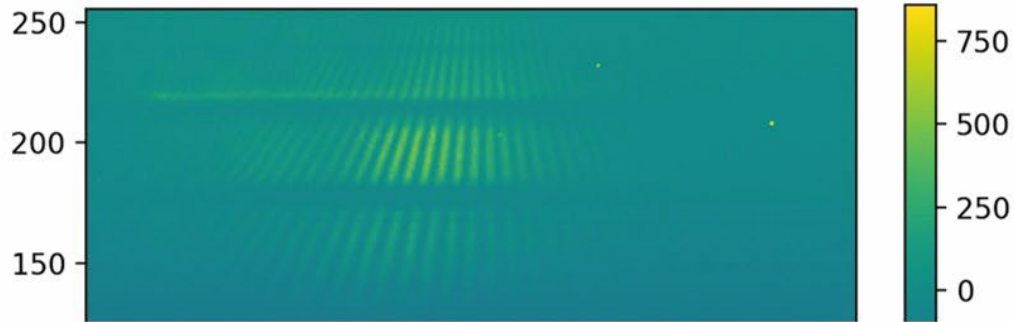
<https://www.chara.gsu.edu/events/meetings>

- 2005 Paris
- 2006 Tucson
- 2007 New York
- 2009 Nice
- 2010 Pasadena:
Caltech
- 2011 Atlanta
- 2012 Atlanta
- 2013 Flagstaff
- 2014 Ann Arbor
- 2015 Atlanta
- 2016 Nice
- 2017 Pasadena:
Carnegie
- 2018 Paris
- 2019 Flagstaff
- 2021 Virtual
- 2022 Exeter, UK
- 2023 Atlanta
- 2024 Tucson
- 2025 Nice
- **2026 Socorro**
our 20th gathering



2025 Celebrating Antoine Labeyrie at Nice Obs.

2026 Celebrating MROI 1st fringe

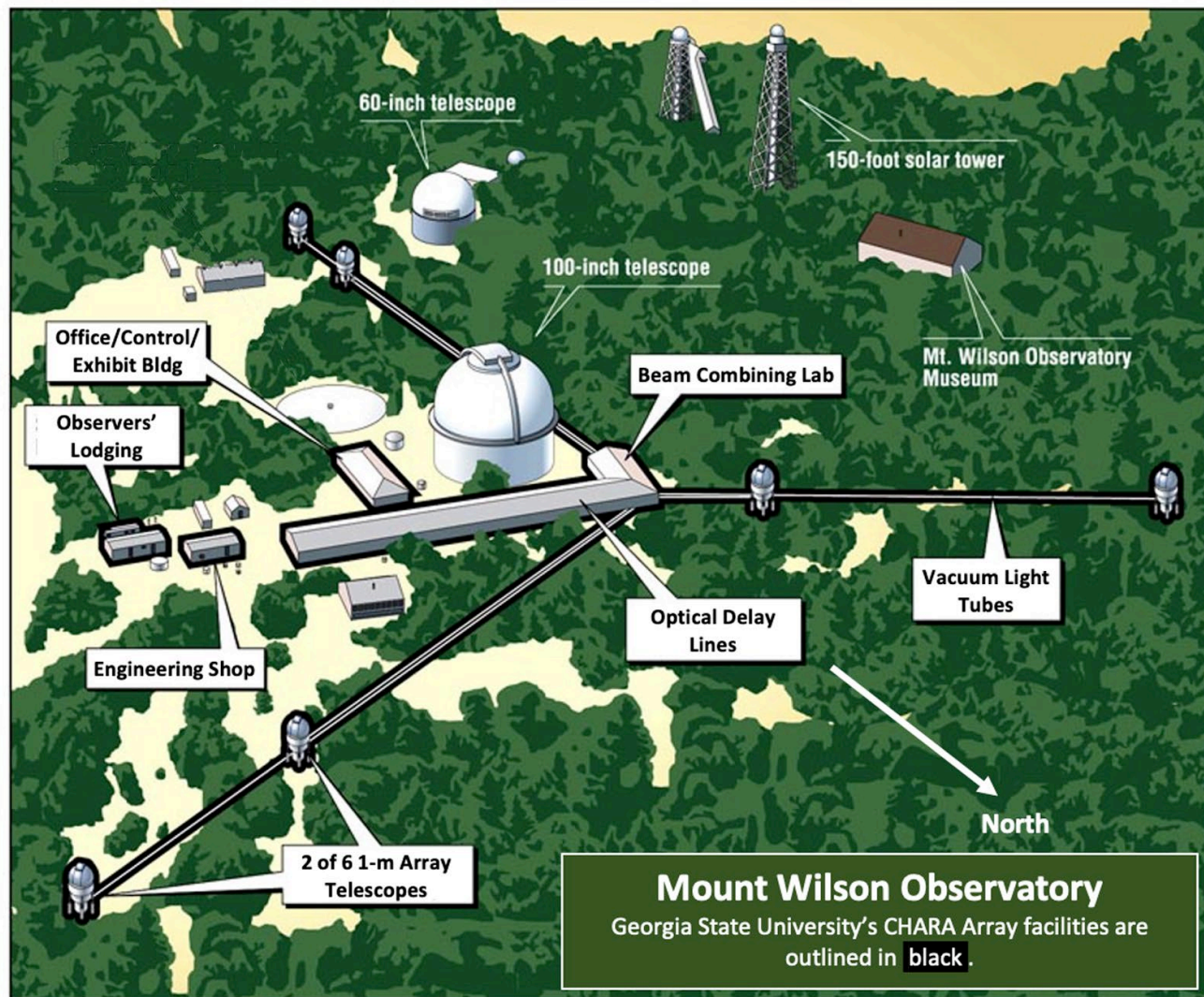


Fringes or ~~Death~~

THIS SCIENCE MEETING

- 62 participants here from USA, France, UK, India, Australia, Chile, UK, and Czech Republic
- Special welcome to
Gerard van Belle (Lowell Observatory to NAU)
Stuartt Corder (Deputy Director, NOIRLab)
graduate students (pioneers in OLBI)
- New Visions in Optical Interferometry Workshop
(Thursday and Friday)

2. Telescopes & Instruments

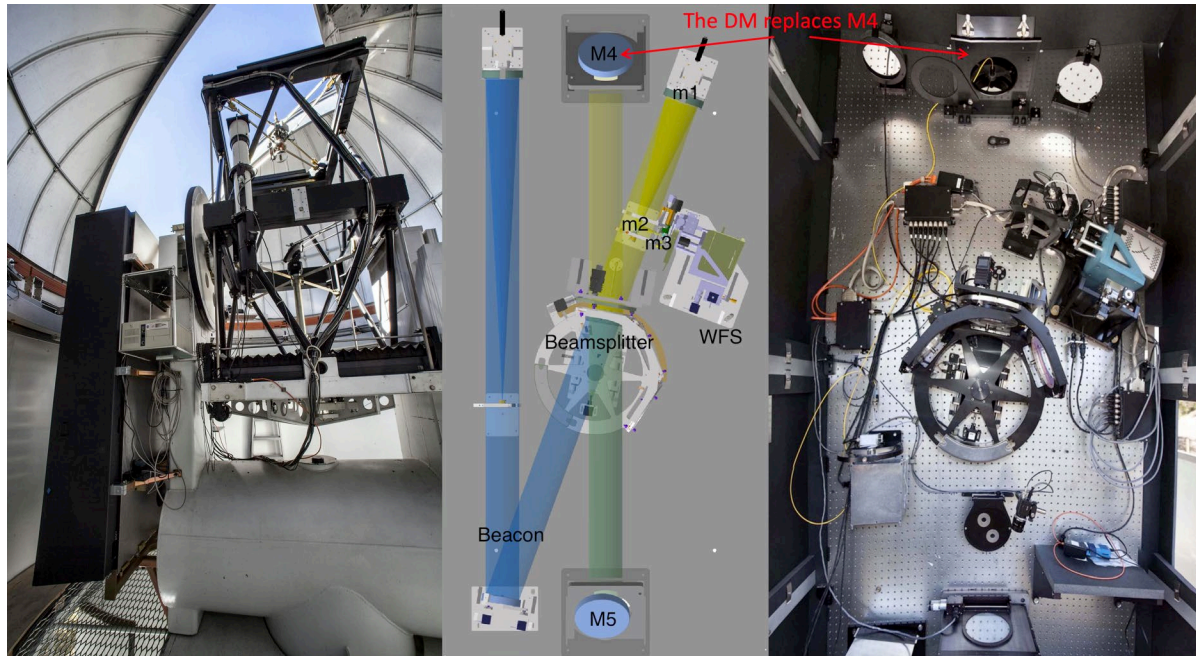


- Six 1 m aperture telescopes with baselines from 34 to 331 m in length
- Evacuated light tubes send beams to OPLE and BCL
- T7 is a new 1 m telescope for fiber optics transmission

Telescopes & Domes

- Enclosure ventilation (planning for future A/C)
- New stairs
- New dome server software
- Telescope drive motors are being replaced (**Scott**)
- Mirrors for E2 and W2 were re-aluminized (**Webster**)

Adaptive Optics, OPLE



- Improved software control of both TelAO and LabAO (**Kubiak**)
- Plans for new electronics control of Adaptive Optics Bench on each telescope (**Hakobyan**)
- Improvements to OPLE delay line tracks and metrology (**Ligon**)
- Solution of software problem that introduced irregular jumps in delay (**Anugu, Turner**)

Beam Combiners

Monnier

Monnier

Mourard

Lanthermann

CMAP T7 to S4







150 kW Power Generator (Farrington)

Seeing Monitor

Mourard



3. Operations – CHARA Consortium

- *University of Michigan*
John Monnier
- *University of Exeter*
Stefan Kraus
- *Université Côte d'Azur*
Denis Mourard
- *Observatoire de Paris*
Vincent Coude du Foresto
- *Université de Limoges*
Ludovic Grossard
- *University of Sydney*
Peter Tuthill
- *Australian National University*
Mike Ireland
- *Kyoto Sangyo University*
Makoto Kishimoto
- *NSF's National Optical-Infrared Astronomy Laboratory (NOIRLab)*
Jayadev Rajagopal

Observing Semesters

- **A** March to July
B August to December
- Call for Proposals for 2026B
Internal:
<https://chara.gsu.edu/observers/plying-for-chara-time>
- ***Due March 31***
- External: Open access program through NOIRLab (**Schaefer**)
<https://time-allocation.noirlab.edu/#/>
- 46 nights available plus 4 nights of Fast Turnaround Snapshot Imaging Mode
<https://chara.gsu.edu/snapshot-imaging-mode>

Observing support by Lanthermann, Farrington , Flores, Jones, & Klement

Data Management (Jones)

- GSU *CHARA Archive* (indexed at JMMC)
<https://chara.gsu.edu/observers/database>
- Online *Database Portal*
<http://db.chara-array.org:8080>
- Data reduction through the *Remote Data Reduction Machine*
<https://chara.gsu.edu/observers/data-reduction-software>
- Access to the Array through the *Remote Observing Machine*
<https://chara.gsu.edu/observers/remote-observing>

4. Science News

- 13 papers over last year
- total of 289 papers to date
- www.chara.gsu.edu/astronomers/journal-articles
- Dissertations:
 - Peter Wysocki (2025, GSU)
 - Noura Ibrahim (2026, Michigan)
 - Ashley Elliott (2026, LSU)
- Topics include:
 - *stellar angular diameters* [1]
 - *YSOs* [3]
 - *Be star disks* [1]
 - *exoplanet host stars* [1]
 - *binary stars, stellar multiplicity* [5]
 - *novae* [1]
 - *exozodi dust disks* [1]
 - *techniques* [3]

Refereed Papers

[CHARA Array Delay Lines: Upgrades, Performance and Future Directions](#) Anugu, N. *et al.* (2026)

[Double Stars, Double Disks: Discovering the Young Companion of Herbig Be Star MWC 340](#)

Ibrahim, N. *et al.* (2026)

[Surprise non-detection of Upsilon Andromedae b with MIRC-X and MYSTIC at the CHARA Array](#)

Gardner, T. *et al.* (2026)

[Multiple outflows and delayed ejections revealed by early imaging of novae](#) Aydi, E. *et al.* (2026)

[The CHARA Array Polarization Model and Prospects for Spectropolarimetry](#) Shuai, L. *et al.* (2025)

[Orbital and Physical Properties of the Pleiades Binary 27 Tau \(Atlas\)](#) Torres, G. *et al.* (2025)

[The Small Separation A-star Companion Population: Tentative Signatures of Enhanced Multiplicity with Primary Mass](#) De Furio, M. *et al.* (2025)

[Precise Age For The Binary HD 21278 In The Young Alpha Persei Cluster](#) Danner, C. A. *et al.* (2025)

[The Dynamic Inner Disk of a Planet Forming Star](#) Setterholm, B. *et al.* (2025)

[Review and Prospects of Hot Exozodiacal Dust Research For Future Exo-Earth Direct Imaging Missions](#)

Ertel, S. *et al.* (2025)

[Newborn Be star systems observed shortly after mass transfer](#) Rivinius, Th. *et al.* (2025)

[First on-sky interference fringes at 810 nm with the CHARA array using servo controlled hectometric outdoor fibre links](#)

Magri, J. *et al.* (2025)

[Multiplicity of Galactic Cepheids from long-baseline interferometry: V. High-accuracy orbital parallax and mass of SU Cygni](#) Gallenne, A. *et al.* (2025)

Atlas binary

(Torres, Tkachenko, Pavlovski, et al.
2025, ApJ, 990,107)

- Combined visual orbit from CHARA with spectroscopic double-lined orbit
- $P=291$ d
- $d=136.2 \pm 1.4$ pc
- $M= 5.04 \pm 0.17, 3.64 \pm 0.12 M_{\odot}$
- Primary is oblate rapid rotator with spin axis aligned with orbital axis

Photo from H. McAlister



Herbig Ae star MWC275

(Setterholm et al. 2025, AJ, 169, 318)

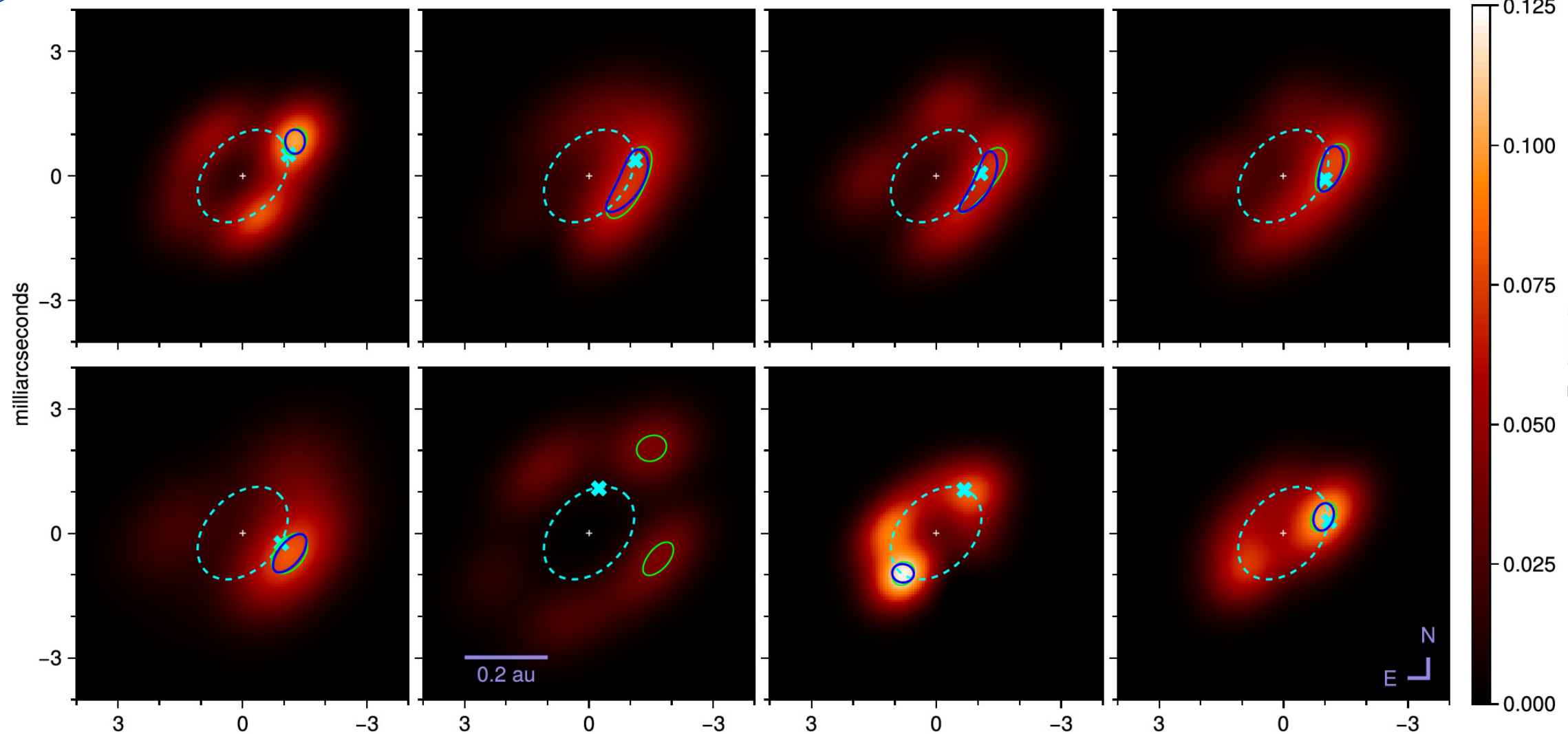
- Time variability of dust sublimation rim
- June and July 2019 results from MIRC-X and PIONIER
- Performed image reconstruction of star, rim flux and halo using OITTOOLS.jl
- Feature appears at rim that moves clockwise at a radius of 0.13 au with a period of 43.6 d
- For star of $2M_{\odot}$, Keplerian period should be 12.0 d
- Moving feature may be related to a tidal wake formed by an unseen planet further out in disk at 0.3 au

June 5, 2019
MIRC-X

June 6, 2019
MIRC-X

June 8, 2019
MIRC-X

June 9, 2019
MIRC-X + PIONIER



June 10, 2019
MIRC-X

July 10, 2019
PIONIER

July 13, 2019
MIRC-X

July 20, 2019
MIRC-X + PIONIER

Global Disk Oscillation modes in Be disks

(Peter Wysocki 2025, GSU PhD)

- GDO modes propagate as spiral features in Be star disks for several cycles
- Varying V and R peaks in emission lines
- Model applied to CHARA VEGA $H\alpha$ 2T data from Nov, Dec 2020 for Be stars γ Cas, φ Per, ζ Tau, β CMi
- Explored disk asymmetries in VEGA differential visibility amplitude and differential visibility phase
- Strong emission and GDO mode found for γ Cas and φ Per



5. Tribute to a Friend



GSU CHARA leaders
circa 1990

- William G. Bagnuolo, Jr. died March 12, 2025
- Major contributor to early development of the Array
- Lead author on 12 of the original Tech Reports
- Survived by wife Michele and daughter Danielle

McAlister

ten Brummelaar

Hartkopf

Bagnuolo

6. Summary & Thanks

- Completed a very busy year in 2025
- Progress on telescopes, AO, & instruments
- Supported many new and continuing science observing programs
- In year ahead, need to work as a community to imagine the future (Astro 2030)



Thank you to ...

LOC (NMT)

- Michelle Creech-Eakman
- Ryan Norris
- Dana Baylis-Aguirre
- David Frothingham
- Cole Mason
- Rebecca Proni
- Nirupam Roy
- Montana Williams

SOC

- Gail Schaefer (co-chair)
- Fabien Baron
- Michelle Creech-Eakman
- Douglas Gies
- Jeremy Jones (co-chair)
- Cyprien Lanthermann
- John Monnier
- Ryan Norris
- Jayadev Rajagopal
- Steve Ridgway
- Rachael Roettenbacher
- Nic Scott
- Isabelle Tallon-Bosc
- Gerard van Belle

Thank you to ...

- Georgia State University College of Arts and Sciences
- National Science Foundation
- Heising-Simons Foundation
- CHARA staff





Well done!