

UNIVERSITY OF COLORADO BOULDER

ACADEMIC REVIEW AND PLANNING ADVISORY COMMITTEE

FINAL REPORT FOR THE INSTITUTE OF BEHAVIORAL GENETICS

Presented to Provost Russell Moore
February 8, 2013

Accepted:



02.26.2013

Provost & Executive Vice Chancellor for Academic Affairs : Date

I. REVIEW PROCESS

The review of the Institute of Behavioral Genetics (IBG) was conducted in accordance with the 2012 ARPAC Review and Planning Proceedings instructions. The unit prepared a self-study, which was reviewed by an internal review committee (IRC). The IRC found the report to be accurate and complete, but in need of clarification in several places. The Institute provided detailed responses to the IRC's comments and questions. An external review committee (ERC) visited the unit during February 2012 and, having reviewed the relevant documents, met with faculty members, students, and university administrators. The reviewers' comments and recommendations are cited at appropriate points. This public document reflects the assessment of and recommendations for the Institute of Behavioral Genetics as approved by the members of the Academic Review and Planning Advisory Committee (ARPAC).

II. OVERVIEW OF THE UNIT: INSTRUCTIONAL PROGRAMS AND RESEARCH/SCHOLARSHIP/CREATIVE WORK

The campus's standardized description of the unit may be found on the website of the Office of Planning, Budget and Analysis (PBA) (<http://www.colorado.edu/pba/depts/arp/index.html>). PBA updates the profile annually in the Fall semester. The data in this report are from the latest profile for the IBG available in November 2012 (and therefore may differ from the corresponding data that occur in the self-study of the department).

The ERC describes the Institute for Behavioral Genetics as "a world-leader that is unique in its extensive combination of human and animal model research studies of human behavioral variation." Throughout its forty-five-year history, IBG has been characterized by its high-caliber interdisciplinary research and the strength of its pre- and postdoctoral research training. By any measure, this institute is an outstanding asset for the University. IBG faculty members are strong and productive, the environment supportive of research and administrative staff, and the training programs highly competitive. The unit's success in maintaining and increasing National Institutes of Health (NIH) funding is exemplary and, as the ERC highlights, there exist "exciting synergies between IBG, the Institute of Cognitive Science, and the Department of Psychology and Neuroscience, as well as between IBG and the Department of Integrative Physiology."

In an earlier program review, the institute was described as a "unique facility, with a strong and very distinguished record." Current research at IBG includes studies of aging, psychopathology, reading and learning disabilities, cognition, substance abuse, behavioral development, and evolution. Its animal-model research programs on the molecular biology of addiction and the genetics of aging and neurodegenerative disease are internationally acclaimed. IBG animal facilities support this research with collections of invaluable, unique, behaviorally and genetically defined mice, including nicotinic receptor knock-out and knock-in strains that are widely used by researchers. Several internationally renowned studies of the genetics of human behavior are

ongoing at IBG, and it is home to one of the nation's largest DNA repositories for genetic research on human behavior.

Personnel and governance

Based on the 2011-2012 PBA unit profile, IBG had 16 Tenured or Tenure-Track (TTT) faculty fellows, whose tenure homes included Psychology and Neuroscience (eleven), Integrated Physiology (four), and Sociology (one). Eight of these TTT faculty fellows are rostered in the Graduate School. In total, 32 faculty fellows associate with IBG, most of whom hold joint appointments in academic units on the Boulder and Denver campuses. The institute has 34 postdoctoral fellows, research associates, and senior research associates. There are currently 43 PRAs, seven administrative and staff members, and 29 undergraduate student employees in IBG.

Leadership by the current director of the institute is considered outstanding by the ERC. The director is widely respected, is strongly committed to maximizing the achievements of his faculty, has successfully maintained the funding of his faculty and senior associates in an increasingly difficult funding environment, and has a strategic vision for guiding institute operations and hiring plans. A deputy director is responsible for the day-to-day administrative operations of the Institute. The current deputy director is widely appreciated for her contributions to a smooth running operation.

Research and scholarship

IBG faculty are exceptionally well funded and among the most productive on campus. The self-study report states that "IBG is the most successful unit on the Boulder campus for funding from NIH, and *far and away the most successful* unit for NIH funding on a per faculty basis." Since its last review in 2002, IBG has increased its external funding to record levels. Data from the Office of Contracts and Grants show IBG grant expenditures for FY2011 at \$13,317,030. IBG ranked sixth among 58 units in grant expenditures for the 5-year period ending in FY 2011. A clear indicator of IBG research effectiveness is the PBA report that affiliated TTT faculty members are among the most productive on campus in refereed publications per faculty member over the last seven years, averaging third of 61 units and first of the ten in its review cycle. Current IBG faculty have authored a significant number of publications in the most influential scientific journals, such as Science (17), PNAS (12) and Nature (9).

Educational mission

The education focus of IBG is on doctoral and postdoctoral training; however it is not a degree-granting department of the university. Pre-doctoral students who are working with IBG are associated with departments such as Psychology, Neuroscience, and Integrated Physiology. IBG administers a competitive graduate training program that is currently supported by three NIH training grants (NIMH, NICHD, and NIDA). Twenty-two graduate students are currently mentored

by IBG faculty fellows who participate in the training program. IBG training grants support 13 pre-doctoral and four postdoctoral trainees. Students not supported by training grants are supported via home department TAs or GRAs. Since the 2002 review, the IBG training program received 254 applicants, 18% (45) of whom were admitted. In the past five years (2007-2011), the average number of applications was double the average of those received in the prior five-year period (2001-2006).

The post-graduate success of IBG students is notable. Of the 33 students who completed the IBG training program since the 2002 review, 82% (27) hold academic positions and 15% (five) are in industry or related, non-academic fields. A 2009 review of the NICHD training grant noted that "Trainees' productivity, in terms of number of publications credited to them in their first two years, is quite strong, and graduates of the program are over-represented among nationally recognized leaders in the field." Thus, the IBG training program continues to be highly competitive, and the quality of the students accepted into and graduating from the program remains very high.

IBG does not have an undergraduate program; however, IBG faculty members provide important research experience for undergraduates through programs such as Bioscience Undergraduate Research Skills and Training (BURST), Summer Undergraduate Research Fellowship (SURF), and the Undergraduate Research Opportunities Program (UROP). Since the 2002 review, IBG faculty members have provided mentorship to 129 undergraduate students in these programs and have served as mentors to 29 students pursuing undergraduate departmental honors theses. A Graduate School-rostered faculty fellow was largely responsible for development of the Neuroscience major in the Department of Psychology and Neuroscience and currently serves as its co-director.

Faculty and Student Diversity

While the number of ethnic minority faculty affiliated with IBG has doubled since the 2002 review, their number remains relatively low compared to other university units; at 13%, IBG ranks 5th of 10 in the current review cycle and 36th of 61 units overall. The institute has no underrepresented minorities or international faculty although if resident-alien employees are considered (as the self-study does), the cultural diversity increased from 14% in 2002 to 20% by 2011. None of the graduate-school rostered faculty members are ethnic minorities, and most (2/3rds) of the minority students and employees in IBG are either undergraduate employees or PRAs.

Since the 2002 review, the percentage of IBG faculty, staff, and students who are female has remained around 57-58%. However, an analysis of the positions held reveals a decline in the percentage of females in higher-level positions. According to the self-study, females constitute 75% of the student employees and PRAs, 59% of the graduate students, 47% of the postdocs/RAs, 25% of Graduate School-rostered IBG faculty, and 19% of all IBG faculty fellows. According to the PBA, the latter figure of 19% ranks 10th of the 10 units in this review cycle and 47th of 61 campus units. An NSF Life Sciences report cited in the self-study describes the distribution of females in the life sciences as 60% among undergraduates, 52% among graduate students, and 32%

among tenure-track faculty. Thus, IBG is above the national average for women in the life sciences through the level of graduate student but is lagging significantly at the faculty level.

Space

Approximately two-thirds of the IBG faculty fellows reside in their home departments on the Denver and Boulder campuses. The remaining faculty, students, research fellows, administrative staff, and animal facilities occupy approximately 38,500 square feet in four buildings on the East Campus: the IBG building, RL1, RL4, and ARCE. Since the 2002 review, IBG self-funded an addition to the second floor of the IBG building of approximately 5,600 square feet of office space, animal housing, and library space.

Budget

IBG's general operating expense budget is supported by their departmental allocation of Departmentally Allocated Indirect Cost Recovery (DA-ICR). Over the past five years, the direct cost expenditures to about 70-85 individual sponsored projects have netted an average of \$2.62 million in Facilities and Administration to the university. Of that amount, approximately 29% (or a five-year average of about \$750,000) is returned to IBG to form the operating expense budget. These funds have been used to assist the establishment of the molecular biology facility; to support the Specific Pathogen-Free (SPF) mouse facility; to support construction projects; and to contribute to new faculty start-up funds. Faculty salary savings also add to the budget when any of the eight Graduate School-rostered faculty members pays a portion of his/her salary on a sponsored project.

III. HISTORY OF PROGRAM REVIEW

Past program reviews (1981, 1995, 1988, 2002) consistently laud the Institute's strength and leadership in the areas of genetic and environmental bases of individual differences in behavior. Pre- and postdoctoral training in this interdisciplinary area has been reliably outstanding. Recommendations throughout the review history have commonly focused on the need for higher recognition by and support from the University and a concrete plan for meeting the Institute's space needs, ideally in a single building. The most recent review, in 2002, further emphasized (1) recruitment of additional rostered faculty to expand the research operation, weighing the options of senior versus junior appointments and shifts in research programs; (2) increasing ethnic and gender diversity in the rostered faculty and graduate student populations; and (3) implementing a plan to customize one of their buildings or find alternative housing for the whole institute.

IV. IBG IN THE CAMPUS CONTEXT

IBG is an exceptional asset for the CU system. Its interdisciplinary research and training programs are models for other units and for the broader interdisciplinary aspirations of the university. Productivity by the faculty is extremely high in both funding and peer-reviewed publications. While

the missions of campus institutes are almost exclusively research, IBG does an outstanding job training pre- and postdoctoral students (having three of the seven training grants on campus). Even IBG's undergraduate contributions are considerable: its broad research programs can provide significant opportunities for undergraduate involvement in research. Furthermore, their week-long genetic analysis workshops (not mentioned in the self-study) are of tremendous value for CU graduate students, postdoctoral fellows, and junior faculty members. IBG maintains healthy relationships with numerous other institutes, departments, and universities, and is fundamental to the synergy that exists within the behavioral genetics community in the larger CU system.

V. IBG IN THE BROADER CONTEXT

IBG is a world-class operation, and its major research foci are key public health priorities. The ERC points out that "its strengths will only grow in importance in an era where genetic and translational research is increasing recognized." IBG researchers and facilities provide vital services to the global research community in their maintenance of nicotinic receptor knock-out/knock-in mouse lines and a large human biobank for genomic research (50,000 biospecimens). The institute has strong collaborative relationships with a number of other major research universities.

The Institute for Behavioral Genetics has a large number of different strains and genetically selected stocks of mice in a specific-pathogen-free (SPF) mouse laboratory. These include inbred and recombinant strains of mice that provide efficient tools for screening behaviors for genetic influence and mapping quantitative trait loci. Selection studies in which mice are bred for certain characteristics provide definitive proof of genetic influence and also yield animal models that are valuable for subsequent research in functional genomics. IBG animals are widely utilized by many researchers.

VI. ANALYSIS

Personnel and governance

To maintain and expand upon the culture of translational research (i.e., research that facilitates the translation of basic science to practical application), the institute will have to continue to engage in strategic hiring. Exploring the functional implications of variation in individual genes using animal models is a powerful tool that increasingly requires greater sophistication in computational biology and advanced methods in genomics. In anticipation of a senior retirement and a junior faculty member's departmental move during the next two years, IBG is requesting three new junior faculty lines to recruit additional expertise in behavioral genomics and computational biology. Beyond these requests, they seek five new lines for building additional strength, perhaps as joint hires with Psychology and Neuroscience, Integrative Physiology, Applied Mathematics, and/or Molecular, Cellular, and Developmental Biology (MCDB). These additional positions are important, IBG argues,

to increase faculty diversity, ensure that the graduate training grants remain at the forefront of science, and expand the number of trainees in more flexible interdisciplinary degrees.

IBG relationships with departments are critical to its multidisciplinary enterprise and the hiring and retention of faculty. Currently, all these relationships are functioning well, but, as is typical of all institute-department associations, constant attention must be paid to hiring processes when individuals of interest to IBG are not compatible with any department; promotion disagreements between the institute and the departments; and salary inequities that may arise from different salary pools available to each department and the institute.

The ERC noted that “little progress appears to have been made since the 2002 external review in the implementation of a systematic strategy for mentoring junior faculty. The latter are left to seek out guidance from more senior faculty on professional and academic issues, or they are left to the departmental mentoring programs.” IBG has recently adapted policies from the Department of Integrative Physiology Mentoring Plan in August 2011 to formalize its own mentoring program. Each new faculty member will be appointed a mentor in his or her first year. This relationship will continue (with either the original mentor or another at the choice of the junior faculty member) through regular meetings, assistance with grant applications and manuscripts, and advice on career advancement.

Several governance issues came to the attention of the ERC. First, despite their long tenure with the institute, senior research associates are allowed no role in institute-level decision making. The ERC suggested that an equitable solution is within the grasp of the director. Second, there is no executive committee for the institute. Its primary value, as noted by the ERC and IRC, would be in preparing for future leadership transitions. Third, the ERC agreed that there should be more cost-sharing of administrative staff by the university but noted that this issue might be partially remedied by centralizing administrative services if institutes such as IBG and ICS moved into shared new space.

Research, scientific integration, and strategic planning

Research by faculty fellows within IBG is excellent; however, it is dependent on continued smooth relationships among its many partners. Future strategic hires and improved or new joint and neighboring space are critical to the continued success of the Institute. Regarding strategic planning, the ERC commented that “Significant scientific and training gains, including increased competitiveness in the pursuit of NIH funds, can be achieved by increasing synergistic interactions between IBG, ICS, Psychology and Neuroscience, and Integrative Physiology.” Both review committees support the self-study’s proposal for newly constructed space to join these units, and they advocate that such a move is critical to maintain the world-class research and training that this institute represents.

Educational mission

Interdisciplinary approaches to research questions and the training of pre- and post-graduates are the norm in IBG. However, traditional department-centered doctoral degrees do not always accommodate interdisciplinary science very well. The institute would like to explore establishing an interdisciplinary PhD, perhaps in Bio-behavioral Science or Behavioral Genetics, so that course and other requirements could be tailored to interdisciplinary needs as opposed to the requirements of a single department.

Diversity

The current absence of underrepresented minorities, low numbers of ethnic minorities, and the gender ratio for IBG rostered faculty are unacceptable. The ERC concluded that narrowly focused faculty recruiting efforts would do little to alleviate these problems. The institute has proposed to establish a new Committee on Diversity and Engagement consisting of five members with representation from faculty, postdocs/RAs, PRAs/SPRA, staff, and graduate students. The committee would be involved with faculty recruitment efforts, coordinate an outreach program, and serve as a resource for minority and female students. To promote increased diversity at the undergraduate level, faculty members participate in CU's Summer Multicultural Access to Research Training (SMART) program and provide research opportunities to minority and/or underrepresented students through other undergraduate programs. The Institute has been able to enhance cultural diversity at the graduate and post-graduate level by hosting international students and postdoctoral fellows. The National Institutes for Health review diversity records, so IBG needs to make sure it is moving aggressively in this area.

Computing facilities and security

The need for massively powerful computing resources increases as studies in behavioral genetics require sequencing entire genomes of thousands of individuals. Installation of a supercomputer near East Campus filled a short-term need, but IBG projects that the need for additional computing facilities will increase ten-fold in the next few years.

The ERC found current computer security procedures for IBG databases, including human subjects data, to be unacceptable. This is very likely a campus-wide issue. Data security has been identified as a key area in human-subjects regulation, and it has been suggested that all human subjects data should be held to the same standards as data currently covered by HIPAA (Health Insurance Portability and Accountability Act). The ERC predicted that "this is likely to become yet another unfunded mandate imposed on universities, that will be especially burdensome for academic campuses such as CU with no attached medical school."

Space and Infrastructure

In the opinions of both the IRC and ERC, space and infrastructure issues jeopardize IBG's future research excellence. Two concerns require immediate attention. First, while the most important

strength of IBG is its ability to combine animal and human research, the animal facilities on which this translational science depends are “inadequate and seriously underfunded” (ERC). In its response to the ERC, the Institute pointed out that the animal facilities still pass regular, federally-mandated inspections by the Institutional Animal Care and Use Committee (IACUC) and the university veterinarian. However they resoundingly agreed that the facilities “are below the standards expected for a world class research institute.” The infrastructure is in need of repair, including poor insulation and the lack of sound dampening measures for behavioral testing. Important equipment for maintaining SPF standards are extremely old and in almost constant need of repair. Moreover, the institute lacks sufficient care and maintenance staff, is largely dependent on work-study students for hands-on animal care, and is, as a consequence, vulnerable to animal welfare issues. None of CU’s animal facilities is currently AAALAC (Association for Assessment and Accreditation of Laboratory Animal Care) accredited, and the IBG facility would certainly not be accredited in its current condition should funding agencies require it. This facilities issue was recognized as a problem in the 2002 review, and the need is now more critical. According to the ERC, IBG will have serious issues in retaining or recruiting outstanding basic or translational scientists due to these substandard facilities. This factor alone would have substantial impact on IBG’s standing as a world-class research organization.

IBG faculty members use overcrowded laboratories and fragmented and, in some cases, declining buildings. Institute operations have been housed across four buildings on East Campus for much of their history. The IRC underscores that “at this point, the space is so limited and unsuited to research needs that sizeable further investment in the current space is difficult to justify.” In fact, current construction plans for the East Campus involve the eventual demolition of three of the four buildings, including IBG’s animal facilities (the IBG, RL4 and RL1 buildings). Three laboratories, which will generate more than \$1,800,000 in contract and grant support in the coming year, are housed in RL1, with no plans in place to relocate after the building’s demolition. There is no alternative space specified for IBG in the current East Campus planning documents. Both the ERC and the IRC emphasized the absence of facilities planning for IBG, with the latter suggesting that the institute take “a more alarmist tone” in their self-study report. Also, because the East Campus redevelopment may take several years to implement, there is an immediate need for planning to rehouse IBG.

Specific requests for space should be seriously considered at the point when the campus nears the demolition of the IBG and RL4 buildings. The current request by IBG is for 80,000 square feet in new facilities both to accommodate existing personnel and activities (around 50,000 square feet to replace current space and an additional 30,000 square feet to accommodate projected increases in tenure-track faculty and the personnel and activities that flow from them. IBG’s self-study proposes the construction of a group of buildings on East Campus to house other bio-behavioral science programs and institutes, including some aspects of Psychology and Neuroscience, Integrative Physiology, and the Institute of Cognitive Sciences. Ideally, this arrangement would constitute a bio-behavioral research cluster with four new, adjacent buildings accommodating the highly collaborative enterprises of IBG, ICS, Integrative Physiology, and Psychology and

Neuroscience. Certainly, for IBG to maintain and extend its leading position in behavioral genetics research, a plan must be made for space that fosters interdisciplinary research and graduate education.

Budget

IBG believes that current DA-ICR resources are not adequate to meet program needs. IBG spends over \$180,000 per year on administrative costs that they believe should be, at least in part, covered by the university. The institute supports 3.75 staff positions using DA-ICR that they consider should be university supported. Anticipated new hires will require additional support in purchasing, payroll, and other administrative needs. Furthermore, IBG has had to absorb a major portion of the costs for the SPF facility and for students in the predoctoral training program. For its part, ARPAC notes that funding of administrative costs through DA-ICR is the model for all institutes on campus.

The annual financial commitment to the SPF facility has averaged close to \$75,000 over the past six years. Fewer senior faculty members are supporting the SPF facility as they phase out of animal research programs or approach retirement. Younger faculty members who use the facility lack the same level of support as their senior colleagues enjoy. This situation suggests the need to reassess the funding model for the facility. In addition, because NIH pays \$16,000 towards student trainee tuition and fees and a flat rate for health insurance that is lower than the cost of CU's graduate student plan, IBG has absorbed an additional \$64,000 per year (the difference between the training award and actual costs) to continue to attract outstanding students. To reduce costs, IBG has chosen not to use training grants for out-of-state graduate students in their first year in graduate school. First-year students must achieve in-state status prior to their second year to be considered for support by an IBG training grant. This approach may be affecting minority students, who may not be able to assume the differential cost of health care and all fees and may also not be in a good position to assume a teaching assistantship in their first year in graduate school. As a solution, the institute requests that CU use the lower resident tuition rate for all NIH-funded trainees.

VII. RECOMMENDATIONS

A. To the Unit:

1. Work with the Office of Information Technology (OIT) on maintaining computer security procedures for databases, including human subjects databases.
2. Create the proposed Committee on Diversity and Engagement to help address significant diversity issues. Aggressively pursue underrepresented minority and female hires through outreach and recruitment efforts, aided by the Committee on Diversity and Engagement.
3. Implement the planned program for mentoring junior faculty and monitor its success.
4. Consider various models that will successfully prepare the institute for future leadership transitions. At the same time, review bylaws in relation to governance issues.

5. Place animal care oversight in the hands of long-term, experienced employees.
6. Raise the institute's profile on the campus and in the community with the goal of identifying alternative sources of funding for graduate education, endowed professorships, and improved facilities.
7. Develop a more detailed argument for hires beyond replacement positions, working with potential campus partners on joint hires.
8. If it is the intent of IBG to develop an interdisciplinary PhD, work with the relevant departments and explore avenues within the university to implement such a plan.

B. To the Dean of the Graduate School:

9. Work with the unit as retirements occur to leverage a larger number of junior positions as appropriate.
10. Work with OIT on maintaining computer security procedures for databases, including human subjects databases.
11. Work with IBG and the relevant departments as they consider an interdisciplinary degree.

C. To the Vice Chancellor for Research:

12. Develop a plan to increase computing facilities to support IBG and large computational efforts by other units.

D. To the Provost:

13. Plan for the long-term relocation of IBG faculty and operations. In this planning, consider, for example, a bio-behavioral research cluster to sustain and enhance IBG's world-class research and training programs.
14. Develop and implement plans with IBG, the Vice Chancellor for Research (VCR), and other units with animal care units to improve or replace animal facilities.
15. Work with OIT on implementing campus-level computer security procedures for databases, including human subjects databases.

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 (e.g. April 1st of 2014, 2015, and 2016) to the dean of the Graduate School and to the provost on the implementation of these recommendations. Likewise, the dean shall report annually on the first of May to the provost on the implementation of

recommendations addressed to the college. The provost, as part of the review reforms, has agreed to respond annually to all outstanding matters under her/his purview arising from this review year. All official responses will be posted online and made available for university community comment.