University of Colorado **Boulder**

2022 Program Review

Institute of Arctic and Alpine Research (INSTAAR)

Academic Review and Planning Advisory Committee Report

Approved

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Provost and Executive Vice Chancellor for Academic Affairs | Date

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Academic Review and Planning Advisory Committee (ARPAC)

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Scott Adler, Dean of the Graduate School and Vice Chancellor for Graduate Education and Professor of Political Science

Katherine Eggert, Senior Vice Provost and Associate Vice Chancellor for Academic Planning and Assessment and Professor of English

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Process Overview

The Academic Review and Planning Advisory Committee (ARPAC) review of the Institute of Arctic and Alpine Research (INSTAAR) was conducted in accordance with the 2022 program review guidelines. Self-study responses were prepared by the unit and checked by two ARPAC members specifically assigned as liaisons to the unit, as part of the discovery process. The ARPAC unit liaisons submitted a summary of findings derived from the self-study and from interviews and/or surveys with faculty, staff, and student unit members. An external review committee (ERC), consisting of two experts from outside of the University of Colorado Boulder, engaged in a virtual visit and submitted a report based upon review of relevant documents and meetings with faculty, staff, and student unit members and university administrators. ARPAC staff, employing web conferencing tools, facilitated the external review as a remote visit over April 7 and 8, 2022. ARPAC reviewed and considered these materials, met with the dean of the institutes, and wrote this report. Discovery process summary and external reviewer comments and recommendations are shared when relevant throughout this report.

Past Reviews

INSTAAR underwent its last program review in 2012. At the time, both internal and external reviewers raised concerns about the institute having inadequate space and about the instability felt by research faculty supported on soft money. The completion of the Sustainability, Energy and Environment Community (SEEC) building, and the Sustainability, Energy and Environment Laboratory (SEEL), both on East Campus, has considerably reduced the unit's space needs, providing INSTAAR with a combined 64,170 sq ft of specialized space, including for offices, cubicles, dry labs, and meeting rooms. To improve conditions for research faculty, the campus decided to allow principal investigators to receive back a portion of Departmental Administration Indirect Cost Recovery (DA-ICR) monies as discretionary funds (notably, this decision was not extended to tenure-track faculty members).

While the institute addressed a number of other comments, there are several items from the prior report on which they are still actively working. These include:

- Linking new hire requests with long-term research programs
- Diversifying its funding base, exploring cost-savings through sharing of support staff with CIRES
- Developing a recruiting plan to diversify faculty, postdoctoral scholars, and graduate students, and involving underrepresented[1] undergraduates in INSTAAR research
- Continuing outreach and increasing funding for outreach.

Despite the ongoing work in these areas, it is clear from the responses in the self-study report that the institute has taken the comments and suggestions to heart and has made strong progress towards addressing these.

Unit Overview and Analysis

The campus' standardized description of INSTAAR is available on the website of the Office of Data Analytics (ODA) at https://www.colorado.edu/oda/institutional-research/institutional-level-data/information-department/academic-review-and-planning. ODA updates the profile annually in the fall semester. This report cites data posted in October 2021, reflecting the state of INSTAAR as of the academic year (AY) 2020-2021.

[1] ARPAC notes that it can sometimes be complicated to have consistent, shared terminology for protected class identity groups. In the context of this report, we use the term "underrepresented" to refer to individuals or groups that have been historically marginalized or minoritized within U.S. higher education. Although national data sources often use the term "underrepresented minority (URM)" to combine people who are Black, Latine, and Native American, ARPAC acknowledges that the term "minority" is contested and diminishing.

Disciplinary Context

INSTAAR is an interdisciplinary research institute that studies Earth systems. The institute involves faculty and graduate students from departments across campus, including Ecology and Evolutionary Biology (EBIO), Environmental Sciences (ENVS), Geological Sciences (GEOL), Geography (GEOG), Atmospheric and Oceanic Sciences (ATOC), and Civil, Environmental, and Architectural Engineering (CEAE). The institute has a distinguished reputation for research excellence, particularly in areas such as climate change, quaternary history, terrestrial and aquatic ecosystems, Earth surface processes, biogeochemistry, and carbon and nitrogen cycling. The institute also has a history of emphasis on polar and high mountain environments and maintains field sites located on all seven continents, the world ocean, and the atmosphere. In addition to research, INSTAAR is deeply committed to graduate education as well as public outreach on topics related to the environment.

Research and Scholarship

The broad umbrella areas of research strength within INSTAAR consist of cold regions research, field sciences, and the geosciences. Although the original focus of INSTAAR was on quaternary, polar, and alpine processes in particular, the institute's mission has evolved and expanded to include present and future climate and environmental change. INSTAAR faculty affiliates have been extremely productive, as evidenced by nearly 1,000 publications between 2016-2020. Over this same period, INSTAAR faculty were cited 73,000 times with the average number of citations per publication more than double the average in the field. Moreover, 45 of these publications were ranked in the top 1% by citations for their field and year. Numerous news outlets have featured INSTAAR research, including the New York Times, Washington Post, PBS NewsHour, NPR, and locally the Denver Post and 9News. As further evidence of the strengths of INSTAAR, CU Boulder is ranked within the top five universities in the country for earth sciences research funding, second for geoscience, and 16th for environment and ecology in a 2021 US News & World Report poll. INSTAAR faculty affiliates hold significant and impactful leadership positions, including in cold region sciences, mountain research, and long-term ecological research.

Collaborations

INSTAAR has formed numerous external strategic collaborations and partnerships with federal agencies and media specialists. The self-study specifically notes partnerships with the National Oceanic and Atmospheric Administration (NOAA), US Geological Survey (USGS), and National Center for Atmospheric Research (NCAR). These partnerships provide direct research funding as well as opportunities for enhancing the research of INSTAAR faculty. Additionally, the institute’s engagements with media specialists, many of which are INSTAAR affiliates, has provided leverage to communicate important environmental issues to the public and helped to change public perceptions about sustainability. Such collaborations have played a significant role in increasing the institute's impact and reputation. While the self-study highlights external collaboration and partnerships, there is little mention of internal strategic partnerships, other than related to the recommendations from the last ARPAC review. Given the overlap of research of INSTAAR with other institutes on campus, including the Renewable and Sustainable Energy Institute (RASEI) and the Cooperative Institute for Research in Environmental Sciences (CIRES), there may be opportunities to develop strategic partnerships that enhance INSTAAR's mission.

Campus Context

INSTAAR significantly elevates the scope and depth of environmental research at CU Boulder. With a focus on evaluating and understanding environmental change, the mission of INSTAAR closely

complements that of CIRES and RASEI. Although research is INSTAAR's primary focus, the institute is also deeply committed to teaching and outreach. It partners with affiliated departments to offer both undergraduate and graduate courses, with INSTAAR faculty affiliates having taught more than 140 courses to over 8,300 undergraduate students since 2012. INSTAAR also provides a number of avenues for undergraduates to participate in research. At the graduate level, INSTAAR faculty members have taught over 115 courses to more than 1,000 students since 2012. The majority of teaching at this level involves mentoring PhD and MS students through research, but INSTAAR also now offers a professional master's program in conjunction with the Department of Environmental Studies. In summary, INSTAAR fills a critical need on campus by enhancing the offerings of environment focused research and courses, which is a particular campus area of excellence.

Strategic Vision and Planning

INSTAAR's historical focus on quaternary science and the cold region environment is shifting due to changing global needs. To adapt to the current rise in climate and environmental change, and to improve the integration of research on environmental science and society, the institute's strategic plan has adopted several new goals. These include prioritizing justice, equity, diversity, and inclusion; maintaining leadership in cold regions research; exploring emerging interdisciplinary themes; and remaining adaptable to new opportunities.

A hiring plan is outlined to support the strategic vision. The self-study notes the high number of impending retirements and the need to hire to maintain strength in the affected research areas, but also the need to use this as an opportunity to increase institute presence in emerging disciplines.

Governance

INSTAAR's governing body is composed of 33 voting members known as fellows. The bylaws for the institute were revised in 2020 and approved by the University in 2021. The self-study lists a number of key changes to the institute's standing rules, which require formal approval by the primary fellows. These changes include defining the expectations of fellows; revised policies for justice, equity, and inclusion; revised annual merit evaluation procedures that consider COVID-19 impacts on career trajectory; and clear description of INSTAAR titles and promotion ladders for all levels. By making these changes, INSTAAR has taken steps to enhance the equity of its governance structure and to create a more inclusive environment.

Inclusive Excellence

In 2020, 45% of INSTAAR's faculty and staff identified as women, as reported in the self-study. However, the self-study notes that while the gender gap has been reduced, INSTAAR still remains predominantly white. Out of the 106 faculty and staff members currently employed by INSTAAR, 92% identify as white, and out of the 41 students currently working for INSTAAR, 76% identify as white. In order to increase diversity among both faculty and students, INSTAAR has implemented a strategic hiring plan; leveraged the Faculty Diversity Action Plan (FDAP) to recruit diverse faculty; improved mentoring programs for students, staff, and faculty; and increased INSTAAR participation in REU programs. To its credit, INSTAAR was selected to hire a new faculty member through the FDAP program. Out of the institute's five most recent faculty hires, four identify as women and two identify as belonging to an underrepresented racial/ethnic group. As a result, the number of faculty members from underrepresented groups has increased to five, with three in tenure-track positions and two in research-track positions.

Unit Culture

The findings from the 2019 workplace culture survey are generally positive. Most INSTAAR faculty, staff, and students felt that their workplace culture was positive, they received respectful treatment, and felt welcome at INSTAAR and proud to work there.

Points of concern revolved around transparency, professional development, and inclusive culture. Notably, all groups (faculty, staff, students) agreed that more transparency is needed with regards to resource allocation and professional development. Only 49% of professional staff felt that they were provided with the mentoring needed to progress in their careers. Additionally, graduate students reported feeling a lack of community.

INSTAAR has taken several actions to address these concerns, including improving transparency through regular updates, clarifying promotion policies, establishing a professional code of conduct, enhancing mentoring and training opportunities, developing better professional ladders, and hosting welcome meetings for new members. They will also work with the Office of Institutional Equity and Compliance (OIEC) to create a new survey that includes questions from the previous survey, but also further probes at the roots of the concerns raised by the previous survey. These efforts are ongoing.

Faculty and Research Personnel

According to the Office of Data Analytics (ODA) profile for AY 2020-2021, faculty and research personnel in INSTAAR consisted of: 20 tenured and tenure-track (TTT) faculty, 11 research faculty, 2 federal research scientists (USGS), 4 senior research associates, 28 research associates, 14 professional research assistants, 4 senior professional research assistants, 1 associate research professor, 4 postdoctoral scientists, 61 graduate students and 4 working retirees. Additionally, the institute had 61 research affiliates and six visiting scientists who held PhD-level positions. The institute also supported 294 undergraduate research assistants during the past 8 years. The self-study does not highlight any new personnel having started in Fall 2020.

Undergraduate Education

As an institute, INSTAAR does not offer undergraduate degree programs. However, INSTAAR fellows contribute directly to undergraduate education by teaching for their respective home departments. The self-study notes that INSTAAR faculty have taught 142 undergraduate classes to more than 8,300 undergraduate students, as noted in section 3.2 Campus Context.

INSTAAR also offers undergraduate research opportunities, including senior thesis projects and paid research assistant positions in labs and fieldwork. These opportunities, along with the courses taught by INSTAAR affiliates, help recruit undergraduates to INSTAAR labs.

Furthermore, INSTAAR is actively involved in a number of summer internship programs, providing multi-week learning experiences to students in both rural and urban communities. One such program is the Research Experience for Community College Students (RECCS), which is a collaborative effort between CIRES and INSTAAR focusing on community college students. In addition to learning about environmental science, students learn presentation and writing skills, take field tours of the local landscape, and attend weekly seminars on science and research careers.

To improve the undergraduate experience for both students and INSTAAR, it would be helpful for the institute to begin tracking and analyzing the progress of undergraduates engaged across its research programs. This could include determining how many students go on to pursue related graduate work.

Graduate Education

INSTAAR faculty affiliates teach graduate courses in their home departments, as well as engage graduate students in INSTAAR research labs. The self-study notes that 118 graduate classes have been offered since 2012, serving over 1,000 students. INSTAAR is also part of the Arctic Studies graduate certificate program.

In addition to formal coursework, graduate mentorship is a key component of graduate education and research at INSTAAR. Since 2012, INSTAAR faculty have served as primary advisors for 112 graduate students. Together, these students write on average 25-45 journal articles in a typical year. A number of students have been awarded Graduate Research Fellowships from the National Science Foundation. In addition to one-on-one mentorship at CU, INSTAAR faculty are also involved in a number of graduate training programs for students and junior researchers around the world.

Overall, INSTAAR maintains a vibrant and interdisciplinary graduate experience for its students through its exceptional graduate mentorship and courses.

Postdoctoral Training

INSTAAR currently employs four postdoctoral associates. However, INSTAAR faculty are involved in mentoring numerous other postdoctoral fellows from partner agencies, including NOAA and USGS. The INSTAAR-based postdoctoral associates are mentored by their respective principal investigators (PIs) since the institute does not have a formal postdoctoral scholar mentoring program. While all formal training is provided by the PI, postdocs may receive informal training from mentors that are assigned through the newSTAAR program, a peer mentoring program designed to help each person who joins INSTAAR find their place, make connections, and succeed in their new path and in creating a balanced life according to the self-study. Notably, these mentors are typically of the same level or higher as the postdoctoral scholar to whom they are assigned. Although it is hard to justify creating a formal postdoctoral program for only a few postdoctoral associates, there may be opportunities to leverage and/or partner with postdoctoral training programs in affiliated departments or other institutes (e.g., RASEI, CIRES). As is, without a formal mentoring program in place, INSTAAR's post-doctoral scholars may receive inconsistent training and professional development.

Staff

According to the ODA profile for AY 2020-2021, staff personnel in INSTAAR consisted of three directors (for finance, communications and outreach, and information technology), four post-award specialists, an executive assistant, and an administrative assistant. As indicated in the self-study, the majority of these individuals are supported by Departmental Administration Indirect Cost Recovery (DA-ICR) or by grants and/or contracts awarded to INSTAAR researchers. The executive assistant position was recently filled in 2021 after the previous employee retired. The administrative assistant's title was upgraded, but the position is currently vacant. The self-study report also requested funding for a Mountain Research Station outreach director and for 50% funding for the salary and benefits of two professional research assistants who INSTAAR wants to hire to maintain its shared labs and equipment in SEEC and SEEL.

Budget

INSTAAR's budget comprises the TTT faculty salaries and an operating budget. The faculty salaries are provided by RIO, and a portion of the operating budget ($0.7M) is provided by Departmental Administration Indirect Cost Recovery (DA-ICR). Grants from the NSF comprise 79% of the award funding

to the unit from 2017-2021. Overall, award funding has remained relatively steady the past few years, albeit with a slight decline in 2021 likely due to COVID-19 and its impact on field work. INSTAAR has dedicated its financial resources to faculty startup and retention lab support, support for Critical Zone and LTER programs, the JEDI task force, and the Mountain Research Station.

INSTAAR's budget consists of two components: tenure-track faculty salaries, which are funded by RIO, and an operating budget. A portion of the operating budget ($0.7M) is paid for by DA-ICR monies. National Science Foundation grants make up 79% of the award funding received by the unit between 2017 and 2021. Although the institute's award funding has declined slightly since 2021, which is likely due to the impact of COVID-19 on field work, grant totals have remained relatively stable in recent years. INSTAAR has utilized its financial resources to support various initiatives, including faculty startups and retentions, lab support, support for Critical Zone (based on the idea that the unique environment at Earth's surface from the top of the vegetation canopy to the base of groundwater circulation is a coherent entity, best studied in an integrative manner) and Long-Term Ecological Research (LTER) programs, a justice, equity, diversity, and inclusion (JEDI) task force, and the Mountain Research Station.

Space and Infrastructure

As previously noted, INSTAAR occupies a combined 64,170 sq ft of office space, cubicle space, dry labs, meeting rooms, and other specialized space on East Campus in the SEEC and SEEL buildings. In addition to this space, the institute also has 2,065 sq ft of specialized cold space in SEEC and SEEL, which is primarily used for conducting experiments as well as sample storage and has shared access to meeting rooms and classrooms. Beyond this, INSTAAR assists in managing the Mountain Research Station (MRS), which serves as a base station for high-mountain research projects along the front range, and houses the Community Surface Dynamics Modeling System (CSDMS), an NSF-supported geoscientific computing facility.

Support Needs

Maintaining and enhancing interactions between INSTAAR faculty and NCAR scientists is a challenge due to the distance between the east campus and NCAR and the concomitant transportation and parking limitations. This distance increases the barrier for faculty to travel back and forth, which in turn can limit the extent of interactions between INSTAAR faculty and NCAR scientists. The institute wishes to implement measures to minimize this barrier.

Recommendations

The members of the Academic Review and Planning Advisory Committee address the following recommendations to INSTAAR and to the offices of responsible administrators:

To the Unit:

1. Continue efforts on strategic planning to help align research emphasis on strategic areas based on INSTAAR's current expertise, upcoming retirements, and emerging interdisciplinary themes.
    a. Continue to align new hires with strategic INSTAAR initiatives while remaining aware that strategic areas may evolve.
    b. Develop a plan to strengthen strategic partnerships across campus, including CIRES and RASEI, which were identified as having significant overlap with INSTAAR in the reply to the ARPAC discovery report.

2. Continue to improve unit culture and inclusivity.
    a. Continue efforts to increase and support student diversity through participation in REU and strong mentoring.
    b. Consider implementing institute programming to foster a sense of community among researchers and students across INSTAAR-affiliated departments.

3. Work with the vice chancellor for research and innovation and dean of the institutes on funding and budget issues, such as resources for the Mountain Research Station, fundraising plans, and bridge funding for startup costs.

4. Explore options with NCAR, the City of Boulder, and the executive vice provost for academic resource management to facilitate transportation between NCAR and INSTAAR and parking at INSTAAR.

To the Dean of the Institutes:

5. Collaborate with INSTAAR to prioritize funding needs, including professional strategic planning support if necessary.

To the Executive Vice Provost for Academic Resource Management:

6. Work with INSTAAR, NCAR, and the City of Boulder to explore solutions for transportation and parking between NCAR and INSTAAR.

Required Follow-up

The director of the Institute of Arctic and Alpine Research (INSTAAR) shall submit two follow-up reports—one due on the first of April 2024 and one due on the first of April 2026. The follow-up reports are to be addressed to the provost and other central campus leadership and shall focus on the implementation of the recommendations from ARPAC detailed herein. The relevant central campus leadership and the provost will also respond to all outstanding matters under their purview arising from this review year's recommendations. Relevant central campus leaders and the provost will submit a follow-up report due on June 1, 2024, and June 1, 2026.