# Discussion: Future of the CHARA Array

# Workshop on New Vision in Optical Interferometry + 2026 CHARA Meeting

- Funding for workshop through Heising-Simons Foundation
  - Covers travel support for workshop participants
  - Introduction to interferometry
  - Software tools for modeling and imaging data
  - Interactive sessions to work on interferometric data
- Lowell Observatory – Flagstaff, Arizona
- March 2026

# Discussion: Future of the CHARA Array

- Near-term Future (2025-2030s)
  - Multi-spectral band advances + beam stability [Pending – dichroics + STST detector]
  - Redesigning labAO + beacon
  - AO optimized for visible wavelengths (DM > 100 actuators)
  - CHARA rejuvenation (hexapods, TEMA upgrade, AC in domes, etc) vs. Array of 2-meters
  - Extended delay – expand 6T coverage
  - Central 2 meter
  - 1 km mobile site
  - New instrumentation (consortium + new collaborations)
  - Automated observing (coordination with JMMC A2P2)
  - Promote cross-institution large surveys
  - Lead serious process to plan for 2030 Decadal Survey – New US Facility or stick with current infrastructure?

# Astro2020 Results

- Conclusion: “NSF is unlikely to have sufficient funds to support all three [CHARA, NPOI, MROI]”

The panel concludes that continued U.S. scientific and technical leadership in ground-based optical interferometry requires strategic investment during the 2020s. Based on the RFI responses, modest ($1 million to $2 million per year) investments would promote continued growth of the interferometry user community and fund new technology development efforts. Mid-scale investments in CHARA and NPOI at the high end of MSRI-2 would enable implementation of larger telescopes, longer baselines, and advanced beam combination technologies needed to deliver the greater angular resolution and photometric sensitivity required to achieve the science goals of the Panel on Stars, the Sun, and Stellar Populations. A final phase of the envisioned CHARA upgrade (replacement of all existing 1 m inner-array telescopes with new AO-equipped 2 m telescopes) would require an additional mid-scale investment during the 2030s. Achieving the potential of MROI would require an MREFC-level investment to bring the full 10-telescope array into science operation by the end of the 2020s.

The full triad of U.S. OIR interferometers is deeply complementary: no one system can accomplish the science of all three by themselves. However, NSF is unlikely to have sufficient funds to support all three. Thus, the U.S. interferometry community and funding agencies would be best served by formulating a plan to realize this goal collectively instead of through internecine competition. This will strengthen U.S. leadership and make it an important component of a balanced U.S. ground-based OIR portfolio.

# Possible 2040-2050 Scenarios

- New Large International Facility (e.g., PFI)
- CHARA only future
- MROI only future
- NPOI only future
- New joint NASA/NSF/private medium-class facility, with >1km baselines
  - DoD could also be involved in principle
- All US ground-based facilities closes
  - Some focused small projects can still go on
  - US groups Join VLTI projects as consortium partners as done today for instruments
- Focus on Space Interferometry (formation flying + moon)

# New US Interferometry Center needed

- Coordinate technology development: cheaper big telescopes, even better detectors, high throughput visible SM and thermal IR fibers, integrated optics and photonics, nulling testbeds , compact DLs (fiber-based ideally)
- Improve science utilization: software tools, calibration/pipeline workshops, coordinate more with ESO, JMMC
- Organize effective 2030 white paper: facilitate hard conversations about closing current facilities and working together on new ones (win-win situations rather than “internecine” competition)

# Concrete Recommendations

- Current facilities could morph into specialized experiments with modest upgrades
  - e.g., MROI IR nulling (add AO, 3-4 telescopes), CHARA visible AO upgrade
- All current groups should work together on defining a new facility at a new site with >1km baselines (Anderson mesa?) for 2030
  - Start with Mid-Scale level project that can grow incrementally, such as:
    - GAIA followup using 3x3m telescopes, 1km baselines, fiber transports, compact DLs
  - Bring in new partners
- Keep pushing space interferometry
  - Develop exciting mid-scale science other than LIFE mission
  - Make it international!

# Discussion Questions

- Is 300 meter maximum baseline enough for the next 30 years?
- Can US stay competitive with ESO in at least some areas?
  - VLTI-ATs now have 200meters baseline, better sensitivity, better uv coverage
  - VLTI-Uts 10000x better sensitivity at ~140meter baselines (UT5 → 245m baseline)
- Should the OI field keep imaging as a core goal or move to 'easier' mode that doesn't require as many telescopes?
- Can we harness excitement of VLTI-UT-GRAVITY sensitivity breakthrough to push interferometry back onto large US-based telescopes?
- Is space interferometry really viable? Can we find compelling SMEX/MIDEX?
- What private resources can help transition us to new facilities?
- Should we form a new "Interferometry Science Center" to organize better?
- Can our field evolve quasi-statically or do we have to wait for crisis?

# Discussion: Future of the CHARA Array

- Long-term Future (2040-2050)
  - New large facility? vs. Investment into existing facilities?
  - International collaboration on new facility? Private foundations?
  - Baseline/sensitivity requirements?
  - Strategy for Astro2030/ESO recommendations

# *Best wishes to Theo...*

# *Special thanks to …*

## *Local Organizing Committee*

- Isabelle Bailet
- Manon Bailleul
- Orlagh Creevey
- Romina Ibañez Bustos
- Juraj Jonák
- Anthony Meilland
- **Denis Mourard (chair)**
- Nicolas Nardetto
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## *Scientific Organizing Committee*

- Orlagh Creevey
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- **Gail Schaefer (Chair)**