



University of Colorado **Boulder**

2019 Program Review

Institute for Behavioral Genetics

Academic Review and Planning
Advisory Committee Report

Approved

DocuSigned by:

Russell L. Moore

9/24/2020

B191482265CC431...

Provost and Executive Vice Chancellor for Academic Affairs | Date

Contents

Process Overview – 3

AY 2019-20 ARPAC Members – 4

Unit Overview – 5

Past Reviews – 17

Analysis – 20

Recommendations – 26

Required Follow-Up – 29

Process Overview

The Academic Review and Planning Advisory Committee (ARPAC) review of the Institute for Behavioral Genetics (IBG) was conducted in accordance with the 2019 program review guidelines. The institute prepared a self-study report, which an internal review committee composed of two University of Colorado Boulder (CU Boulder) faculty members outside of the unit checked. The internal reviewers 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, consisting of two experts from outside of CU Boulder, visited the unit and submitted a report based upon review of relevant documents and interviews with faculty, staff, and student unit members and university administrators. Internal and external reviewer comments and recommendations are shared when relevant throughout this report.

Academic Review
and Planning
Advisory
Committee
(ARPAC)

Alaa Ahmed, Associate Professor, Department of Mechanical Engineering

Alison Boardman, Associate Professor, School of Education

Barbara Battenfield, Professor, Department of Geography

Paul Campos, Professor, University of Colorado School of Law

Paul Moeller, Associate Professor, University Libraries

Austin Okigbo, Associate Professor, College of Music

Judith Packer, Professor, Department of Mathematics

Teri Rueb, Professor, Department of Critical Media Practices

Kathleen Ryan, Associate Professor, Department of Journalism

Hanna Shell, Associate Professor, Department of Cinema Studies and Moving Image Arts

Tamara Sumner, Professor, Institute of Cognitive Science

Michael Stutzer, Professor, Leeds School of Business

Paul Youngquist, Professor, Department of English

Academic year 2019-20
voting members

Non-voting members

Bob Boswell, Vice Chancellor for Diversity, Equity, and Community Engagement and Professor of Molecular, Cellular, and Developmental Biology

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

Mary Kraus, Vice Provost and Associate Vice Chancellor for Undergraduate Education and Professor of Geological Sciences

Michele Moses, Vice Provost and Associate Vice Chancellor for Faculty Affairs and Professor of Education

Ann Schmiesing, Executive Vice Provost for Academic Resource Management and Professor of Germanic and Slavic Languages and Literatures

Scott Adler, Dean of the Graduate School and Professor of Political Science

Staff

Andre Grothe, Office of Faculty Affairs

Emmanuel Melgoza Alfaro, Office of Faculty Affairs

Unit Overview

The Office of Data Analytics (ODA) maintains a standardized description of IBG [on its website](#). ODA updates the profile annually in the fall semester. This report cites data posted in October 2018, reflecting the state of IBG as of the academic year (AY) 2017-2018.

Disciplinary context

IBG was founded in 1967, and has a two-pronged mission: to conduct/facilitate research in the genetic bases of individual differences and to train researchers in this area. The institute is by nature interdisciplinary and also spans two CU campuses, with faculty/faculty fellows and researchers from a wide range of disciplines, including the CU Boulder departments of Ecology and Evolutionary Biology, Integrative Physiology, Psychology and Neuroscience, and Sociology, and the CU Anschutz Medical Campus departments of Pharmaceutical Sciences, Pharmacology, and Psychiatry. According to the self-study, IBG “is one of the world’s leading research institutes for genetic research on behavior,” a sentiment echoed by the external reviewers, who call it “influential in the still rapidly growing field of behavioral genetics, with an unrivaled training program that has launched three generations of scientists.”

Research and scholarship

IBG plays an important role on the Boulder campus and within the University of Colorado system. Past program reviews (most recently in 2012) consistently praise the institute’s strength and leadership. IBG defines its mission as focusing on four core research areas:

- Drug abuse
- Reading and learning disabilities
- Aging and neurogenerative diseases
- Executive functions, brain imaging, and mental health

The external reviewers praise the substantial collaboration by faculty with one another and in terms of the research methods

and strategies used across these four areas. They identify this collaboration as both rare and valuable.

The focus of the institute has been on understanding the mechanisms by which genes influence each of these four research areas through research that cuts across human behavioral genetics, advanced statistical genetics, neuroscience, and experimental genetics using model organisms. The reviewers add, “IBG is positioned to continue to make significant and unique contributions to our understanding of how genes shape each of these core research areas/constructs and additionally to clarify how genes work with environments. The more recent addition of brain imaging is key in this endeavor to understand mechanisms.”

Within its four core areas, IBG offers a substantial number of research projects, such as the Colorado Adoption Project, the Colorado Twin Study and Longitudinal Twin Study, the Colorado Learning Disabilities Research Center, the Colorado Drug Research Center, and the Adolescent Brain and Cognitive Development (ABCD) Study. It is home to a DNA repository (with about 40,000 samples) for research on human behavior, as well as studying behaviorally and genetically defined lines of mice. Current research areas include aging, alcohol, behavioral development, brain structure and function, cognitive abilities and executive functions, drug abuse, evolution, neurodegenerative disease, nicotinic receptors, personality, psychopathology, reading and learning disabilities, and synaptic plasticity.

IBG faculty and researchers are productive, consistently ranking in the top quartile (or better) for the number of refereed journal publications and/or chapters per faculty member of the 60+ units surveyed at CU Boulder by ODA over the prior seven years (specifically, 14th out of 66 units university-wide, 5th of

13 units in the review cycle). IBG tenure-stream faculty members are less productive in terms of conference presentations and in terms of refereed books and monographs, textbooks, or edited books, ranking 55th out of 66 units university-wide and last in units within this review cycle. Two major journals in the field have been edited in the institute: *Behavior Genetics* and *Experimental Gerontology*.

For 27 years, IBG has hosted annual week-long National Institute of Mental Health (NIMH)-supported workshops in statistical genetic methods for human complex traits. The workshops attract about 100 trainees each year, including IBG graduate students and postdoctoral trainees, and have included over 2,000 registrants since they began.

Collaborations

As will be discussed in the section on faculty and research personnel, 32 faculty fellows are affiliated with IBG, both on the Boulder campus as well as at other institutions. The seven external affiliations are:

- University of Colorado Anschutz Medical Center: Departments of Pharmaceutical Sciences (two), Biochemistry and Molecular Genetics (one), and Psychiatry (one); and the Center for Bioethics and Humanities (one)
- University of Denver: Department of Psychology (one, retired)
- University of Minnesota: Department of Psychology (one)

The reports make note of no other formal collaborations. As a mark, however, of informal research networks in which IBG personnel participate, the external reviewers say that while they have no current direct or indirect collaborations with the institute (i.e. no conflict of interest for reviewing standards), “IBG leaders and students have been influential directly or indirectly to our own careers.”

National
and
international
context

The 2012 ARPAC report called IBG a “world-class operation,” and based upon faculty productivity, that description is still valid. Internally, IBG used data from the Thomson-Reuters Web of Knowledge to estimate the productivity and citation impact of Graduate School-rostered tenure-stream faculty members. The Thomson-Reuters scale of “h-indices” for citation impact shows IBG personnel span a range from 59 for one senior faculty member to 10 for the most recent assistant professor hire.

On a national scale, IBG has demonstrated success in obtaining continued project funding, including training grants. In 2019 the institute successfully renewed a National Institute on Drug Abuse (NIDA) T32 training grant on the genetics of substance abuse, a project given an “outstanding” impact score (28) by Thomson-Reuters Web of Knowledge. This grant has been in place since 2004. Additionally, the annual NIMH-supported workshop grant was also successfully renewed through 2024, meaning the program will have been offered annually for 33 years. Thomson-Reuters Web of Knowledge gave the workshop an “exceptional” impact score (15).

Campus
context

IBG’s mission is to conduct research and facilitate training in the interdisciplinary area of the genetic bases of individual differences in behavior. It is one of 12 institutes hosted on the Boulder campus. As an institute, it offers no degrees. IBG’s graduate-level behavioral genetics certificate, which includes courses from several CU Boulder departments, showcases the interdisciplinary nature of its faculty affiliates and researchers. IBG also offers postdoctoral training across its four research foci. Over 170 graduate students and post-doctoral researchers have graduated from the IBG training program since the institute was established in 1967.

Faculty
and
research
personnel

According to the AY 2018-2019 ODA profile based on AY 2017-2018 data, IBG employed seven tenure-stream faculty members and 41 research faculty members. Another tenure-stream faculty member started in August 2018, bringing IBG's count to eight tenure-stream faculty members as reflected in the self-study and on the institute website. These faculty have tenure homes in the following departments: Ecology and Evolutionary Biology (one), Integrative Physiology (four), and Psychology and Neuroscience (three). The institute has 18 postdoctoral fellows, research associates, and senior research associates. IBG also employs 21 professional research assistants and one senior professional research assistant. These ODA profile numbers differ from those in the self-study, which lists 16 postdoctoral fellows, research associates, and senior research associates, and 28 professional research assistants. The count of IBG tenure-stream faculty is identical to that in the 2012 review report, which identified eight tenure-stream faculty members as IBG-rostered. However, other personnel numbers have declined since the 2012 review report, which listed 34 postdoctoral fellows, research associates, and senior research associates; and 43 professional research assistants.

The self-study additionally identifies 24 faculty fellows affiliated with IBG with primary appointments in other Boulder campus units (including the departments of Ecology and Evolutionary Biology, Integrative Physiology, Molecular, Cellular, and Developmental Biology, Psychology and Neuroscience, and Sociology) and at CU Denver (Biochemistry and Molecular Genetics, Center for Bioethics and Humanities, Pharmaceutical Sciences, and Psychiatry). The self-study also identifies eight retired and emeritus faculty members from the Boulder and Denver campuses, as well as from the University of Denver and the University of Minnesota, as faculty fellows, bringing the total number of faculty fellows to 32. IBG's self-study notes that the

number of faculty fellows has increased substantially over the last 18 years, from 18 in 2001.

The self-study reports that a faculty search underway in AY 2018-2019 was unsuccessful. IBG is currently recruiting for an assistant professor with an academic appointment in either Computer Science, Ecology and Evolutionary Biology, Economics, Integrative Physiology, Molecular, Cellular, and Developmental Biology, or Psychology and Neuroscience. As the external reviewers and self-study note, one pressing staffing concern moving forward is the need for a new director when the current director steps down at the end of the 2020-2021 academic year; the external reviewers recommend the director be a senior recruit from outside of the CU Boulder system. Both reports also stress the need for up to five additional faculty lines, at both the junior and senior levels. The institute predicts that its animal model research will gain importance through experimental methodologies addressing the functional significance of genomic variation. It also identifies pharmacogenomics (for mental health and drug abuse) and epigenetic mechanisms as two important areas of growth for behavioral genetics. Because of these emerging fields, IBG wishes to recruit additional behavior geneticists with expertise in molecular biology, neurophysiology, imaging, and computational neuroscience.

Undergraduate education

IBG is a research unit and thus does not offer undergraduate courses, although IBG-rostered faculty members teach undergraduates in their tenure-home departments. Undergraduate students do work within the various IBG research initiatives as student employees. No further specific undergraduate education data were provided in the self-study.

Graduate education

As with undergraduate education, IBG offers no graduate courses, although faculty members teach graduate-level

courses in their home departments. As previously noted, IBG offers a behavioral genetics graduate certificate, to which students can apply after admission to an IBG-affiliated graduate degree program, such as in Integrative Physiology, MCDB, or Psychology and Neuroscience. Courses that qualify for the certificate are offered by these same departments. Thirteen students were enrolled in the certificate program as of the 2018-2019 academic year. Three of the seven institutional training grants awarded by the National Institutes of Health (NIH) to CU Boulder are held by IBG. These grants support ten graduate fellowships and five postdoctoral fellowships. The self-study notes that four additional graduate students as well as five postdoctoral trainees are IBG affiliates. It also notes that a proposed renewal (since funded) for the National Institute on Drug Abuse (NIDA) T32 grant includes a requested increase from four to six graduate fellowships and from two to three postdoctoral fellowships through 2026.

Postdoctoral
training

As mentioned above, postdoctoral training is an important element of IBG's mission, with current support of 16 postdoctoral fellows, research associates and senior research associates. The institute's outcomes tracking surveys indicate over 90% of their 170 training program alumni, which include postdoctoral fellows as well as graduate students, work in research-related careers in academia, government, or private industry.

Budget

IBG's budget is supported by departmentally allocated indirect cost recovery (DA-ICR) monies. The self-study notes that external research funding on average includes 45-50 individual sponsored projects (including individual components of center grants, subcontracts to individual sponsored projects, and training awards) that contribute to the DA-ICR pool. According to the self-study, "over the past seven years, the total expenditures for those projects have averaged \$7.0 million and

netted an average of \$1.76 million in F&A [recuperated facilities and administrative-related costs] to the university. Of that amount, approximately 29% is returned to IBG and forms our operating expense budget.” Over the last five years, direct funding has contributed \$32,872,000 (as per ODA, 16 of 61 units university-wide and fourth out of 13 life and environmental science units). That amount declined 10% in 2017. Grant funding has gone down by about \$1 million annually since 2013, hitting a low of \$6.1million in FY 2015 and never being above \$7 million since 2016. The self-study explains this decline as being due to senior faculty retiring and junior faculty still developing funding trajectories.

Space
and
infrastructure

IBG occupies 33,400 square feet in three East Campus buildings: 17,200 square feet in the IBG home building, 7,700 square feet in RL4, and 8,490 square feet in the Administrative and Research Center Building. New space was constructed in 2006, but after the decommissioning of RL1, overall IBG space shrank by nearly 5,100 square feet compared to what the institute had during the 2012 ARPAC review. A decline in unit space, it should be noted, does not necessarily represent a decline in usable space or high-quality space; the self-study mentions that IBG’s usable office and laboratory space has actually increased since 2012. According to ODA, the IBG total space ranks 10th out of the 13 units within the review cycle, and laboratory space 11th.

The external reviewers praise the institute and the university for addressing some key problems in its space and infrastructure, specifically as related to animal care. The 2012 ARPAC report called the facilities for animal care “substandard;” the external reviewers note that the problem has been addressed by substantial improvement in the vivarium facilities at the campus level. IBG has also worked to improve its information

technology infrastructure to support the computing that underpins biomedical and statistical genetics and “big data.”

But physical space remains an issue for IBG. The self-study indicates a goal of building a new IBG structure to consolidate operations and provide a world-class facility for the institute. Both the internal and external reviewers concur that this is a reasonable request.

Governance

IBG’s by-laws stipulate that the institute's directorate, made up of the principal executive officer and all faculty fellows, oversee research and educational program assessments. Membership for new faculty fellows is awarded by the directorate.

Renewable fellowship terms run up to five years, and the fellows' salaries are paid for by either IBG or their individual academic units. The institute assigns its directorate members to its six standing committees. The by-laws also stipulate the terms for a search for a new director, which IBG will be undertaking presently (the current director is scheduled to step down in 2021). IBG has adopted a junior faculty mentoring plan, based on Integrative Physiology’s, which involves assigning a senior faculty member to offer advice on a range of issues, from grant applications to career advancement. The self-study notes that all junior institute faculty to date have received tenure in their respective home departments.

The institute abides by the anti-discrimination and harassment standards of the university and granting agencies; IBG has posted these policies on its website. The institute also has policies in place to address personnel grievances that fall outside areas governed by university rules for anti-discrimination and harassment. The IBG grievance protocols are designed to solve fairness concerns locally, either in a meeting brokered by the director or another impartial moderator, or by a grievance committee set up for more

involved cases. Issues that cannot be resolved by the institute grievance committee are transferred to the dean of the institutes for adjudication.

The by-laws differentiate between faculty fellows and other IBG personnel, including but not limited to research professors, research associates, and graduate students. As indicated earlier, the former make up the directorate and participate in institute governance and standing committees while the latter do not. This is true even in the case of research professors or senior research associates who have been with the institute for years. The 2012 ARPAC report pointed out this was potentially problematic, and suggested that “an equitable solution is within the grasp of the director.”

Inclusive
excellence

In its self-study, IBG reports that “through new faculty recruitment, we have increased our faculty diversity in age, rank, and gender, making progress with junior faculty representation, ethnic diversity, and female representation.” However, as with many science, technology, engineering, or mathematics units, IBG struggles with inclusive excellence, and their most recent faculty hire at the time of the self-study was a white man. According to the ODA profile, two tenure-stream faculty members are women, one identifies with an underrepresented minority population (Hispanic/Latino, according to the self-study), and the rest are white men. While 38% of its tenure-stream faculty members (three of eight) are either women or from an underrepresented group (ranking second out of 13 of units in its current review cycle, and 15th out of 66 units university-wide), when broken out by individual categories the institute falls in the middle or lower third of rankings. It ranks fifth out of 13 units for underrepresented minority representation (28th university-wide), seventh out of 13 for minority race/ethnic status representation (39th university-

wide), and ninth out of 13 for women tenure-stream faculty members (53rd university-wide).

IBG is attempting to remedy this situation, with a plan for faculty fellows to help with increasing institute diversity. The self-study noted that a new African American faculty member from the department of Psychology and Neuroscience would be invited to be a faculty fellow. However, this may not fully address the issue. As the internal reviewers note, the faculty fellows are also mostly men. According to IBG's own data, only three (of 20) faculty fellows are women, and one is Asian or Asian American. The internal and external reviewers noted the lack of diversity as an issue, with the internal reviewers writing, "the institute needs a plan to improve this area."

The self-study makes a case for diversity existing within the wider scope of institute personnel: 54% of all IBG members (faculty, faculty fellows, emeriti, research associates, postdoctoral fellows, graduate students, professional research assistants, staff, and student workers) identify as women, and 13% identify as belonging to an underrepresented minority population. The self-study ties the increased diversity among these populations to the work of the institute's Committee on Diversity and Engagement, established in 2011 and consisting of five members including a faculty fellow as well as representatives from among postdoctoral fellows, research associates, professional research assistants, staff members, and graduate students. However, the improved diversity among student and non-faculty employee populations only highlights how women and members of underrepresented minority populations are not well-represented among those who have faculty status.

In the self-study, IBG requests a total of five new tenure-stream faculty, including potentially a new director. In its self-study and

in its responses to the internal reviewers, IBG acknowledges it is struggling with diversity. Yet the institute makes no mention of strategies or plans within the hiring process to ensure improved inclusive excellence, other than stating that “we welcome any and all advice on how to improve our success in this area.”

Climate
and
culture

IBG in general seems to foster a positive climate and culture. A March 2018 survey asking about climate, and addressed to the institute’s faculty, staff, and graduate student appointees, received responses from 75% or more of the invited participants. The surveys identified a slight sense of exclusion among each of the three groups, and perhaps room for improved intra-group dynamics (one or two within each of the three groups felt the climate wasn’t respectful). Staff seem to feel slightly less valued as IBG community members than do faculty or graduate student appointees.

A survey of IBG-affiliated students conducted by the internal reviewers identified a concern about sexual harassment of students at the field’s national conference, adding, “while this does not appear to be a problem that arises from the behavior of members of the Institute itself, the unit’s strong presence in the field suggests that it should take a leadership role in mitigating the problems.” Foundations for that national leadership role might be found in IBG’s guidelines for positive, inclusive, and responsible conduct, which the institute has posted online. Additionally, IBG plans to add bystander intervention training for the national conference with the assistance of the Office of Institutional Equity and Compliance.

Past Reviews

ARPAC previously reviewed IBG in 2012. Since then, the institute has made progress on several of the committee's recommendations, including:

- Improving oversight of animal care thanks to a campus investment in a dedicated off-site facility.
- Establishing IBG leadership transition protocols.
- Developing and implementing a junior faculty mentoring program.
- Approving clear by-laws that define institute governance.
- Pursuing strategic faculty hires that support stated areas of need.

However, other areas from the 2012 recommendations remain problematic:

- While IBG has articulated inclusive excellence goals, the institute has not yet successfully made these a reality. The Committee on Diversity and Engagement is a good start. However, additional financial and logistical support is needed from the institute (which clearly has good intentions) and from university administration so that IBG will be able to successfully recruit diverse junior and senior tenure stream faculty members.
- IBG acknowledges that it still has to implement IT system improvements to keep up with contemporary computing and database security needs.
- Today, IBG has a smaller space footprint than it did in 2012. At that time, IBG requested an 80,000 square feet space allocation, citing the loss of a building that partially housed IBG facilities. It was also hoped that the institute might gain a centralized building. Neither of these occurred, and it is unclear if this is because of a lack of effective advocacy by IBG, by a lack of university prioritization, or both. Regardless, a lack of space detracts from the world-class

work being done by IBG faculty members and affiliated researchers.

- In 2012, ARPAC recommended that IBG work to raise its profile on campus and in the community, with the end goal of identifying alternative sources of funding for graduate students, endowed professorships, and improved facilities. As of 2019, the institute appears to continue to rely on a successful federal grant funding model.
- Progress on an interdisciplinary degree Ph.D. program centered in IBG, supported by ARPAC in the 2012 report, is not mentioned in the current self-study.

Another long-standing issue for IBG, going back at least two reviews to 2002, but not previously the subject of an ARPAC recommendation, concerns the institute's critique of the funding structure for first-year out-of-state students, who do not receive in-state tuition until they apply for resident status after living in Colorado for a year. IBG has consistently complained about this classification, arguing that the increased tuition and fees these students must pay inhibits the institute from recruiting talented minority or first-generation students as part of their research training grants. These students often cannot afford to take on differential costs and fees and/or a teaching assistantship and so accept offers at other institutions with the funding to cover tuition differences. The institute has asked that the university use the lower resident tuition rate for all NIH-funded trainees. Per state law, the university may not charge a tuition rate different than the student's residency status would dictate. The only out-of-state students who have their first-year tuition fully covered by the Graduate School are those few students who have been awarded National Science Foundation grants. The Graduate School does not have funds to cover other out-of-state students' tuition. Other institutes have addressed this problem with internal funds or with financial help from an affiliated college/school. Another solution might be a model

where these pre-doctoral trainees are awarded graduate research assistantships. This could be explored with the Graduate School as a way to better support CU Boulder's graduate trainees/fellows.

Analysis

ARPAC congratulates IBG on the progress it has made since the 2012 review. The institute has initiated significant changes in governance, facility oversight, and strategic planning. These changes are helping IBG to maintain its status on campus and in the scientific community.

Strategic vision and planning

IBG acknowledges that in order to remain and expand its world-class research and training, the institute must continue its faculty recruitment, infrastructure development, and other activities that support its scientific and educational work. As mentioned above, the institute wishes to recruit additional behavior geneticists with expertise in molecular biology, neurophysiology, imaging, and computational neuroscience. IBG also recognizes the need for a leadership succession plan after its current director's term ends in 2021. IBG hopes to recruit five additional faculty members to work in emerging strategic areas, with at least one at the senior level, possibly to replace the departing director.

Additionally, IBG would like more space to accommodate new personnel and infrastructure and reiterates its suggestion from the 2012 review for the campus to develop an East Campus life sciences research complex, saying such a facility would help to attract significant funding for large-scale projects. Both the internal and external reviewers agree that new faculty and facilities are needed, but the internal reviewers in particular argue that IBG's vision of the future reads more like a wish list than a cohesive strategic plan. ARPAC agrees with this assessment. IBG should use its wish list as a starting point to clearly articulate how space and personnel growth might lead to its envisioned future. Given the upcoming leadership change, it could be wise to delay this next step in strategic visioning and planning until a new director is selected.

Additionally, ARPAC notes that the current director is not only leading IBG but is also an extremely productive researcher and

scholar who is the principal investigator on many IBG grants. As suggested above, IBG's strategic vision should take into account the need for a senior level hire to keep its research productivity at a high level.

Graduate
education
and
postdoctoral
training

IBG's reputation within both graduate and postgraduate education is stellar. It provides a training ground for students to work on high-profile research, and its student placement track record is exceptional. Despite this, the institute argues that it is having trouble recruiting competitively sought-after graduate students and is again asking the university to apply in-state tuition for out-of-state students working on NIH training grants. The rationale is that the best first-year students are compelled to accept admittance to other graduate programs because of financial concerns. IBG indicates that other CU Boulder graduate programs have developed remission mechanisms that allow them to recruit a more diverse slate of students. This is a complicated issue because of statutory limitations, but one workaround could be to reclassify trainees as graduate research assistants. ARPAC supports the Graduate School, IBG, and others in working together to come up with a solution to first-year graduate student funding on the Boulder campus, which would potentially impact recruitment positively at institutes and departments beyond IBG.

Budget

IBG's budget is reliant on grant-generated indirect cost recovery monies, and while the institute excels at securing grants, that success has slowed since the 2012 review. IBG says that this is because senior faculty members aren't seeking as many grants, and junior faculty have not yet ramped up to full productivity. However, this same rationale was mentioned in the 2012 report. Given that IBG has developed improved mentoring practices that help junior faculty with fundraising and grant writing strategies, something may be falling through the cracks.

Another potential concern is that competition for federal grant dollars has grown and that these are a less consistent source of funding. This points to a need for IBG to look to new funding sources. In 2012, ARPAC recommended that the institute seek graduate student funding through mechanisms like foundation grants linked to establishing endowed professorships, and/or fundraising for improved facilities. IBG has been limited in those efforts because of a lack of dedicated advancement staff. This situation has recently improved, with an advancement officer assigned to IBG and affiliated units who is tasked with fundraising strategies organized around thematic research agendas. ARPAC reiterates that it is imperative that IBG work with advancement personnel to seek out alternative funding sources for work underway and for the facilities improvements it so desperately needs.

Space,
infrastructure,
and
support needs

ARPAC commends IBG's successful efforts to advocate for improved animal facilities and its continuing advocacy for resources to address the institute's need for consolidated and up-to-date facilities. As mentioned above, this is an ongoing issue for IBG. As the internal reviewers note, none of the current spaces support "state-of-the-art research and communication typically seen in an institute largely supported by federal funding." The external reviewers agree, saying "the current home(s) of IBG research teams are substandard (albeit, apparently comfortable to most staff and scientists) and frankly not suitable for serious recruitment of even junior scientists. This chronic problem compromises the IBG's great potential for growth." A failure to resolve these matters could damage the institute's reputation and its ability to attract top-level talent.

ARPAC reiterates the need for IBG to develop a concrete strategic plan in conjunction with university administrators, prioritizing space needs and describing in detail what it will take to modernize its facilities. Such planning would serve the

institute well as it engages advancement personnel in identifying and cultivating donors.

Frustratingly, many of IBG's space issues carry over directly from the last review. They also overlap with the needs of IBG faculty members' tenure-home departments. Aside from the fixes to the animal care facilities, developments have not advanced much past ARPAC's last assessment that "IBG faculty members use overcrowded laboratories and fragmented and, in some cases, declining buildings."

Governance

ARPAC is pleased with IBG's improved governance standards as described in the institute's self-study report. However, concerns last raised by ARPAC in 2012 about giving the institute's senior research associates a voice in IBG's governance and adding an executive board have not been addressed. The institute should address these matters as priorities, especially in light of the impending leadership change.

Inclusive
excellence

Previous review cycles have recommended that IBG increase gender and racial diversity among the institute's tenure-stream and research faculty, but there is little evidence of concrete improvements. While IBG's percentage of women personnel overall (among tenure-stream and research faculty members, professional research assistants, graduate students, postdoctoral fellows, staff members, and student workers) looks impressive, seven of the 56 women personnel are student hourly workers and 31 are either graduate students or professional research assistants. Just eight IBG personnel overall identify as non-Caucasian. Five tenure-stream faculty/faculty fellows are women, and two IBG faculty identify as belonging to an underrepresented population. This is unacceptable. It is imperative for students, as well as for postdoctoral fellows and professional research assistants, to

see tenure-stream faculty members who are either people of color and/or women in order to understand that diverse populations are welcome and can be professionally successful in scientific spaces. In addition, research has established that scientific groups, like other work organizations, do better work when they are made up of diverse populations at all levels, up to and including senior leadership. Other research shows that the only way to change the status quo in hiring is to create finalist pools with more than one woman or person of color (<https://hbr.org/2016/04/if-theres-only-one-woman-in-your-candidate-pool-theres-statistically-no-chance-shell-be-hired>). IBG needs concrete plans to recruit and retain diverse faculty beyond just asking for advice.

It is noteworthy that two women tenure-stream faculty members are institute alumni. This circumstance highlights that diversity in institutional training is an essential component of the commitment to inclusive excellence and might offer further opportunities for diversifying the tenure-stream faculty population.

Climate
and
culture

ARPAC praises IBG for its collegial atmosphere and is encouraged by the institute's quick and proactive responses to climate and culture problems. Any problems seem, at this point, to be typical interpersonal issues found in most human interactions. We are especially impressed by the response to concerns raised by the internal reviewers about sexual harassment of students at the national conference in the field. IBG quickly scheduled meetings with the Office of Institutional Equity and Compliance to begin bystander training for IBG conference attendees in order to help strategize and address these worrisome concerns, which, as noted, stemmed from the behavior of individuals with no IBG affiliation. ARPAC recommends that IBG act further to lead the conference in requiring and modeling better behavior; for example, IBG might

lead an effort to create a statement of inclusion, anti-harassment, and bystander intervention for the conference.

Recommendations

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

To the Unit:

1. Conduct a nationwide search for a new IBG director, to be hired before the current director's term expires in 2021.
2. In collaboration with the Office of Research and Innovation, identify and seek alternative sources of funding, such as foundations or other entrepreneurial strategies, for IBG to move beyond the traditional federal grant model.
3. Work with the Office of Advancement to investigate alternative sources of funding for graduate education, endowed professorships, and improved facilities.
4. Develop a strategic plan, in conjunction with the hire of the new director, that creates a vision for the future and outlines a rationale for clear hiring priorities (number of faculty, junior or senior level, research areas) that will lead to continued IBG growth and high research status.
5. Develop and implement a concrete plan to improve diversity in tenure-stream faculty members that lives up to CU Boulder's standards of inclusive excellence. This should include, but not be limited to, consulting with personnel in the Office of Diversity, Equity, and Community Engagement (ODECE) (<https://www.colorado.edu/odece/our-people>) and Human Resources (<https://www.colorado.edu/hr/about-hr/hr-staff-directory>). The Office of Faculty Affairs can also assist with strategies (<https://www.colorado.edu/facultyaffairs/who-we-are>).
6. Work with university leadership and Office of Advancement personnel in developing a strategic plan to improve the

institute's facilities to better reflect IBG's national reputation and institutional needs.

7. Explore roles for long-term research associates in faculty governance.

To the Vice Chancellor for Research and Innovation and Dean of the Institutes:

8. Provide strategies to IBG to improve diversity in tenure-stream faculty members that lives up to the spirit of CU Boulder's standards of inclusive excellence and supports the institute's strategic plan.

9. Support IBG's efforts to develop a funding plan to improve the institute's facilities to better reflect its national reputation and institutional needs.

10. As the IBG develops strategic faculty search plans that adhere to the goals of inclusive excellence, support the recruitment of faculty as identified, pending budgetary approval.

11. Incentivize explicit collaborations between IBG and other institutes and departments at CU Boulder, including via thematic focused fundraising emphases.

12. Support diversification of funding strategies that will make it easier for institutes like IBG to compete successfully for funding from non-federal funders with direct cost charging.

To the Dean of the Graduate School:

13. Work with IBG to determine ways that CU Boulder can better support PhD students on training grants.

To Provost:

14. Support a nationwide search for a new director, to be hired well before the current director steps down in 2021.

15. Prioritize funding strategies to support IBG's efforts to improve the institute's facilities to better reflect its national reputation and institutional needs.
16. As IBG develops strategic faculty search plans that adhere to the goals of inclusive excellence, support the recruitment of faculty as identified, pending budgetary approval.

Required Follow-Up

The director of the Institute for Behavioral Genetics shall report annually on the first of April for a period of three years following the year of the receipt of this report (i.e., April 1st of 2022, 2023, and 2024) to the vice chancellor for research and innovation and dean of the institutes, and to the provost on the implementation of these recommendations. Likewise, the vice chancellor for research and innovation shall report annually on the first of May to the provost on the implementation of recommendations addressed to the institute. The provost, as part of the review reforms, has agreed to respond annually to all outstanding matters under their purview arising from this review year. All official responses will be posted online.