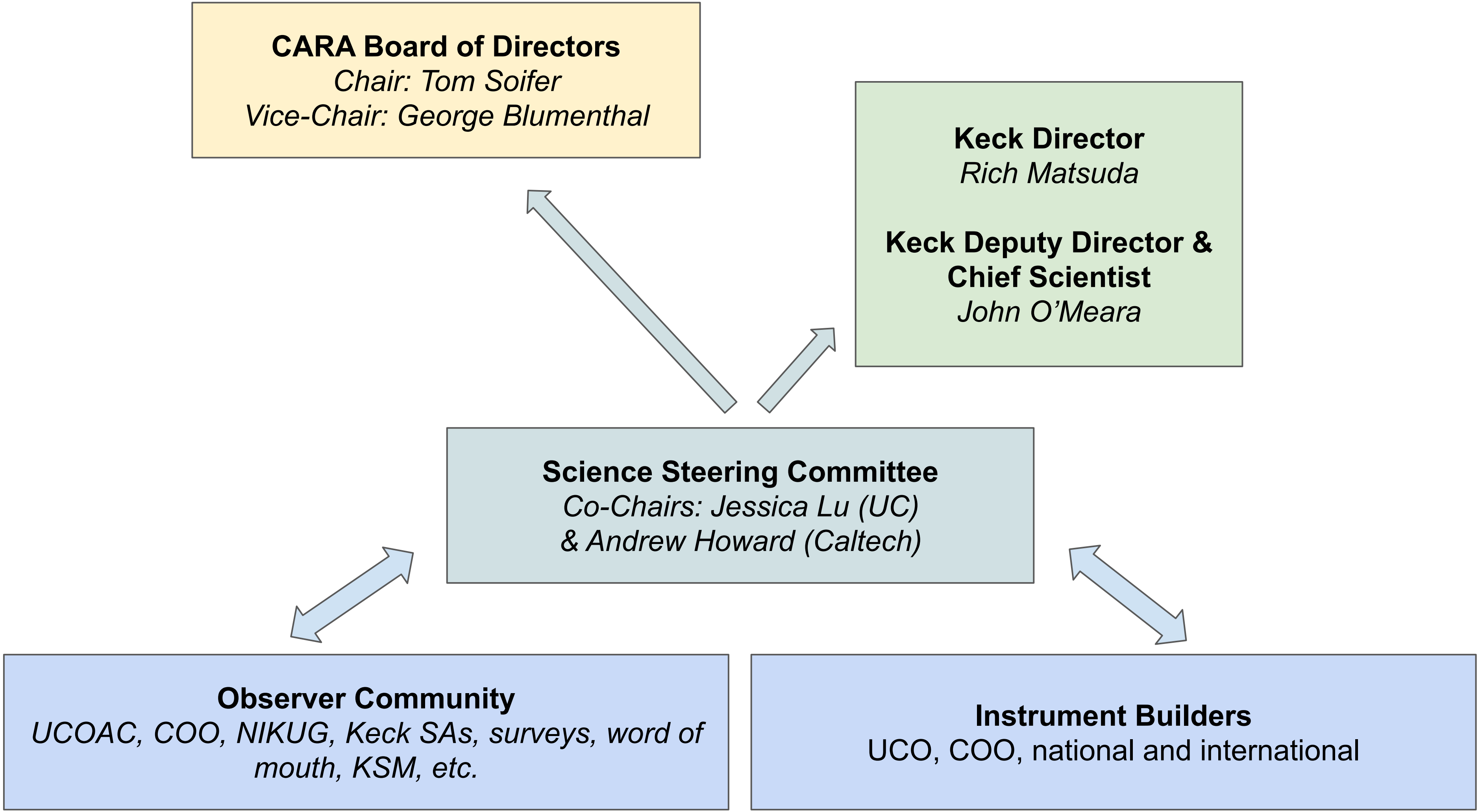
# Keck Science Steering Committee Updates

Andrew Howard & Jessica Lu
*on behalf of the SSC*


**CARA Board of Directors**
*Chair: Tom Soifer*
*Vice-Chair: George Blumenthal*
**Keck Director**
*Rich Matsuda*
**Keck Deputy Director & Chief Scientist**
*John O'Meara*
**Science Steering Committee**
*Co-Chairs: Jessica Lu (UC)*
*& Andrew Howard (Caltech)*
**Observer Community**
*UCOAC, COO, NIKUG, Keck SAs, surveys, word of mouth, KSM, etc.*
**Instrument Builders**
UCO, COO, national and international

# Science Steering Committee

**Mail List** address for all **SSC Members** and associates: all-keckssc@keck.hawaii.edu
[Non-member posts will be held for moderation before being delivered to list members]

**Mail List** address for **SSC Executive Members**: keckssc@keck.hawaii.edu
[Non-executive member posts will be held for moderation before being delivered to list members]

## SSC Membership and Contact Information

| | |
|---|---|
| Andrew Howard (Caltech Co-chair) | |
| Jessica Lu (UC Berkeley, Co-Chair) | |
| George Becker (UC Riverside, voting) | |
| Jean Brodie (Swinburne, voting) | Chas Beichman (Exec. Director, NASA Exoplanet Science Institute NExScl, ex-officio)[1] |
| Jessie Dotson (NASA, voting) | Bruce Macintosh (UCO/UCSC, ex-officio)1 |
| Dimitri Mawet (Caltech, voting) | Chris Martin (Caltech, COO, ex-officio)1 |
| Tucker Jones (UC Davis, voting) | Doug Simons (UH, IfA, ex-officio)1 |
| Mansi Kasliwal (Caltech, voting) | Jeffrey Chilcote (Notre Dame, non-voting) |
| Mike Liu (UH, voting) | Jason Wang (Northwestern University, non-voting) |
| Joshua Schlieder (NASA, voting) | Pieter van Dokkum (Yale, non-voting) |

## *SSC Roles*

The SSC advises the CARA Board and the WMKO Director on those aspects of the Observatory that affect its scientific capability and productivity.

# 2024-2025 SSC Actions recommended to CARA Board

- Developed 5-Year Implementation Plan with Instrument Prioritization (with the Observatory and based on community input).
- Conducted first “Science Reviews” of instruments in early development stages
- Monitored project readiness through external reviews and briefings
- Reconsidered the science impact and operational costs of NIRES hibernation
- Continued development of Zshooter
- Advised on process and science-relevant operations decisions.

# Other Topics – Just a flavor

- **Zshooter location** – considered trade-offs to optimize performance Zshooter and TBD instruments to be developed over the next decade. Recommendation: right Nasmyth (HIRES port) with space for future instruments

- **KPF stability and performance** – consider current limiting factors that limit RV measurements and make recommendations for a process to improve

- **AO Working Group** – ongoing work to prioritize development and operations priorities

# 5-Year Implementation Plan with Instrument Prioritization

- Overall 5YP addresses major projects, operations, Maunakea efforts in the context of the “Keck 2035” strategic plan.

- Community visits by WMKO (Kassis/Bouchez/Lyke) to partners to solicit inputs:
    - Valuable discussion and community building!  Should be repeated.
    - SSC Co-chairs attended nearly all of the community visits by Zoom

- Additional inputs: NASA community (via NIKUG and community survey), Keck AO Working Group, project updates at SSC meetings, submitted white papers

# SSC Prioritized Instrumentation and AO Projects

- Fully funded projects not part of prioritization (HISPEC, SCALES)
- Projects are at different levels of maturity and have widely varying costs
- SSC process involved: consideration of community inputs, briefings from project leaders, assessments of scientific opportunity and technical readiness, extended discussions, and votes
- SSC recommendations are advisory to the CARA Board

# SSC Prioritized Instrumentation and AO Projects

**Large projects considered:**

**FOBOS** (~1800-fiber spectrometer)
**EXES** (mid-IR echelle)
**Liger** (NIR IFS and camera)
**LRIS-2** (LRIS replacement)
**Keck I Adaptive Secondary + GLAO**
**NIRSPEC2** (NIRSPEC replacement)
**ORCAS** (satellite laser guide star)
**Narrow Field VisAO**
**Visible Multi-conjugate AO**
**Wide Field Imager** (WFI)
**Zshooter** (U- to K-band spectrograph)

**Medium-scale projects considered:**

**High contrast adaptive optics testbed**
**K2-KPF Fiber Feed**
**Seeing-limited instrument testbed**

# SSC Prioritized Instrumentation and AO Projects

**Top Priority Projects:**

**Liger** (NIR IFS and camera)

**LRIS-2** (LRIS replacement)

**Zshooter** (U- to K-band spectrograph)

**K2-KPF Fiber Feed**

**Keck I Adaptive Secondary + GLAO**

Top priority projects will be *pursued aggressively*.

Other projects to be reconsidered on longer timescales in a TBD process

# Instrument Suite Evolution – Hibernation and Retirement

- **NIRES** – hibernate at the end of 2025B. Extended to May 16, 2026 because of lost time due to Keck II shutter problem (see 2026A instrument availability).
  - Based on community feedback at the 2024 Keck Science Meeting, the planned hibernation was reconsidered based on additional community input. This was very helpful feedback!
- **ESI** – hibernate at the end of 2026A and decommission at the end of 2027A
- **HIRES** – decommission at the end of 2026B (announced in 2026A instrument availability)
- Other instruments will be hibernated/retired to make room for new instruments. This includes: NIRSPAO and KPIC, NIRC2, OSIRIS

# Science Case, Landscape, and Instrument Capabilities Review

- Implemented the first “Science Reviews” in the past year and will continue for pre-PDR instruments
- Goal: Verify that instruments concepts are aligned with science goals and Strategic Plan
- Process: instrument science team delivers documentation + 90-min talk, followed by SSC discussion and a vote
- Timing: During preliminary design phase, when instrument changes are possible and before major funds committed
- LRIS-2 passed their science review

# 2025-2026 SSC Reminders

- Next Keck SSC Meetings
    - Dates are to-be-announced (check SSC website)
    - Most of the meeting is open to the community.

- Send us your input!

# Extra Slides

# AO Working Group


Chairs: Tuan Do (UCLA) and Dimitri Mawet (Caltech).

Their initial plans include:

- Structure: steering committee to lead focused studies + broader working group of community members to provide feedback and concerns.
- Topics for study groups
  - Current: State of Keck AO with performance metrics: NGS vs LGS, user issues etc.
  - Future: Future of Keck AO (e.g. IWA NIR pyramid WFS, ASM proposal)
  - Future: AO shutdowns planning and feedback

**SSC recommends AOWG also focus on tactical and strategic prioritization of current AO projects (development and operations).**

# ISE Considerations

## Science Relevance Considerations

- Past glory (e.g. discovered kryptonite on Io)
- Future promise (e.g. critical for LIGO followup)
- Killer application (e.g. general high sensitivity spectrograph, or exoEarth finder)

## Demand Considerations

- Science communities served (e.g. beloved by galaxy evolution folk)
- Usage history (e.g. peak demand was during Spitzer prime mission)
- Current usage trend (e.g. now the most popular instrument on KI)

## Technical Considerations

- Reliability (e.g. no downtime, ever)
- Cost burden (e.g. masks are a pain, or cryogen hog)
- Staff burden (e.g. 9/10 wake-up calls are high)
- Summary of risk matrix content (e.g. all green/yellow, or two major reds)

## Strategy Considerations

- Potential development path to maintain capability (e.g. LRIS ⇒ LRIS2, or planned detector upgrade)
- Competitive landscape (e.g. Gemini has a better one)

## Decommissioning Considerations

- What do we lose
- Overlap requirements (e.g. RV baseline transferral)
- Practicalities (e.g.,Cassegrain instrument, not always available)

# SSC recommended and board approved process for instrument retirement:

Once an instrument has been identified for future retirement, we start a two year process culminating in the instrument being permanently removed from use at WMKO. Steps, in order, include:

1. Retirement justification provided by WMKO to the Keck SSC and CARA Board.
    a. Review in context of science relevance, demand (including long-term commitments), technical cost/risk, and strategic needs.
    b. **Decision point #1:** Recommend advancing instrument to “last-chance” status.

# SSC recommended and board approved process for instrument retirement:

Once an instrument has been identified for future retirement, we start a two year process culminating in the instrument being permanently removed from use at WMKO. Steps, in order, include:

2. “Last Chance Opportunity” announced for the upcoming two semesters and advertised to the scientific community.
    a. TACs must be made aware of the limited time horizon for the identified instrument.
    b. WMKO scheduler works to ensure all approved proposals are scheduled time, with possible campaigns or block-scheduling as warranted.
    c. Solicit feedback from community to collect cases for substantially high scientific justification and/or new strategic or technical need to reconsider hibernation, considering all costs and risks.
    d. **Decision point #2:** Recommend advancing instrument to hibernation.

# SSC recommended and board approved process for instrument retirement:

Once an instrument has been identified for future retirement, we start a two year process culminating in the instrument being permanently removed from use at WMKO. Steps, in order, include:

3. Proposal Calls for the final 2 semesters announce planned hibernation.
4. During the final semester, WMKO prepares for warm-up, power-down, and hibernation.

# SSC recommended and board approved process for instrument retirement:

Once an instrument has been identified for future retirement, we start a two year process culminating in the instrument being permanently removed from use at WMKO. Steps, in order, include:

5. After  last scheduled night, the instrument is turned off. This means that cryogens are not used to keep the instrument cool, the power is turned off, and all alarm systems are deactivated.
   a. Instrument enters into a 1 year hibernation period.
   b. WMKO leads the development of decommissioning plans for permanent removal of the instrument from the observatory.
   c. SSC and WMKO leadership determine whether there is a substantially high scientific justification and/or new strategic or technical need to bring it out of hibernation, considering all costs and risks.
   d. **Decision point #3:** Approve decommissioning.
6. After a year of hibernation, the decommissioning plan is executed.

# SSC recommended and board approved process for instrument retirement:

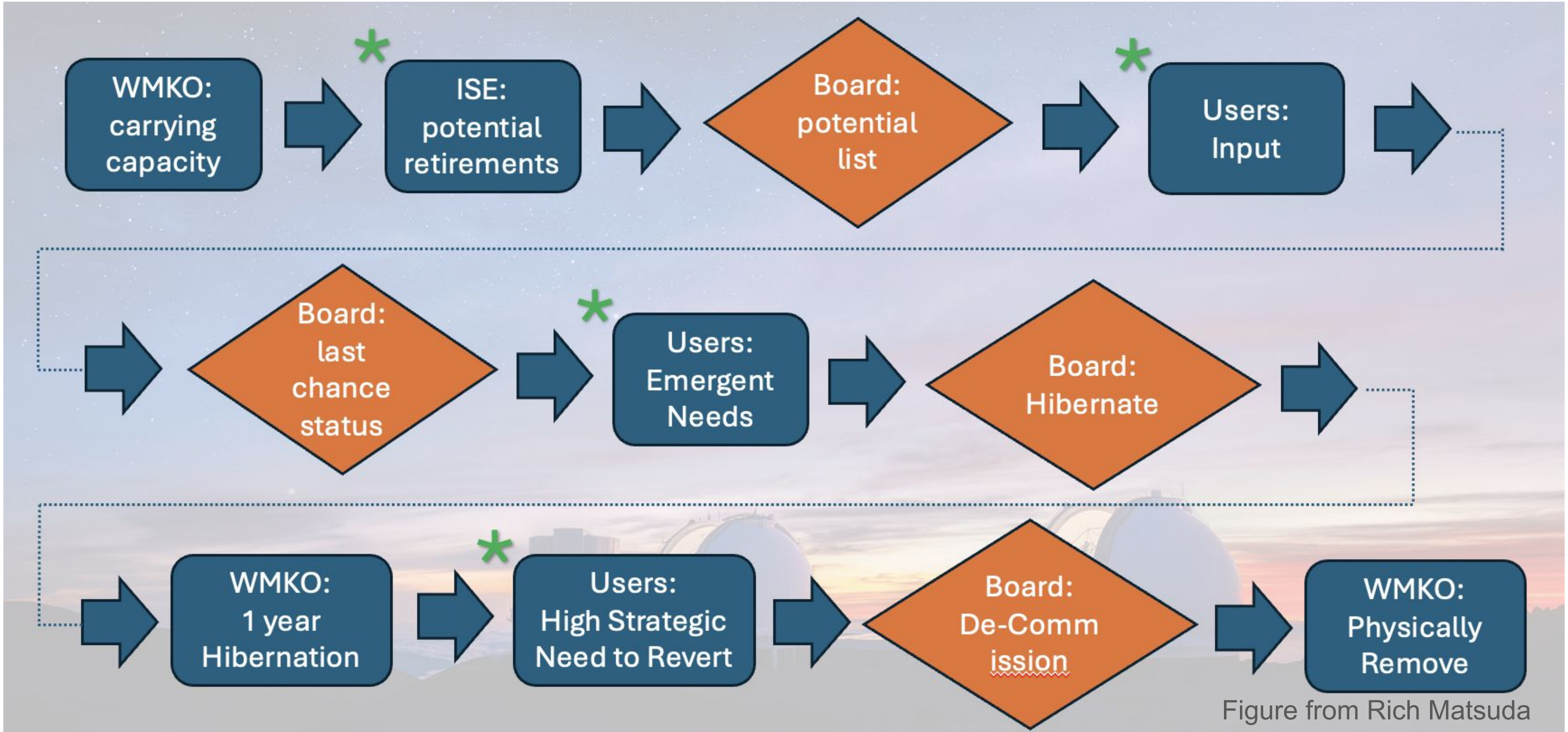



Figure from Rich Matsuda