

IBG Self Study 2011

As part of the Academic Review and Planning Advisory Committee's (ARPAC) review of our Institute, we were asked to conduct a self study during the Fall of 2011. ARPAC requested that each unit under review report the results of their self study in the form of response to a series of questions posed by ARPAC. The units under review in 2011-12 were those falling under the rubric of the life sciences (MCDB, Psychology and Neuroscience, Integrative Physiology, Ecology and Evolutionary Biology, Institute of Cognitive Science, and IBG) and environmental sciences. All units reviewed responded to the same set of questions.

The IBG self study committee consisted of all IBG Faculty Fellows and representatives of the graduate students, researchers, and staff. However, among the IBG Faculty Fellow, a core self-study group comprised those Fellows taking the lead responsibility for responding to one or more self study questions.

Core Faculty Fellows were: John Hewitt (co-Chair), Jerry Stitzel (co-Chair), Don Cooper, John DeFries, Marissa Ehringer, Tom Johnson, Matt Keller, Matt McQueen, Soo Rhee, Andy Smolen, Toni Smolen, Mike Stallings

Non-Faculty Fellow committee members currently were:

Representing graduate students:	Will Horton, Joanna Vandever
Representing researchers:	Mike Marks
Representing staff members:	Sean Shelby

The schedule of Self Study committee meetings was as follows:

Wednesday, August 31 st ;	First self-study meeting
Friday, September 23 rd ;	First drafts of due from workgroups
Wednesday, September, 28 th ;	Second self-study meeting.
Friday, October 7 th ;	Meeting of Faculty Fellows on the future of IBG (strategic planning)
Friday, October 28 th ;	4.00pm onwards, with refreshments
Wednesday, November 2 nd ;	Final drafts due from workgroups
Friday, November 11 th ;	Third self-study meeting
Wednesday, November 16 th ;	JKH and JS circulate finalized draft self-study
Friday, December 9 th ;	Final self-study meeting
	Self-study process ends

'Town hall' meeting were held with each of the following groups: 1) graduate students; 2) Professional Research Assistants; 3) Senior Professional Research Assistants, Research Associates, and Senior Research Associates; 4) Staff members. The town hall meetings were organized by the groups' representatives and reported back to the full committee (i.e. Faculty Fellows did not attend these meetings). Additionally, all members of each of the four groups were surveyed by anonymous questionnaire, administered by the representatives, and the results were reported to the full committee.

Neither this description of the self study process nor the results of the town hall meetings and the survey questionnaires are part of the official responses to the ARPAC questions, but they are included in this version of the report for posting on the IBG website. Also included in this

version of the report are the names of each of the workgroups responsible for the first draft of the response to each question.

The final version of the response was prepared by the co-Chairs of the Self Study Committee, John Hewitt and Jerry Stitzel.

We thank all of the members of the Institute who participated in the self study.

Workgroup responses, as of 12-05-11

- **Question 1: Unit Overview**

Task: Please provide an overview of your unit, including a summary of the resource requests justified elsewhere in the reporting. (Hewitt, Stitzel, Smolen T)

1.1 Overview of the Institute for Behavioral Genetics (IBG)

1.1.1 IBG's Mission

Founded in 1967, IBG is one of the top research facilities in the world for genetic research on behavior. Its mission is to conduct and facilitate research which examines the genetic bases of individual differences in behavior and to conduct research training in this interdisciplinary area.

1.1.2 IBG's Faculty

There are 8 tenured or tenure-track faculty rostered in the Graduate School and based at IBG. In total there are 32 faculty fellows, most of whom hold joint appointments in academic units on the Boulder and Denver campuses. Although Behavioral Genetics can be thought of as the intersection between genetics and the behavioral sciences, our faculty comes from a broader range of backgrounds.

On the Boulder campus: Dept of Psychology & Neuroscience (10 +3 emeriti), Dept of Ecology & Evolutionary Biology (1 + 1 emerita), MCDB (1), Dept of Integrative Physiology (4), Dept of Sociology (1), Graduate School (2)

At the University of Colorado Denver: Departments of Pharmaceutical Sciences (2), Pharmacology (3), and Psychiatry (1 + 1 emeritus), and the Center for Bioethics and Humanities (1). At the University of Denver: Department of Psychology (1).

In addition to our research mission, faculty on the Boulder campus teach both undergraduate and graduate students.

1.1.3 Graduate trainees

22 graduate students mentored by IBG faculty fellows participate in the IBG training program; since we are not a degree-granting unit, all current graduate students are affiliated with academic units on the Boulder campus. We direct three NIH pre- and postdoctoral training grants (from NIMH, NICHD, and NIDA) supporting 13 graduate students and 4 postdoctoral fellows, and we co-direct another training grant supporting 7 postdoctoral fellows (NIAAA)

1.1.4 Postdoctoral Fellows and Researchers

IBG supports approximately 34 postdoctoral fellows, research associates, and senior research associates.

1.1.5 Other Researchers, Administrative, and Student Hourly Employees

There are currently 48 PRAs, 7 administrative and animal laboratory staff members, and 26 undergraduate student employees.

1.1.6 Research Funding

IBG administers about \$55 million in total grant dollars; \$12-13 million per fiscal year. We have approximately 48 research projects that are funded through IBG. Our faculty direct two major NIH supported research centers: The Learning Disabilities Research Center (P50HD027802) and the Center on Antisocial Drug Dependence (P60DA011015).

1.1.7 Physical Infrastructure

IBG occupies 38,500 sf in four buildings on the East Campus of CU Boulder: the IBG building (17,200sf), RL1 (3,600sf), RL4 (7,700sf), ARCE (10,000sf). Our goal is to obtain new integrated space, totaling 80,000sf, within a bio-behavioral research cluster to accommodate our growing research and graduate education needs in collaboration with Psychology and Neuroscience, IPHY, and ICS.

1.1.8 Research overview

Data collection and analysis are ongoing for several internationally renowned studies including the Colorado Adoption Project, the Colorado Twin Registry, the National Youth Survey Family Study, the Colorado Learning Disabilities Research Center, the Colorado Center on Antisocial Drug Dependence and the National Longitudinal Study of Adolescent Health. IBG is home to one of the nation's largest DNA repositories for genetic research on human behavior, as well as housing a wide array of behaviorally and genetically defined lines of selected, recombinant inbred, transgenic, and knock-out gene mice, including the world's most complete collection of nicotinic receptor knock-out and knock-in strains. Current research includes studies of aging, neurodegenerative disease, psychopathology, reading and learning disabilities, cognition, substance abuse, behavioral development, and evolution.

1.2 Overview of accomplishments of the Institute

Since the last Program Review (2001-2002), the Institute has seen a decade of accomplishments, made possible by outstanding faculty, researchers, support staff, and students. Here we summarize some of the highlights, and then look towards the future

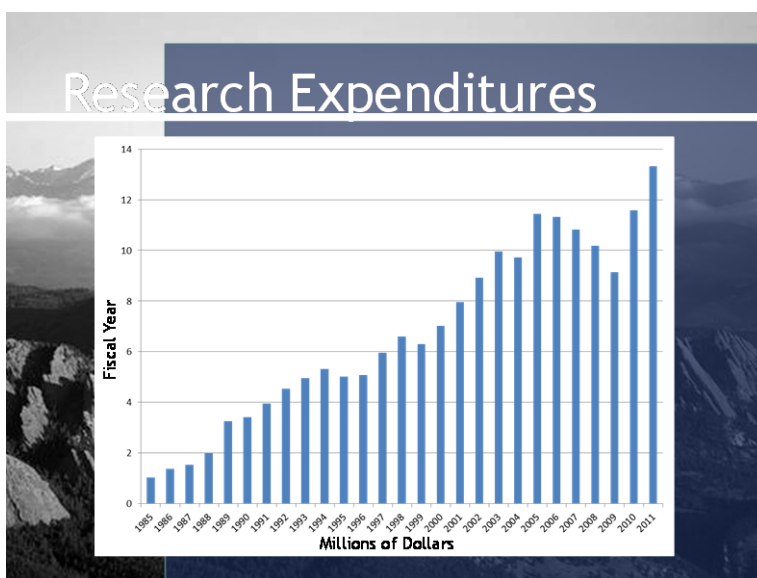
1.2.1 Program review

Our last program review was conducted during 2001-2. In its summary findings, the Program Review Panel stated that the “. . . Institute for Behavioral Genetics is an independent academic

enterprise that is peerless in its field and a superb asset to the University of Colorado and to the Boulder Campus.” (Program Review Final Report, May 2002).

1.2.2 Research productivity

Since that review, annual external grant awards to the Institute (IBG) have risen from \$7,962,881 in FY 2001 to \$10,925,336 in 2005, to \$12,768,341 in FY 2011, and our research expenditures totaled \$13,317,030 in FY2011, a record for the Institute. The indirect costs (ICR) returned to the Institute to provide our departmental administrative support (DA-ICR) increased from \$464,076 in 2001, to \$616,628 in 2005, to \$887,772 in FY 2011, reflecting an approximate doubling in total ICR earned from approximately \$1.6million to \$3.1million. This represents an astonishing level of productivity in externally funded research, especially when set against the modest increase in the number of graduate school rostered tenured and tenure track (TTT) faculty from 6 in 2001 to 8 currently, with two senior retirements and 4 new junior recruitments.



1.2.3 Scholarship

That the productivity in scholarship matches the productivity in funding is evidenced by the fact that in the Office of Planning and Budget's unit profiles for each of the past four years, IBG ranks *first, second, or third* out of all 60+ units surveyed at CU Boulder for the average number of refereed publications per faculty member over the prior seven year period. Two major journals in our field are edited in the Institute: *Behavior Genetics* (Editor-in-Chief: John Hewitt) and *Experimental Gerontology* (Editor-in-Chief, Thomas Johnson).

1.2.4 Faculty recruitment

Since 2001, there have been four new IBG faculty hires rostered in the Graduate School, and one rostered in Psychology and Neuroscience. Together with two retirements (Jeanne Wehner

and Al Collins), half of the Graduate School rostered TTT faculty (4 out of 8) are recently appointed.

1.2.5 New Faculty Fellows

Part of the success of the Institute has been through expanding still further its interdisciplinary collaborations; this is reflected in the total number of Faculty Fellows being increased from 18 in 2001 to 32 currently (27 excluding emeriti) with a broader range of disciplines represented. IBG faculty currently participate in externally funded research in collaboration with Psychology and Neuroscience, Integrative Physiology, Molecular Cellular and Developmental Biology, Sociology, the Institute for Behavioral Science, the Institute of Cognitive Science, Applied Math, and Science Discovery on the Boulder campus, and numerous departments and universities elsewhere.

1.2.6 Research infrastructure

The construction of an addition of 5700 square feet of new animal testing, wet laboratory, and office space as a second floor above our SPF mouse colony was completed in 2006. IBG has continued to improve its laboratory space, investing in renovations and improvements for its wet laboratories and the Information Technology infrastructure that underpins much of the work in biometrical and statistical genetics.

However, much of our space is old and in need of further expensive repair and renovations, and the Institute has been fragmented across four different buildings on the East Campus, with adverse consequences for our inherently interactive and collaborative research model. Thus we urgently need a long range plan to replace our existing space. This is addressed below under 'Plans and future directions'.

1.2.7 Graduate education

In graduate education, of the seven institutional training grants currently awarded by NIH to CU Boulder, three are held by IBG (from NICHD, NIMH, and NIDA) supporting a total of 13 graduate fellowships and 4 postdoctoral fellowships. In addition, IBG co-directs an NIAAA postdoctoral grant held at UC Denver that supports an additional 7 postdoctoral fellows, one or two typically at IBG. IBG's doctoral student body has increased from 13 in 2002, to 15 in 2005, to 22 currently.

1.2.8 Diversity

Through new faculty recruitment and Faculty Fellow appointments, we have increased our faculty diversity in age, rank, and gender, making most progress with junior faculty representation.

1.2.9 Summary

Since the last program review in 2001, IBG has increased its external funding to record levels, is ranked among the most productive units across all of CU Boulder in number of peer reviewed

publications per faculty member, is a leader in its discipline's scholarship, has expanded its faculty and developed new interdisciplinary collaborations, has increased its number of trainees, and has increased the diversity of the faculty.

1.3 Plans and future directions

IBG is unique among its peers in its potential for integrating animal model and human research. During the past decade, there have been breathtaking advances in human genetics, with methods for the discovery of genes influencing complex traits moving from single candidate gene association studies, to genome-wide association studies, and now deep sequencing of individual genes or, indeed, whole genomes. Along with these advances has come an even greater need for a deep understanding of statistical and population genetics as well as an ever increasing need for sophistication in computational biology. Accompanying these advances in human genetics has come a new era of neuroscience encompassing everything from single cell neurophysiology to human brain imaging. Exploring the functional implications of variation in individual genes using animal models has become a powerful tool for translating human statistical associations to real biological knowledge. Maintaining and enhancing a culture of 'translational' research will ensure our continued leadership in research and training in the genetics of behavioral traits. To remain and expand its world class research and training, the Institute must continue its faculty recruitment, infrastructure development, and other activities that support the scientific and educational endeavor.

1.3.1 Faculty recruitment.

During the next two years we anticipate that one senior graduate school rostered faculty will leave his position through retirement and one junior faculty will vacate his line through transfer to an academic department. Given this, the Director has agreed with the Dean of the Graduate School and with the Vice Chancellor for Research, that IBG will be able to recruit three new junior faculty, using the salary lines that become available during 2012 and 2013. To participate in the next generation of human research the Institute should be looking to recruit additional expertise in behavioral genomics and computational biology. To develop our interface with brain science, we should recruit additional behavior geneticists with expertise in molecular biology, neurophysiology, imaging, and computational neuroscience.

Beyond this, we are requesting that five new lines be created that will enable us to build upon our existing strengths in the genetics of learning disabilities, mental health, neuroscience, and statistical genetics as well as developing new strengths in genetics and behavior in relation to brain structure, function, and development (brain imaging); computation and genome sequencing (supercomputing).

1.3.2 Research infrastructure

1.3.2.1 Space.

One vision for the future of the Institute is not so much as a stand-alone research unit (albeit spread over four different buildings!), but as an Institute that brings its unique strengths to collaborations across the life sciences. To this end, the Director has been advocating for the

development of a Life Sciences Research complex on the East Campus that encompasses several departments and institutes.

The East Campus Vision Task Force report included the following statement:
“Life Sciences (estimated 3 buildings; ca. 400K ASF) Caruthers Biotech building as nucleus (houses Biochemistry Division, Department of Chemical and Biological Engineering [ChBE], and the Colorado Initiative in Molecular Biotechnology [CIMB])

Proposed Chemistry and Life Sciences Building [CLS] adjacent to Biotech (to house Department of Chemistry and Biochemistry [CHEM], Department of Integrative Physiology, possibly faculty in Neuroscience from the Department of Psychology and Neuroscience).

Companion wings or buildings could house combinations of the following units that would interact with those in Biotech and CLS: Department of Molecular, Cellular and Developmental Biology [MCDB], Institute of Cognitive Science [ICS], Institute of Behavioral Genetics [IBG]. Housing for these units may be planned as wings added to the CLS or biotech buildings, or perhaps an additional stand-alone building."

Our ability to do cutting edge science and to attract funding --- especially for larger scale projects and Centers funded by NIH --- would be enhanced by such a Life Sciences Research Complex, and especially a bio-behavioral cluster involving IBG, ICS, Psychology and Neuroscience, and Integrative Physiology, that could support the full range of our research from genome sequencing to brain imaging, from molecular biology to physiology to neuroscience and behavior.

1.3.2.2 Research infrastructure: technology.

The Institute must continually upgrade its genotyping and sequencing technology, its animal and related wet laboratory facilities, and its computational and database environment. This can be done by continuing to reinvest salary savings. We should make sure to take full advantage of the newly installed research `super computer' and the brain imaging facility on the Boulder Campus.

1.3.2.3 Diversity

The Institute continues to have as priority the creation of additional age, gender, and ethnic diversity among faculty, researchers, staff, and graduate students. We strongly support employment practices that facilitate the career development of women, especially in regards to competing needs of family and career.

1.3.2.4 Financial outlook.

The success of the Institute has been predicated on its success in attracting external funding to support its research and training, and on the return of salary savings and a proportion of its

earned ICR monies to support the infrastructure and administration that makes the educational and scientific mission of the Institute possible. We see great opportunities in the future to extend and expand on our past success

- **Question 2: *Faculty Support***

Task: Please describe how your unit's faculty are hired, supported, and retained. (Hewitt, Stitzel)

2.1 IBG's Current Faculty

There are 8 tenured or tenure-track faculty rostered in the Graduate School and based at IBG. In total there are 32 faculty fellows, most of whom hold joint appointments in academic units on the Boulder and Denver campuses. Although Behavioral Genetics can be thought of as the intersection between genetics and the behavioral sciences, our faculty comes from a broader range of backgrounds.

On the Boulder campus: Dept of Psychology & Neuroscience (10 +3 emeriti), Dept of Ecology & Evolutionary Biology (1 + 1 emerita), MCDB (1), Dept of Integrative Physiology (4), Dept of Sociology (1), Graduate School (2)

At the University of Colorado Denver: Departments of Pharmaceutical Sciences (2), Pharmacology (3), and Psychiatry (1 + 1 emeritus), and the Center for Bioethics and Humanities (1). At the University of Denver: Department of Psychology (1).

2.2 Tenure and Tenure Track (TTT) Faculty rostered in the Graduate School

IBG is a Research Institute administered under the auspices of the Graduate School and the office of Vice Chancellor for Research. The Director of IBG reports to the Dean of the Graduate School, and the research and support personnel report, ultimately, to the Vice Chancellor for Research. Under the current arrangements, eight IBG TTT faculty lines are rostered in the Graduate School and paid by General Fund money allocated to the Graduate School, reporting, ultimately, to the Dean of Graduate School.

However, also under the current arrangements, IBG TTT faculty must also have a tenure home in a degree granting academic department (such as Psychology and Neuroscience or Integrative Physiology, where the tenure homes of all 8 Graduate School rostered TTT faculty currently reside, 4 in each Department). As a result, these faculty also currently report to the Dean of Arts and Sciences. When recruiting new faculty, it is necessary to have an academic department agree to accept the faculty member, and decisions on tenure and promotion are the responsibility of the academic department.

2.2 Faculty recruitment

Since 2001, there have been four new IBG faculty hires rostered in the Graduate School, and one rostered in Psychology and Neuroscience. Together with two retirements (Jeanne Wehner and Al Collins), half of the Graduate School rostered TTT faculty (4 out of 8) are recently appointed.

2.3 New Faculty Fellows

Part of the success of the Institute has been through expanding still further its interdisciplinary collaborations; this is reflected in the total number of Faculty Fellows being increased from 18 in 2001 to 32 currently (27 excluding emeriti) with a broader range of disciplines represented. IBG faculty currently participate in externally funded research in collaboration with Psychology and Neuroscience, Integrative Physiology, Molecular Cellular and Developmental Biology, Sociology, Institute for Behavioral Science, Institute of Cognitive Science, Applied Math, and Science Discovery on the Boulder campus, and numerous departments and universities elsewhere.

2.4 Plans and future directions

IBG is unique among its peers in its potential for integrating animal model and human research. During the past decade, there have been breathtaking advances in human genetics, with methods for the discovery of genes influencing complex traits moving from single candidate gene association studies, to genome-wide association studies, and now deep sequencing of individual genes or, indeed, whole genomes. Along with these advances has come an even greater need for a deep understanding of statistical and population genetics as well as an ever increasing need for sophistication in computational biology. Accompanying these advances in human genetics has come a new era of neuroscience encompassing everything from single cell neurophysiology to human brain imaging. Exploring the functional implications of variation in individual genes using animal models has become a powerful tool for translating human statistical associations to real biological knowledge. Maintaining and enhancing a culture of 'translational' research will ensure our continued leadership in research and training in the genetics of behavioral traits.

2.5 Faculty recruitment in 2012-13

During the next two years we know that one senior graduate school rostered faculty member will leave his position through retirement and one junior faculty member will vacate his line through transfer to an academic department. Given this, the Director has agreed with the Dean of the Graduate School and with the Vice Chancellor for Research, that IBG will be able to recruit three new junior faculty, using the salary lines that become available during 2012 and 2013. These junior positions will be targeted at the next generation of genomic and brain science. To participate in the next generation of human research the Institute has an urgent need to recruit additional expertise in behavioral genomics and computational biology. To develop our interface with brain science, we must recruit additional behavioral geneticists with expertise in molecular biology, neurophysiology, and imaging brain function and structure. However, the Institute also must plan to recruit faculty who can take leadership positions in IBG's traditional areas of strength as key faculty retire, and must also take advantage of the new opportunities afforded by university's strategic investments in brain imaging and supercomputing.

2.6 Faculty recruitment over the next seven years

We therefore request that, in addition to the three planned junior faculty recruitments, five new lines be created that will enable us to build upon our existing strengths in the genetics of learning disabilities, mental health, neuroscience, and statistical genetics as well as developing new strengths in genetics and behavior in relation to brain structure, function, and development (brain imaging); computation and genome sequencing (supercomputing).

It is possible that some or all of these could be interdisciplinary or joint hires co-ordinated with Psychology and Neuroscience (learning disabilities, brain imaging, mental health, neuroscience), Integrative Physiology (neuroscience), the Institute of Cognitive Sciences (brain imaging), Applied Mathematics (computation, statistical genetics), or MCDB (genome sequencing).

2.7 Relationship to Flagship 2030

Our plan for faculty recruitment responds to the first Core Initiative of Flagship 2030 to enhance education and scholarship by adding 300 new tenure-track faculty in the next 10 years, the second Core Initiative to foster research excellence by providing targeted investments in cutting-edge research, and the third Core Initiative to enhance graduate education and increase the graduate student population.

- **Question 3: Undergraduate Education**

Task: Please describe how effective are the unit's undergraduate programs. (Cooper, Keller, McQueen)

3. Although IBG does not have an undergraduate program *per se*, faculty participate in the undergraduate teaching mission of the University, primarily in the Department of Psychology and Neuroscience and the Department of Integrated Physiology. They also participate by providing research experiences for undergraduates through such programs as BURST, SURF and UROP. IBG faculty have received 42 such awards since the previous program review with an 88% success ratio of awards to applications and the mentoring of undergraduate honors theses and Independent Study projects. Since the last Program Review cycle, IBG faculty have provided mentorship to 129 undergraduate students in the BURST, SURF and UROP programs, and have served as mentors to approximately 29 students pursuing undergraduate departmental honors theses. One recently appointed IBG graduate school rostered Faculty Fellow, Don Cooper, is credited with being largely responsible for the development of the new undergraduate major in Neuroscience that began in the Fall of 2010. Dr. Cooper has taken a lead in its curriculum design, creation of new courses, dealing with advising, and making sure the prerequisites were in order. He serves as co-Director, along with Prof. Rudy, of the undergraduate neuroscience major.

- **Question 4: Graduate Education**

Task: Please describe how effective are the unit's graduate education programs. (Stallings, Training Committee (McQueen, Keller, Smolen T, Ehringer, Rhee (BG Area in Psych Chair)), Horton, Vandever

4. The Institute for Behavioral Genetics (IBG) is not a degree-granting department of the University. However, IBG's faculty administer a structured graduate training program that is currently supported by NIH training grants from the National Institute of Child Health and Human Development (NICHD), the National Institute of Mental Health (NIMH), and the National Institute on Drug Abuse (NIDA). It is noteworthy that only seven NIH training grants have been awarded to departments and/or research units on the CU campus—and IBG holds three of those seven training grants. Our training grants support 13 pre-doctoral trainees and four post-doctoral trainees in our program. Students not supported by our NIH training grants are supported via home department teaching assistantships or graduate research assistantships. Currently, there are 22 pre-doctoral graduate students participating in the IBG training program from various home departments, including, at this time, the Behavior Genetics, Clinical, and Neuroscience programs in the Department of Psychology and Neuroscience, and the Department of Integrative Physiology. Accordingly, trainees are graduate students in an academic department who receive training in both the subject matter of their home department as well as individualized training in behavioral genetics.

The effectiveness of our graduate education program can be evaluated on three primary measures: 1) the demand for training in behavioral genetics and the quality of the graduate students we accept into our program; 2) the quality of our graduate curriculum and the faculty who teach it; and 3) the ability of our graduates to secure post-graduate positions in academia and related fields.

4.1 Demand and quality of students.

Since our previous Program Review (in 2001-2002), 254 applicants have applied to the IBG training program and 45 (18%) were admitted. Thus, our training program is both highly competitive and in high demand. It is also noteworthy that the average number of applications in the past five years (2007-2011) is twice the average number of applications during the period 2001-2006, so interest in the IBG training program continues to grow. The graduate students admitted into our program are of very high quality. Of the 45 students admitted since the previous review, six (Jeremy Owens, Clarissa Parker, Jennifer Wilking, Lara Ray, Cinnamon Bidwell, and Melissa Munn) have secured highly prestigious NRSA F31 grants from the NIH, allowing them to support their own research training. In addition, 4 of the 35 students admitted through Psychology have received the highly-competitive Dozier Award for 'Best Graduate Student,' awarded annually from the Department of Psychology and Neuroscience. Our students are routinely awarded travel scholarships to present their work at professional meetings and many have received 'young investigator' and other recognition awards from scientific organizations and societies. From a recent review (2009) of our NICHD training grant it was noted "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, there is substantial evidence to indicate that the IBG training program continues to be in high demand and that the quality of the students we accept into the program remains very high.

4.2 Quality of the curriculum and faculty

IBG faculty members administer a highly interdisciplinary training program. Because IBG students must satisfy the requirements of both their home department degree, as well as the requirements of the IBG training program, our program is structured to provide essential training in behavior genetics, but is also flexible enough to be tailored to the needs of individual students. Training program requirements include courses in graduate-level statistics, genetics, behavioral genetics, and scientific integrity. In addition students must also select from courses including: 1) quantitative genetics, biometrical genetics, advanced statistical genetics, bioinformatics and genomics, molecular genetics and genomics, behavioral and clinical neuroscience; and 2) specialty or seminar courses on topics such as genetics and addiction, neurobiology of addiction, genetics of psychopathology, developmental psychopathology, population genetics, and benchmark papers in behavioral genetics. Other courses in applied mathematics, molecular genetics, computer science, and neuroscience are also often taken as electives by IBG students. Our curriculum continues to evolve as the field of behavioral genetics grows and evolves, and because our training program is supported by NIH training grants, it is evaluated regularly by external reviewers. Comments from our latest reviews include: “The mission and structure of the [IBG] training program historically and currently targets training in foundational and cutting edge approaches that ensure that graduates, both from the predoctoral and postdoctoral programs will be in high demand;” and our “Course work, both requirements and electives, are clear, as are expectations for research activities with mentors. Courses are comprehensive but do allow for a good amount of flexibility in electives to meet individual student needs.” From our most recent Graduate Student Survey students gave highly favorable ratings to our curriculum, the IBG faculty, support staff, financial support and opportunities to conduct research.

As noted elsewhere in this report, the faculty members administering our graduate training program are extremely well-funded and have very active and productive research programs that provide extensive, and high quality research opportunities for our trainees. In the Office of Planning and Budget's most recent unit profile, IBG ranked first out of all 60 units surveyed at CU Boulder for the average number of refereed publications per faculty member over the past seven years. Further, IBG is unique in that its faculty conducts and facilitates research on the genetic bases of individual differences in behavior using both humans and laboratory animals, and conducts research training in this highly interdisciplinary area. Exposure to research training in both human and animal settings is particularly valuable for our trainees. The IBG-affiliated faculty are also highly multidisciplinary representing numerous departments and institutes on the CU Boulder campus including Psychology and Neuroscience, Molecular, Cellular and Developmental Biology, Ecology and Evolutionary Biology, Integrative Physiology, Sociology, the Institute of Behavioral Science, Institute of Cognitive Science, and the Graduate School; as well as Pharmaceutical Sciences, Pharmacology, Psychiatry and the Center for Bioethics and Humanities at UC Denver. To our knowledge, there are no other programs in the nation that offer the same breadth of interdisciplinary research and training in the field of behavioral genetics. A recent external reviewer notes: “The credentials of the [IBG] preceptors and mentors

are outstanding. Indeed, the faculty of the IBG have long comprised a unique if not unprecedented concentration of scientific expertise in training and research on behavioral genetics in the United States, if not the world.”

4.3 Careers of IBG graduates

The post-graduate success of our students is a clear indication that our training program continues to provide the necessary training and research experience to facilitate the career pursuits of our graduates. Of the 33 graduate students who have completed the IBG training program since our previous Program Review (2001-2002), 27 (82%) hold academic positions and 5 (15%) are in industry or related (but non-academic) fields (the status of one former student is currently unknown). A recent external reviewer notes: “It is safe to say that a significant proportion of the more prominent scientists currently active in behavioral genetics in the world have graduated from training in the [IBG] program.” Clearly, there is high demand for our graduates and they have been very successful in securing post-graduate academic positions.

4.4 Feedback from current students

As part of the self-study, the current graduate students were surveyed and informal feedback was provided at a town hall meeting. The following summary of the survey and town hall meeting was provided by Will Horton (Graduate Student and member of the self study committee):

Summary of Results from the Graduate Student Survey and Town Hall Meeting

The graduate student survey consisted of 22 questions to determine how satisfied IBG grad students are with various aspects of their training and places where it could be improved. Roughly half the questions asked for a rating of 1 (worst) to 5 (best), while the other half were open ended. 16 of the 22 current students filled out the survey, with average time in the program of 2.44 years (slight bias towards more senior students).

In general, students are happy with the program, with overall approval ratings of 4.26 out of 5. Other possible important findings from the rated questions are a generally high rating of IBG faculty members, support staff, financial support and opportunities to conduct research. Lower ratings were seen for journal club, computing facilities, teaching, the IBG library and community outreach activities. Importantly, many students did not respond to questions about community outreach, computing facilities, a formalized grievance procedure and the library perhaps indicating a lack of knowledge or use of these resources. In general, students rated gender diversity of faculty, staff and students moderately low and ethnic diversity of those same groups quite low.

The open ended questions show that most students came to CU specifically because of IBG, though there was some difficulty in initially finding information about the program. Suggestions to increase the visibility of and enrollment in the program included, most notably, a greater web-

presence by increasing number of websites from faculty, students and post-docs with information on the diverse research happening at the Institute. Also mentioned were having a more competitive stipend level and recruiting other current CU students who may have an interest in behavioral genetics (ie: students of IBG affiliated faculty who are not in the program, or from departments not already associated with IBG like computer science or math). Most students are clear on the requirements and think that they are appropriate, with some indicating that their home departments could learn from our example. Suggestions to improve the training included a) a more even distribution of classes across both semesters b) information on when classes are offered to allow students to take more IBG specific courses and c) a better representation/interaction between animal and human research. Along these same lines, newer students thought it would be much easier to settle in to IBG if there were more social interactions between students, which could be achieved with a graduate student lounge or perhaps a required class/seminar/week long orientation with faculty members and senior students giving brief data blitz presentations. Students also would appreciate more career development content, such as how to write CVs, how to find post-doctoral positions after graduation, etc.

Students also showed an interest in possible changes coming to IBG in the long term such as the possibility of IBG being able to grant degrees instead of having to split time between IBG and home-department related activities. The thought of a new building or part of a building is also exciting, since many students expressed concerns about current available space and building quality as well as the slight hassle of being split between different campuses.

- **Question 5: Research**

Task: Please describe how effective are the unit's research programs. (Stitzel, Marks, Hewitt)

5.1 IBG is an interdisciplinary research institute

Research at IBG is highly interdisciplinary and spans from animal model research to human genetics. Data collection and analysis are ongoing for several internationally renowned studies including the Colorado Adoption Project, the Colorado Twin Registry, the National Youth Survey Family Study, the Colorado Learning Disabilities Research Center, and the National Longitudinal Study of Adolescent Health. IBG is home to one of the nation's largest DNA repositories for genetic research on human behavior, as well as housing a wide array of behaviorally and genetically defined lines of selected, transgenic, knock-out and knock-in mice. Current research includes studies of aging, neurodegenerative disease, psychopathology, reading and learning disabilities, cognition, substance abuse, behavioral development, and evolution. Our faculty direct two major NIH supported research centers: The Learning Disabilities Research Center (P50HD027802) and the Center on Antisocial Drug Dependence (P60DA011015) and a Research Resource Center: Studies with Nicotinic Null Mutant Mice (P30DA015663).

5.2 IBG research programs are extremely effective

Since the last program review of IBG in 2001-2002, annual external grant awards to the Institute (IBG) have risen from \$7,962,881 in FY 2001 to \$10,925,336 in 2005, to \$12,768,341 in FY

2011, and our research expenditures totaled \$13,317,030 in FY2011, a record for the Institute. The indirect costs (ICR) returned to the Institute to provide our departmental administrative support (DA-ICR) increased from \$464,076 in 2001, to \$616,628 in 2005, to \$887,772 in FY 2011, reflecting a doubling of total ICR earned from approximately \$1.6 million to \$3.1million. This represents an astonishing level of productivity in externally funded research, especially when set against the modest increase in the number of graduate school rostered tenured and tenure track (TTT) faculty at IBG from 6 in 2001 to 8 currently, with two retirements and 4 new recruitments.

Three measures of research effectiveness are grant expenditures, faculty productivity and local economic impact of the research. Based on these measures, the research program at IBG has been very effective. According to the unit profile of IBG compiled by Academic Review and Planning, IBG ranked 6th among 57 CU Boulder Departmental and Institute units in grant expenditures for the five year period ending in FY 2010. This number is even more impressive when considering the fact that IBG ranked 44th out of 60 units in terms of tenured and tenure track faculty members during this period. Perhaps the clearest indicator of research effectiveness at IBG is the finding by Academic Review and Planning that IBG ranks 1st among 60 units in refereed articles and chapters per tenured and tenure track faculty member. IBG averages over 50 publications per year (94 in FY2011 across all Faculty Fellows) with current faculty co-authoring 17 Science, 12 PNAS and 9 Nature articles (the 3 most influential scientific journals based on eigenfactor analysis (Fersht A. 2009. The most influential journals: Impact Factor and Eigenfactor. PNAS 106: 6883-6884)). In addition, publications from each of the most senior IBG faculty (three full professors) were cited over 600 times in 2010. Finally, it has been estimated that research at IBG has a local economic impact of \$32 million.

By all these metrics, the research programs at IBG are extremely effective.

5.3 The future excellence of IBG's research depends on new infrastructure

However, our success has been achieved in spite of our overcrowded laboratories, our fragmented and in some cases decaying buildings, and our physical distance from research collaborators and core research facilities in other Institutes and Departments. To take our research programs to higher levels, in both quantity and quality, it is imperative that the University works with us to develop a long range plan for expansion into new, high quality, research space situated in appropriate proximity to our collaborators in the bio-behavioral sciences.

- **Question 6: *Space and Infrastructure***

Task: Please describe the unit's needs for space and infrastructure. (Smolen A, Research Program Committee (Johnson, Cooper), Shelby, Vandever, Hewitt)

6.1 Background.

Growth of IBG is an essential feature of our Strategic Plan. At the present time IBG has 32 faculty fellows. Approximately two-thirds of the IBG faculty fellows reside in their home department on the main Boulder campus, the University of Colorado Denver, or the University of

Denver. The remaining 10 faculty fellows, 5 support staff, 22 graduate students 34 postdoctoral Research Associates, 48 Professional Research Assistants, 7 animal laboratory staff and 26 undergraduate student employees occupy approximately 38,500 sf in four buildings on the East Campus of CU Boulder: the IBG building (17,200sf), RL1 (3,600sf), RL4 (7,700sf), ARCE (10,000sf). Since our last Self Study report in 2001, we have self-funded an addition of approximately 5,600 square feet of office, animal housing and library space to the second floor of the IBG building at a cost to IBG of about \$1,000,000.

6.2 Renovation of existing facilities and need for new buildings.

The housing of IBG in four buildings has made it difficult for faculty, students and staff to interact on a daily basis and, in our view, has impeded our interdisciplinary research mission. As noted above, IBG has invested substantially in self-funding renovations and additions to our current buildings. Although these remodeling efforts have provided some short-term relief, the expansion of the faculty projected in our plan will require additional space, primarily for research laboratories (e.g., molecular genetics, neurophysiology, animal, and human behavioral laboratories) as well as facilities for computational and epidemiological research. Our Strategic Plan envisions an expansion of the IBG faculty by up to eight members over the next several years and we plan to initiate searches for at least three of these in calendar year 2012.

In order to balance current needs with space for future growth, IBG would need to construct a building of approximately 80,000 square feet of assignable space consisting of a mixture of office, laboratory and animal facilities. There really is no realistic alternative to this request. Not only has it become unfeasible to consider further renovation of existing space for laboratories because of restrictive building codes, but the East Campus planning documents show that at least three of the buildings that are currently occupied by IBG: the IBG building (Bldg #560), RL4 (Bldg #562) and LITR (Bldg #566), are to be razed. There is no alternative space specified for IBG in the current East Campus planning documents. Although the East Campus redevelopment plan may take several years to implement, our immediate needs are becoming urgent. The Institute for Arctic and Alpine Research (INSTAAR) will vacate LITR in 2014, at which time the building is slated for removal. The Johnson, Smolen and Core Genotyping laboratories are housed in that building, and no plan is in place to relocate these facilities, consisting of 3,700 sf (2,400 sf of which is laboratory) in the interim. These laboratories will generate more than \$1,800,000 in contract and grant support in the coming year.

We are asked to “consider whether (we) think unit, College, and/or campus space allocation policies need to be developed and to be used more effectively to address current and future space issues.” Answer: Yes. IBG consistently generates the fourth-highest total amount of contracts and grants of all of the units on the Boulder Campus. On a per faculty basis, we are likely the highest. For IBG’s current accommodation to be erased from the East Campus plan, with no clear plan to relocate IBG speaks to the ineffectiveness of campus allocation policies.

6.3. Communication and Interaction

We envision a building, or group of buildings on East Campus that would house other bio-behavioral science programs and institutes, including some aspects of Psychology and Neuroscience, Integrative Physiology, and the Institute of Cognitive Sciences. This would enhance communication and interactions between IBG and these units with which we have established collaborations.

6.4. Staffing

Acquiring additional support staff is critical to our mission. We are chronically understaffed. This year our total expenditures increased to over \$13,000,000. To administer these expenditures we have just five administrative staff. Only one (actually 1.25) of these staff is paid from the University general fund. As we continue to bring in more grant support, from which the University derives millions in indirect costs, it would seem appropriate that the University would support additional staff to meet the added administration burden that these successes create. It is noteworthy that this was one of the recommendations of the previous program review.

6.5. Computing

As the field of behavioral genetics moves to studies that require the sequencing of entire genomes of thousands of individuals, the need for the massively powerful computing resources becomes paramount. The installation of the new supercomputer near East Campus fills a short-term need, but it will have to be supported by additional, similar resources. The analyses involving whole-genome sequencing are very dependent on active memory (not merely storage) and this is expensive. At the very least, we see our need for additional computing facilities to increase 10-fold in the next few years. What will be needed beyond that is impossible to predict.

6.6. Fundraising

Up to this point, most of our fundraising has been the result of contracts and grants, with little or none from philanthropic sources. We have been meeting with members of the CU foundation in an effort to increase our success in this area.

6.6. ICR distribution models

The University's ICR distribution needs to be re-visited. As units produce more and more income, they should be granted a greater share of the ICR that is generated from these activities. ICR generation should be factored into decisions about allocation of space, facilities, staffing, and faculty lines.

6.7. Special Needs.

With the exception of first-class laboratory and specific pathogen free animal housing facilities, we have no special needs with respect to design of a new and comprehensive IBG building.

- **Question 7: Strategic Planning**

Task: Please describe what are the unit's strategic goals and aspirations, and discuss the relationship between your unit's strategic goals and aspirations and the 2030 planning document. (Hewitt, Stitzel)

7.1 Summary

To maintain and expand its world class research and training, the Institute must renew its efforts in faculty recruitment, significantly improve its physical accommodation, and strengthen the infrastructure and activities that support its scientific and educational endeavors.

7.1.1 Faculty. In addition to our three planned junior faculty recruitments, resulting from vacated lines, 2012-13, we request that five new lines be created. These appointments will allow us to increase the diversity of our faculty, to ensure that our graduate training program remains at the forefront of new scientific developments, and to expand further the number of our trainees in what we envision as more flexible interdisciplinary degrees.

7.1.2 Facilities. We advocate the development of a Bio-behavioral Research Cluster, including four new adjacent buildings that can accommodate the highly collaborative research enterprises of IBG, ICS, Integrative Physiology, and Psychology and Neuroscience.

7.2 Background

IBG is one of the top research facilities in the world for genetic research on behavior and training in this interdisciplinary field. Internationally renowned studies of the genetics of human behavior, including the Colorado Adoption Project, the Colorado Longitudinal Twin Study, the Colorado Learning Disabilities Research Center, and the Colorado Center on the Genetics of Antisocial Drug Dependence. IBG is also home to one of the nation's largest DNA repositories for genetic research on human behavior. IBG's programs of animal model research on the molecular biology of addiction, and the genetics of aging and neurodegenerative disease are internationally acclaimed. Such research is supported by maintaining a wide array of behaviorally and genetically defined lines of selected, recombinant inbred, transgenic, and genetically modified mice, including the world's most complete collection of nicotinic receptor knock-out and knock-in strains.

IBG is unique among its peers in its potential for integrating animal model and human research. Historically, the major research foci of IBG have been quantitative behavioral genetics (e.g. twin, family, and adoption studies of human behavioral development) and behavioral pharmacogenetics (e.g. animal model studies of components of the addiction process). During the past decade, we have seen real accomplishments in the integration of these research foci by directly applying genetic research with animal models to human clinical problems, and examining the expression of individual human genes in animal models. A conspicuously successful example of this is in the genetics of addiction where animal studies of the molecular biology of nicotinic receptor genes are being directly integrated with research on the role that polymorphisms in these genes play in human addiction and related behaviors.

These research successes have been made possible by our commitment to long-term focused research and training programs in human and animal behavior genetics, and a clear understanding of the importance of developing and maintaining our core scientific resources. These resources include long term longitudinal human adoption, twin and family studies, behaviorally and genetically defined mouse strains, extensive data archives and electronic data bases, and computational, biochemical, and molecular genetics facilities. Almost in their entirety, these resources have been maintained through external grant funding and we fully expect that this will continue.

The past decade has also brought us breathtaking advances in human genetics, with methods for the discovery of genes influencing complex traits moving from single candidate gene association studies, to genome-wide association studies, and now deep sequencing of individual genes or, indeed, whole genomes. Along with these advances has come an even greater need for a deep understanding of statistical and population genetics as well as an ever increasing need for sophistication in computational biology. Accompanying these advances in human genetics has come a new era of neuroscience encompassing everything from single cell neurophysiology to human brain imaging. Exploring the functional implications of variation in individual genes using animal models has become a powerful tool for translating human statistical associations to real biological knowledge. Maintaining and enhancing our culture of translational research will ensure our continued leadership in research and training in the genetics of behavioral traits.

To maintain and expand its world class research and training, the Institute must renew its efforts in faculty recruitment, significantly improve its physical accommodation, and strengthen the infrastructure and activities that support its scientific and educational endeavor. There are a number of areas that we have identified, including faculty recruitment and a new vision for the accommodation of bio-behavioral research on the East Campus, where strategic institutional investment would likely be repaid many times over.

7.3 Faculty recruitment.

IBG tenure track faculty rostered in the Graduate School are among the best investments at the University of Colorado. With eight such faculty, IBG generated \$3,078,787 in indirect costs in FY2011. Even given that 29% of ICR earned was returned to IBG to run the Institute, this still represents a net ICR of \$2,185,939, or an average of \$273,242 per faculty member. The General Fund salary support for those eight faculty, including the Director, totaled \$865,309 in salaries, or an average of \$108,636 (not including benefits paid by the University). But even with the most unfavorable assumptions, each IBG faculty member represents a net gain for the campus budget. We therefore urge the University to consider our plan to increase the number of IBG faculty as being in the best interests of the campus as a whole as well as those of the Institute and its educational and research mission.

During the next two years we know that one senior graduate school rostered faculty member will leave his position through retirement and one junior faculty member will vacate his line through

transfer to an academic department. Given this, the Director has agreed with the Dean of the Graduate School and with the Vice Chancellor for Research, that IBG will be able to recruit three new junior faculty, using the salary lines that become available during 2012 and 2013. These junior positions will be targeted at the next generation of behavior genetics. To participate in the next generation of human research the Institute has an urgent need to recruit additional expertise in behavioral genomics and computational biology. To develop our interface with brain science, we must recruit behavioral geneticists with expertise in molecular biology, neurophysiology, and imaging brain function and structure.

However, the Institute also must plan to recruit faculty who can take leadership positions in IBG's traditional areas of strength as key faculty retire, and must also take advantage of the new opportunities afforded by university's strategic investments in brain imaging and supercomputing.

We therefore request that, in addition to the three planned junior faculty recruitments, five new lines be created that will enable us to build upon our existing strengths in the genetics of learning disabilities, mental health, neuroscience, and statistical genetics as well as developing new strengths in genetics and behavior in relation to brain structure, function, and development (brain imaging); computation and genome sequencing (supercomputing). These appointments will ensure that our graduate training program remains at the forefront of new scientific developments and will permit us to expand further the number of our trainees.

It is possible that some or all of these could be interdisciplinary or joint hires co-ordinated with Psychology and Neuroscience (learning disabilities, brain imaging, mental health, neuroscience), Integrative Physiology (neuroscience), the Institute of Cognitive Sciences (brain imaging), Applied Mathematics (computation, statistical genetics), or MCDB (genome sequencing).

7.4 Space.

Our vision for the future of the Institute is not just as a stand-alone research unit (albeit spread over four different buildings!), but also as an Institute that brings its unique strengths to collaborations across the life sciences in general and bio-behavioral research in particular. To this end, we advocate the development of a Bio-behavioral Research Cluster as part of the larger Life Sciences complex on the East Campus. The Bio-behavioral Research Cluster would provide research laboratories and related accommodation for the Institute of Cognitive Science, Psychology and Neuroscience, and Integrative Physiology, as well as IBG. These four units together had externally funded research expenditures of \$32,488,256 in FY2011 [IBG's contribution was \$13.3 million], generating approximately \$8.7 million in indirect costs [IBG's contribution was \$3.1 million].

The East Campus Vision Task Force report, as part of the Master Planning process, included the following statement:

``Life Sciences (estimated 3 buildings; ca. 400K ASF)

Caruthers Biotech building as nucleus (houses Biochemistry Division, Department of Chemical and Biological Engineering [ChBE], and the Colorado Initiative in Molecular Biotechnology [CIMB])

Proposed Chemistry and Life Sciences Building [CLS] adjacent to Biotech (to house Department of Chemistry and Biochemistry [CHEM], Department of Integrative Physiology, possibly faculty in Neuroscience from the Department of Psychology and Neuroscience).

Companion wings or buildings could house combinations of the following units that would interact with those in Biotech and CLS: Department of Molecular, Cellular and Developmental Biology [MCDB], Institute of Cognitive Science [ICS], Institute of Behavioral Genetics [IBG]. Housing for these units may be planned as wings added to the CLS or biotech buildings, or perhaps an additional stand-alone building."

<http://www.colorado.edu/masterplan/history/Documents/East%20Campus/ECVfinaltask%20force%20reports.pdf>

Since that report in February 2010, the Caruthers Biotech Building housing the CIMB (now called the Biofrontiers Institute) is fait accompli. The plan for the proposed Chemistry and Life Sciences Building seems to have morphed into a Chemistry and Biochemistry Building, apparently eliminating the proposed accommodation for Integrative Physiology and Psychology and Neuroscience

Thus there remains a need for a new Bio-behavioral Research Cluster (as part of the Life Sciences Complex on the East Campus) that can accommodate the highly collaborative research enterprises of IBG, ICS, Integrative Physiology, and Psychology and Neuroscience in adjacent buildings. The Chairs, Directors, and planning committees of these four units agree that the ability to do cutting edge collaborative interdisciplinary science and to attract funding --- especially for larger scale projects and Centers funded by NIH --- would be enhanced by such a Bio-behavioral Research Cluster that could support the full range of our research from genome sequencing to brain imaging, from molecular biology to physiology to neuroscience and behavior.

We envision four separate but interconnected or adjacent buildings that would bring together researchers and research infrastructure in a way that facilitates our increasingly collaborative multidisciplinary research and graduate training. This would allow us to grow our research operations (and hence return on investment for the university), and to present ourselves to sponsors, trainees, and potential faculty as the world class research and training enterprises that we are. The approximate assignable square feet for each building in the research cluster would be: IBG, 80,000sf; ICS, 40,000sf; IPHY 60,000sf; Psys/Neuro 60,000sf. These would be primarily research and graduate training facilities, with undergraduate classroom teaching and associated personnel remaining on the main campus, at least until the East Campus is developed for full scale undergraduate teaching.

7.5 Graduate Training.

Our Graduate Training currently is driven by two major factors. First, as we are not a degree granting institute, our students must enroll in and meet the requirements of an academic department. This works fairly well, but as research and hence the need for graduate training becomes increasingly inter- or cross- disciplinary, the University should consider graduate degree models that are more flexible. We would like to explore a graduate degree in life sciences or bio-behavioral sciences generally, or perhaps behavior genetics specifically, that would more readily allow the course requirements to be tailored to the needs of the individual student. As just one example, a student training in computational and statistical human behavior genetics might take courses in Psychology and Neuroscience, Molecular Biology, Computer Science, and Applied Math in combinations that would not meet the requirements of any of those departmental doctoral degrees.

Secondly, support for graduate students is derived largely from our three NIH training grants, together with IBG general funds. There is no certainty that this funding will continue indefinitely and so we must be prepared for the possibility of needing to rely on teaching assistantships to a greater extent. Currently, such teaching assistants are distributed by the College of Arts and Sciences to the academic departments, and so students affiliated with IBG are dependent on the largesse of the academic departments. If we are to move towards increasingly inter- and cross- disciplinary training, the University should consider ways to have some teaching assistantships distributed through the Institutes or directly to the individual student.

7.6 Diversity

To help ensure that we are doing all we can to promote diversity at all levels of the Institute, we plan to establish a new Committee on Diversity and Engagement. The committee will consist of five members including a faculty fellow, a post-doctoral/research associate, a PRA/SPRA, a staff member, and a graduate student representative. The Institute will be recruiting several new faculty fellows over the next 5 years and it is the objective of the Institute to have the committee in place in time to be involved with each of the new recruitments. Based on our current self-study, IBG should strive to increase female and minority representation on the Faculty and enhance minority representation at all levels through recruitment and outreach. Although we believe that intercultural understanding at IBG already is strong, improving female and minority representation will serve to enhance this understanding.

7.7 Linkages to Flagship 2030

7.7.1 Faculty Recruitment

Our plan for faculty recruitment responds to the first Core Initiative of Flagship 2030 to enhance education and scholarship by adding 300 new tenure-track faculty in the next 10 years, the second Core Initiative to foster research excellence by providing targeted investments in cutting-edge research, and the third Core Initiative to enhance graduate education and increase the graduate student population.

7.7.2 Space

Our plan for a new bio-behavioral research cluster further serves three Flagship 2030 Core Initiatives: (2) Fostering Research Excellence; (3) Enhancing Graduate Education; and (6) Investing in the Tools for Success. It contributes to the transformational, “Flagship,” initiative --- the “Creating University Villages” initiative which proposes creating mixed-use, education-related spaces, and is also supported by the Facilities Task Force recommendation, “Big Idea No.6: Build out East Campus as quickly as possible to be a second academic campus;” It also is linked to the transformational, “Flagship,” initiative --- the “Colorado Research Diamond,” an initiative that is also supported as Proposal 2 in the Report of the Task Force on Research, Scholarship, and Creative Work.

IBG’s research facilities are currently spread over four separate buildings on the East Campus. This is clearly not consistent with the proposed use of the East Campus as outlined in the Flagship 2030 report. It is also the case that our major competitors, nationally and internationally, have all been rehoused into purpose-built, state-of-the-art, integrated facilities during the past decade. For IBG to maintain and extend our leading position in behavior genetics research requires developing a plan for a new integrated research building to foster interdisciplinary research and graduate education. This plan for a new building has become even more essential with the advent of the Flagship 2030 plans for redevelopment of the East Campus Research corridor into a mixed-use, second academic campus.

In considering our relationship to the “Colorado Research Diamond”, the Institute for Behavioral Genetics conducts internationally renowned research on behavioral traits of important societal relevance, maintaining unique animal genetic resources, and developing large scale statewide and national human phenotypic and genetic databases. The combination of molecular and statistical genetics with detailed phenotypic studies of drug abuse, alcoholism, mental health, cognitive disabilities, and aging is yielding important new knowledge. IBG facilitates collaborations across regional universities including UCB, UCD, and DU. We have Fellows in Integrative Physiology, Psychology and Neuroscience, MCD Biology, UCDHSC Depts. of Psychiatry, School of Pharmacy, and Dept. of Pharmacology, and the University of Denver. IBG is consistently among the most successful units on campus for attracting external research and training funds. IBG is *the* most successful unit on the Boulder campus for funding from the National Institutes of Health (NIH), and *far and away the most successful unit* for NIH funding on a per faculty basis. The NIH has identified genetic research as a top priority for future research and funding. Increasingly, funding opportunities are being directed at the development of interdisciplinary teams capable of conducting research that transcends traditional academic boundaries. Examples from recent NIH strategic planning statements include:

National Institute of Mental Health strategic: *‘We will support basic, translational, and clinical research to gain a more complete understanding of the genetic, neurobiological, behavioral, environmental, and experiential factors that contribute to mental disorders.’*

National Institute on Alcohol Abuse and Alcoholism: *'Continue to identify genes associated with vulnerability for alcohol dependence by employing new and emerging technologies'*

National Institute on Drug Abuse: *'Priority areas of research for NIDA include: Uncovering genetic and environmental factors that predict vulnerability to addiction and treatment response.'*

To illustrate the opportunities that IBG can create for large scale, innovative, interdisciplinary science with major implications for society, IBG has a P60 Comprehensive Research Center Award on Drug Abuse. This brings approximately \$12 million total costs and is a collaboration between UC Boulder and UC Denver, involving faculty in the Departments of Psychology and Neuroscience, Integrative Physiology, MCDB, and the Institute of Cognitive Sciences at UC Boulder, and Department of Psychiatry and the Center for Bioethics and Humanities at UC Denver. This is one example of interdisciplinary research that typically brings about \$12-13 million annually to IBG, a figure that we expect to increase as we expand our faculty and research activities. IBG can serve as a key component of the Bio-behavioral Research Cluster within the Life Sciences Research Complex, focusing on the kinds of biomedical research funded by the National Institutes of Health.

7.7.3 Graduate Education

Our interest in looking at new models for inter- or cross-disciplinary degrees, and our concern to explore alternative funding mechanisms for graduate trainees is clearly addressing Core Initiatives (3) to Enhance Graduate Education and (4) to Ensure Access.

7.7.4 Diversity

Our redoubled commitment to diversity at all levels of the Institute is directly related to Core Initiative (7) Learning for a Diverse World.

- **Question 8: Budget**

Task: Describe your unit's current budget model, and discuss its strengths and weaknesses. How are financial resources received and distributed? To what extent are these resources adequate to meet program needs? What strategies can your unit offer to address these budgetary needs? (Smolen T, Shelby)

8.1 IBG's current budget model:

IBG's general operating expense budget is supported by our departmental allocation of indirect cost recovery (DA-ICR) which is based on actual F&A charges for the 12 month period from April 1-June 30 of the previous fiscal year and July 1-March 31 of the current fiscal year. Each year IBG has, on average, about 70-85 individual sponsored projects (including individual components of center grants, subcontracts to individual sponsored projects, and training

awards) that contribute to our DA-ICR pool. Over the past five years, the direct cost expenditures to those projects have netted an average of \$2.62 million in F&A to the university. Of that amount, approximately 29% is returned to IBG and forms our operating expense budget. This becomes our “continuing budget” that is offset by the next year’s DA-ICR, either positively or negatively in years when direct cost expenditures are down.

The DA-ICR is allocated and adjusted up, or down, following the close of the current fiscal year. At that time, the DA-ICR is divided among a number of State General Fund accounts assigned to IBG that support administrative staff, faculty indirect cost recovery accounts, equipment costs, construction projects, and the day-to-day needs of the Institute. The five-year average across these various accounts is around \$750,000 per year and forms our operating expense budget.

The strength of this model is that it allows nearly complete flexibility in the use of our operating expense funds. Furthermore, the university allows IBG to save any funds remaining at the end of the fiscal year for future programmatic needs. We have used those funds in the past to assist in the establishment of our molecular biology facility and for support of the specific pathogen free (SPF) mouse facility. We have also used those funds to support the construction of several additions onto the IBG building and to renovate laboratory space for current and new faculty use. These funds have also contributed to new faculty start-up funds.

The major weakness of this budget model is that our continuing budget fluctuates from year-to-year based on the F&A recovered from sponsored projects, almost exclusively NIH-funded projects. Not only is NIH funding difficult to obtain but funded grants have undergone nearly continuous year-to-year cuts in the subsequent years of the award. That has resulted in projects being seriously short-funded and having to cut back on expenditures. Also, with the uncertainty of future funding, principal investigators are cutting back on spending during the last two years of their projects in order to plan for a one-year no-cost extension. This gives them an extra year to successfully refund their projects but has the effect of stretching their expenditures, and the F&A return, over two to three years instead of one. When that occurs, it has a major impact on our budget and our ability to save funds for future programmatic use.

It’s also the case that NIH’s budget is regulated by Congress and sponsored project funding is oftentimes delayed by “continuing resolutions” when Congress neglects to pass a budget for the current fiscal year. These continuing resolutions are often extended well into January and February. That can affect sponsored project expenditures and F&A recovery during the last quarter (Jan-March) of the university DA-ICR year.

These DA-ICR-funded accounts are the major source of our budget, excluding IBG faculty salaries and the salary of the Director and Associate Director of IBG which are paid by the university and dispersed in separate general fund accounts.

By agreement between the Director and Graduate School, if any of the eight IBG faculty members, who are rostered in the Graduate School, should pay a portion of his/her academic year salary on a sponsored project, IBG is allowed to retain the faculty member’s salary savings from the State general fund. This is referred to as “faculty salary savings.” These funds are to be

used primarily for programmatic purposes within IBG and are not returned to the faculty member in total.

As with the DA-ICR funds, faculty salary savings have contributed greatly towards paying for major IBG construction projects, new faculty start-up, remodeling of laboratory space and the purchase of major pieces of equipment. A portion of salary savings and DA-ICR is returned to individual faculty and researchers based on how much of these they generated. During the past year, \$25,000 of salary savings and \$100,000 of DA-ICR was returned to individual faculty or researchers. Faculty members have been able to use their returned ICR funds to purchase items that are not allowable on sponsored projects, such as memberships, journal subscriptions and books. The faculty have also used the funds to support graduate student travel to scientific meetings, as well as their own travel not supported by their grants.

However, the amount of salary savings can vary tremendously from year-to-year and cannot be counted on as a major source of support. Due to extensive cuts in sponsored project funding, faculty members often choose to use academic year salary budgeted for them to support their ongoing projects. [It should be noted that their committed effort to the projects does not change, only their use of funds budgeted to pay them for their effort.] While this benefits the projects, it is a major loss of funds to IBG and impacts our ability to use salary savings for the benefit of all IBG. Some examples of the future uses of such funds might be for the purchase of upgrades to the IBG computer system; time on the new CU supercomputer; a confocal microscope (\$125,000); upgrades to the molecular biology facility (\$150,000+); the purchase of a new cage washer (\$150,000+) and autoclaves (~\$70,000 each) for the SPF facility; or installation of new cabinetry in the wet labs of RL4 (~\$200,000). We know that for the cage washer and autoclaves, we are well past their reasonable life expectancy and could need replacing at any time.

8.2 How are financial resources received and distributed?

The DA-ICR Report for the next fiscal year is sent to departments and institutes in the spring of the current fiscal year. The university uploads the previous FY budgets into IBG's general fund accounts in July of the new fiscal year; the new fiscal year DA-ICR distribution among IBG programs occurs generally in August, and at that time general fund budgets are adjusted accordingly, depending on whether there has been an increase or decrease in the IBG continuing budget from the previous year.

Faculty salary savings are not swept from the faculty salary programs until the close of the academic year.

8.3 To what extent are these resources adequate to meet program needs?

These resources are not adequate to meet program needs. IBG is spending over \$180,000 per year on administrative costs that we feel should be, at least partially, absorbed by the university. Currently, we are using our DA-ICR to pay for our receptionist, our payroll liaison, for personnel engaged in purchasing for IBG, and for faculty administrative support. These are basic needs for every department and institute on campus and should be covered by the University, rather

than linked to our DA-ICR, which is highly variable and relies on influences outside our control (i.e. Congress, the NIH budget, and national priorities for funding). It's also the case that with the anticipated three new faculty recruitments, our administrative staffing may need to increase to accommodate the expected increase in purchasing, payroll, and other administrative needs. The need for additional assistance from CU becomes even more necessary, given the fact that IBG has needed to absorb a major portion of the costs for both the SPF facility and for students in our Predoctoral Training Program (because of reductions in the level of NIH support for trainees).

Through retirements and the phasing out of animal model programs by some investigators, IBG has lost a majority of our senior faculty who supported the SPF facility through sponsored project funding. Some of our younger faculty who use the facility lack the same level of support that was provided by the older faculty. As a result, IBG has had to assume a major financial commitment to keep the SPF facility open. That support has averaged upwards of \$75,000 per year over the last six years. However, it will be difficult to recruit new SPF facility users, mouse or rat, without adequate laboratory space in which to conduct their research. Our primary wet-lab space is in Research Lab 4. Most of Research Lab 4 does not meet the standards expected of a first-rate wet lab and we cannot wait several years for a new IBG building, or space in a Life Sciences complex. Both the current and, hopefully, future occupants of the building need the space upgraded as soon as possible to meet, at the very least, basic standards.

As previously stated, IBG has also needed to absorb costs associated with our predoctoral training program. Although IBG has three NIH-funded training grants that fund 13 students in our training program, we have needed to spend an additional \$64,000 per year supporting these students since our training grants were renewed and have transitioned into the new NIH financial policy covering training expenditures. NIH training grants now pay only 60% of tuition and fees, and a flat rate for health insurance that does not cover CU's current health insurance plan for graduate students. In order to enhance our ability to attract outstanding students, IBG is paying the difference between the training award and actual costs. However, one down-side to the new NIH policy is that we have had to change our program.

IBG can no longer afford to appoint out-of-state graduate students their first year in graduate school. The out-of-state tuition that is assessed to our training grants is too great and IBG cannot afford to pay the tuition differential. As a result, all of our new students hold teaching assistantships within their home academic departments during their first year in graduate school. They must achieve in-state status prior to their second year in order to be considered for support on an IBG training grant.

While this strategy has saved our training grants, and IBG, some money, we suspect it may also have an unwanted impact on the diversity of our graduate students. A high percentage of the minority students in our program have been recruited from schools outside of Colorado. Most of these students need full financial coverage in order to attend CU. Under our present model, the students must cover a portion of their health insurance and all fees, which amount to several thousands of dollars, during their first year. Many cannot afford that. It is also possible that many of these students, if they come from small, traditionally black, universities may not be

comfortable with a teaching assistantship at CU right out of their undergraduate programs. All these problems would be resolved if the University would grant in-state rather than out-of-state tuition to students on training grants, as it does already for students paid on research grants and students supported by teaching assistantships. It should be noted that the University has some funds to support underrepresented graduate students through the NSF-AGEP program. However, there are insufficient funds to support all incoming minority students through this program.

8.4 What strategies can your unit offer to address these budgetary needs?

We currently have 5.0 staff positions total (not including the Associate Director), of which IBG pays for 3.75 from our DA-ICR and the general fund pays for 1.25 positions. With the addition of three new faculty members over the next two-three years, we feel we may need at least one new staff member. One strategy that would address this need would be for CU to increase general fund support by three administrative positions: two currently held administrative positions and a third new position within fiscal year 2013, following our next faculty recruitment. That would provide a total of six staff positions: 4.25 general fund positions and 1.75 FTE positions paid by IBG's DA-ICR. This request is supported by Flagship 2030, number 5: Supporting the Mission.

Our SPF animal facility has been cited by the campus veterinarian as needing the floors resurfaced in certain areas. We would ask that the university and IBG share the cost of resurfacing the SPF floor in these more critical sections. We anticipate the costs could be as much as \$100,000 for select hallways and rooms.

With respect to the need for laboratory upgrades in RL4, we anticipate needing approximately \$300,000. IBG would be able to share with the University one third (\$100,000) of the cost of the renovation, spread over two fiscal years, if it could be arranged. These requests would fall under Flagship 2030, number 2: Fostering Research Excellence; and especially number 6: Investing in the Tools for Success.

Finally, with regard to the increased costs associated with our predoctoral training program, we would like to suggest that CU share the cost of out-of-state students with IBG by assessing the resident tuition rate for those students supported on our NIH-funded training grants. This tuition differential sharing program is already in effect for faculty members supporting GRAs on sponsored projects and for teaching assistants. Sponsored projects are assessed only the in-state rate for tuition. We only ask that this program be extended to holders of federally-funded training grants. This would help to increase student diversity in our program by making our program more attractive to a broader applicant pool. This request would relate to Flagship 2030 initiative number 3: Enhancing Graduate Education; also initiative number 7: Learning for a Diverse World

- **Question 9: *Interdisciplinary Research***

Task: Please discuss how your unit can contribute to and facilitate the next generation in interdisciplinary research. (Ehringer, Horton, McQueen, Marks, Willcutt)

9.1 IBG research is interdisciplinary

As an interdepartmental research unit, the faculty at IBG has a long history of interdisciplinary research integrating the fields of psychology, cellular and molecular biology, pharmacology, mouse genetics, human genetics, and neuroscience. Our main areas of research include the genetics of drug abuse, reading disability, aging, nicotinic receptors, risky behavior, personality, and cognition.

Ongoing efforts are aimed at understanding the genetic and environmental mechanisms that contribute to individual differences in these behaviors, and how underlying biological differences manifest individual and common risks for various disorders. These areas of research involve collaboration across more than one discipline, and often across many. As just one illustration, our currently funded Center on Antisocial Drug Dependence involves faculty in the Institute for Behavioral Genetics, the Institute of Cognitive Science, Psychology and Neuroscience, Integrative Physiology, and MCBBD (Molecular, Cellular, and Developmental Biology) on Boulder Campus, and Psychiatry, and the Center for Bioethics and Humanities on the Denver Campus. Its research spans the gamut from genome wide association studies, to developmental psychopathology, to public health epidemiology, to brain imaging.

9.2 IBG Faculty Fellows are drawn from multiple disciplines

Currently, the 32 IBG faculty fellows represent nine different disciplines (Psychology and Neuroscience, Sociology, Ecology and Environmental Biology, Integrative Physiology, Molecular Cellular and Developmental Biology, and Bioethics and Humanities, Psychiatry, Pharmacology, and Pharmaceutical Sciences) spread across Boulder campus, the University of Colorado Denver, and the University of Denver.

9.3 IBG training is interdisciplinary

The IBG faculty seeks to educate a new generation of interdisciplinary researchers in several formal and informal ways. First, as described in more detail elsewhere, we sponsor an interdisciplinary training program for graduate students which provides training through coursework and individual research. Second, we hold a weekly journal club where graduate students and faculty discuss peer-reviewed journal articles related to behavioral genetics. Because of the diverse nature of our faculty and students, the topics and tools discussed in these meetings include the latest statistical approaches for analyzing whole-genome sequencing data, and also include the latest technologies for studying single-neuron electrophysiology from a genetically engineered mouse. Third, IBG sponsors a monthly colloquium series that hosts internationally recognized experts to present their research and meet with faculty and students. Finally, IBG researchers make efforts to cross disciplines in order to focus on a common question. Perhaps the best example of this is our work in the area

of nicotinic receptors. Faculty at IBG have been studying the role of nicotinic receptors in drug behaviors using mouse behavioral genetics approaches for over 30 years. Within the past 10 years, a collaborative effort between animal researchers and human genetics researchers at IBG has shown that the genes for the nicotinic receptor subunits are associated with drug behaviors in humans. Because of the unique environment at IBG, our faculty are in a strong position to follow up the human genetic findings by conducting molecular and pharmacological studies that will guide us toward understanding the underlying function of human risk variants. Our graduate and postdoctoral trainees are exposed to and participate in this kind interdisciplinary research as a normal part of their experience. Interdisciplinary approaches to research questions are the norm, rather than the exception.

9.4 How we can do more to contribute to and facilitate the next generation of interdisciplinary research

Although IBG has been at the forefront of interdisciplinary research and training for 40 years, we can do even more. We have identified three specific goals for the next 10 years.

First, in the area of faculty recruitment, we must take advantage of the new and powerful research platforms available to us: genome sequencing, brain imaging, supercomputing. The fast-paced developments in genomics dictate commensurate educated personnel who can manage the large scale data generated by new technologies. New collaborative efforts between IBG faculty and computational biologists and neuroscience faculty are in their infancy. As a unit, IBG needs to continue to foster these interactions and to stay aware of other units on campus with expertise and interests that could be integrated into our programs. “Gene hunting” is not an end in itself, as its purpose is to assist in the knowledge about etiology and potential treatments for complex disorders. Hence, positive findings from gene hunting for behavioral traits must be integrated with findings from other fields. Thus, IBG needs to continue to recruit outstanding new faculty to their ranks who will bring additional interdisciplinary expertise.

Second, in the area of training, we must explore new models for interdisciplinary degrees. There is increasing recognition that interdisciplinary science does not always fit well in the traditional ‘department centered’ doctoral degree. Like the Biofrontiers Institute, we would like to explore establishing an interdisciplinary PhD, perhaps in Bio-behavioral Science, or even in Behavior Genetics itself, so that the course and other requirements could be tailored to the needs of the interdisciplinary training rather than simply meeting the requirements of a single department.

Third, as we have expressed in several places in this self-study, we believe that the time is right for the construction of new Bio-behavioral Research Cluster on the East Campus, consisting of four separate but interconnected or adjacent buildings housing the research programs of IBG, ICS, Psychology and Neuroscience, and Integrative Physiology. We believe that this is essential to create the conditions for the next generation of interdisciplinary research.

- **Question 10:** *The Role of Departmental and Non-Departmental Units*

Task: Since units under review include both regular degree-granting departments as well as research institutes, each unit should use this question as an open opportunity to describe their mission in relation to other departments, research units, schools and colleges, the campus, and off-campus community and research interests. (Johnson)

10.1 Research Interests of IBG

Most of the effort of IBG is focused on analysis of behavior, using a genetic approach. This focus involves highly cross-disciplinary research wherein behavioral, molecular genetic, and physiological assessments are combined to understand the basis of behavioral phenotypes. IBG has a focus on phenotypes of societal relevance, including drug abuse, reading and learning disabilities, psychopathology, and aging and Alzheimer's Disease. These and other areas of research combine human clinical and population studies with the assessment of molecular markers of multiple types, and the necessity of continuing efforts to integrate animal model and human research.

10.2 Affiliations of Fellows at the Institute for Behavioral Genetics (IBG).

IBG is a Research Institute administered under the auspices of the Graduate School and the office of Vice Chancellor for Research. The Director of IBG reports to the Dean of the Graduate School, and the research and support personnel report, ultimately, to the Vice Chancellor for Research. Under the current arrangements, eight IBG TTT faculty lines are rostered in the Graduate School and paid by General Fund money allocated to the Graduate School, reporting, ultimately, to the Dean of Graduate School. However, also under the current arrangements, IBG TTT faculty must have a tenure home in a degree granting academic department (such as Psychology and Neuroscience, or Integrative Physiology where the tenure homes of all 8 Graduate School rostered faculty currently reside, 4 in each Department). As a result, these faculty also currently report to the Dean of Arts and Sciences. When recruiting new faculty, it is necessary to have an academic department agree to accept the faculty member, and decisions on tenure and promotion are the responsibility of the academic department. Thus, for Graduate School rostered faculty, there is a sense of 'serving two masters'.

In addition to the eight Graduate School rostered TTT faculty, there is also one Senior Research Associate (Andrew Smolen) and one Professional Exempt Employee (Toni Smolen, Associate Director of IBG) who are Faculty Fellows in the Institute reporting to the Vice Chancellor for Research.

Outside of these 10 Faculty Fellows paid through the Institute, there are 22 additional Faculty Fellows associated with the Institute through their research and training collaborations, but rostered in other units on campus, other campuses of CU, or even, in one case, another University. Eight of the Faculty Fellows are rostered at the Anschutz Medical Center in Denver in a variety of Departments (Pharmaceutical Sciences: 2, Pharmacology: 2 + 1 emeritus, Psychiatry: 1 + 1 emeritus, The Center for Bioethics and Humanities: 1). One is at the University of Denver, in the Department of Psychology. The remaining 13 are in Departments at UC Boulder (Psychology and Neurosciences: 6 + 3 emeriti, Ecology and Evolutionary Biology: 1 + 1 emerita, Sociology / Institute for Behavioral Science: 1, and Molecular, Cellular and

Developmental Biology: 1). There are also faculty who are not Fellows of IBG. These include one Research Associate Professor and one Research Assistant Professor affiliated with Integrative Physiology and numerous Research Associates and Senior Research Associates. This extraordinary mix of Faculty Fellows and researchers gives IBG its resilience and flexibility, but also creates some administrative complexity.

10.3 Relationships with Departments

To be successful in its multidisciplinary enterprise, IBG must forge relationships with a variety of Departments. The success of these relationships depends to some extent on their being good levels of trust and mutual understanding between the Director of the Institute, Chairs of the Academic Departments (e.g. Psychology and Neuroscience, Integrative Physiology), Directors of other Institutes (e.g. IBS, ICS), and the Office of the Dean of Arts and Sciences. Currently, all these relationships are functioning well and IBG has experienced several years of efficient and productive inter-unit relationships. However, since so much depends on these relationships, it is worth noting areas that could potentially lead to difficulties in the future.

1. IBG is not a degree granting program and is thus needs to coordinate its graduate training mission in relationship to several Departments, both at the University of Colorado at Boulder and at other academic institutions throughout the state. Currently, this does not cause any insurmountable difficulties, but the IBG training committee needs to constantly be aware of differences between our training requirements and those of the departments or programs in which students enroll for their graduate degrees.
2. Before a new faculty member can be hired by IBG, a position in a PhD-granting Department must be arranged. Several individuals have not been hired by the IBG over the last two decades, due to a lack of compatibility with a degree-granting Department, and some IBG Faculty have found themselves in what they consider to be inappropriate academic appointments, which can lead to loss of potential programs and relationships, difficulties with promotion and/or tenure, and some difficulty in graduate student recruitment.
3. Tenure decisions for faculty rostered in the Grad School are still made by individual Departments and thus place faculty under “double jeopardy” or the burden of ‘serving two masters’. Instances have occurred where faculty in the Institute and in the Department disagree with regard to promotion decisions. Because only affiliates of Departments are able to vote on tenure, there are always instances in which faculty rostered through the IBG are not able to vote on advancement and tenure of their colleagues. This represents an almost unique position in which tenure decisions are made by colleagues not in IBG.
4. Faculty salaries are determined through the ‘pool’ allocated to each Department and Institute. Typically, these pools are very similar. However, there is a very narrow range of merit among the Graduate School rostered faculty (all are very meritorious), and so the merit raises awarded cannot differ markedly from the average. In the large academic departments, there is a wider range of merit, and so highly meritorious faculty can accumulate considerably higher than average raises over time. The result is that, from the perspective of salary, Graduate School rostered faculty might see themselves as less well rewarded than their academic department peers performing at similar levels of merit. In practice, this issue has not led to large inequities in

the long run, as we have used creative mechanisms to correct imbalances. But we might consider alternatives to this system.

Question 11: Library Resources

Task: Please describe your library resource needs.

Possible considerations:

- Is the library acquiring resources that address emerging research in the disciplines of your unit? Can you comment on additional resources needed.

-Are you interested in submitting articles to Open Access journals? Many academic publishers and societies have Open Access journals that require author submission fees. Would you endorse a process for campus funding to pay for author submissions?

- The Libraries is planning to build a digital repository to house CU faculty and student research, such as pre-print articles, data sets, theses and dissertations. Does your unit have an interest in participating in this initiative?

11.1 The use of library resources by IBG

First, it is rare for any faculty, researcher, or student to set foot in the Norlin Library. The bricks and mortar library, with hard copy books and journals, is essentially unused by IBG personnel in their professional work. However, great use is made of electronic access to research journals. The role of the library in providing access is almost transparent and only become apparent when one tries to access journals from a non-campus computer. Thus IBG fully supports the continued purchase of journal electronic access and would welcome being invited to identify important gaps in such access. Currently this is done through the academic departments and the individual Institutes are not consulted directly.

11.2 Open Access

We support the concept of Open Access imposed by NIH and its PubMedCentral repository. This requires NIH supported research to be Open Access within one year of publication. Many leading journals do this much sooner or even immediately. However, there are also many journals that require payment to make papers Open Access immediately on publication. These typically charge \$3000 per paper. These costs can be legitimately charged to NIH grants in appropriate circumstances. It is the current view of IBG that, because of the high costs involved, paid Open Access should be the decision and responsibility of the individual researcher and his external funding, not a cost to the campus as a whole.

- **QUESTION 12: Diversity**

TASK: Address enhanced diversity as a unit goal. (Stitzel, Ehringer, Smolen, Vandever)

12.1 Introduction

The University of Colorado's Strategic Plan, "Flagship 2030" states that "By 2030, CU-Boulder will be a model for the nation in applying best practices in support of diversity and inclusive excellence. Beyond the moral imperative, a world-class university cannot afford to pass up the contributions offered by different perspectives and backgrounds. To achieve this vision, we have renewed our commitment to a more welcoming and diverse community for learning, discovery, living, working, and service. We will build a university community that is more representative of the larger community..."

The faculty of the Institute for Behavioral Genetics (IBG) strongly endorses the objectives for diversity and inclusiveness as outlined in Flagship 2030 and the institute has engaged in efforts to enhance the diversity of IBG faculty, staff and students. Some of these efforts have been successful while others require additional effort. For example, at the time of our previous self-study, there were 12 ethnic minorities, 2 from underrepresented populations, employed at IBG as faculty, staff or students. Despite the fact that the number of employees and students at IBG has been relatively static (167 employees in 2002, 173 in 2011), the number of ethnic minorities employed at IBG has doubled to 24 in 2011 and the number of underrepresented minorities has increased to 13. The current percentage of IBG employees who identify as minorities is 14% as compared to 7% in 2002. Cultural diversity at IBG also is enhanced by foreign/resident alien employees. These numbers have remained static between 2002 (11) and 2011 (11). Combined minorities and individuals of foreign origin as a measure of cultural diversity, IBG has increased cultural diversity from 14% in 2002 to 20% in 2011. However, ethnic diversity at the faculty level has not shown significant improvement over the same period of time. As was the case in 2002, there are no ethnic minorities among the graduate school rostered IBG faculty. Moreover, most (2/3rds) of the minority students and employees are either undergraduate employees or Professional Research Assistants.

Gender diversity at IBG has remained consistent over the past 9 years with about 57-58% of faculty, staff and students being female. However, also consistent with previous years, as one moves up the academic ladder, female representation diminishes. For example females constitute 75% of the student employees and professional research assistants, 59% of the graduate students, 47% of the postdoc/research associates, 19% of all IBG Faculty Fellows, 25% of Graduate School rostered IBG faculty, but only one out of eight (12.5%) of the TTT Graduate School rostered IBG faculty. According to a report by the National Science Foundation, in the life sciences, female percentages are 60%, 52% and 32% for undergraduates, graduate students, and tenure track faculty, respectively. Thus, up through the graduate student level, IBG is above the national average for women in the life sciences but at the faculty level, IBG lags behind.

12.2 What would the unit's ideal program for diversity, intercultural understanding, and community engagement look like?

Our ideal program to achieve these goals would start with the continuation of several successful programs that currently are in place at IBG to enhance diversity and promote inclusiveness. Descriptions of these programs are provided in question 12.3. To further our efforts in these areas, a Committee on Diversity and Engagement also will be established. This standing committee will provide oversight to these existing programs as well as develop, implement and provide oversight to new programs for creating a welcoming and diverse community. In addition to enhancing diversity, the goal of the IBG program in diversity and understanding is to encourage an atmosphere of trust and mutual respect.

12.3 Given current resources, what efforts are you engaged in or could you engage in to pursue diversity, intercultural understanding, and community engagement (For example, faculty recruiting efforts, programs for under-represented students, and outreach programs)?

IBG currently is engaged in several efforts to pursue diversity, intercultural understanding and community engagement. One effort is through faculty participation in the University of Colorado's Summer Multicultural Access to Research Training Program (SMART). Each summer between 2 and 4 multicultural undergraduate students work in the laboratories of IBG faculty fellows through this program. These students come from throughout the United States and Puerto Rico. Two underrepresented minority students that participated in this program returned to IBG for their graduate studies. It is worth noting that the very successful SMART program was modeled after IBG's long-standing Summer Research Internship Program which brought in 27 African American students primarily from Grambling State University but also William Paterson University and the University of Colorado to work in IBG laboratories during the summer. Faculty members also have provided research opportunities to minority and/or underrepresented students through other CU programs including the Undergraduate Research Opportunities Program (UROP), Bioscience Undergraduate Research Skills and Training (BURST), The Summer Undergraduate Research Experience (SURE) program and The Miramontes Arts & Sciences Program (MASP). Other underrepresented students have participated in research at IBG through the Summer Research with NIDA for Underrepresented Minority Students Program for Undergraduates and High School Students.

Cultural diversity at IBG also is enhanced by the inclusion of international students and scholars. IBG faculty have hosted 8 students from the University of Bath, UK since 2005, and there currently are graduate students, Post-doctoral Research Associates and visiting scholars at IBG from Chile, China, England, Finland, Japan, Nigeria, Puerto Rico, and Spain. In addition, IBG annually hosts an NIMH-sponsored International Workshop on Statistical Genetics and Methodology of Twin and Family Studies) which includes lectures from 22 distinguished faculty from the US, England, Australia, China (Hong Kong), and the Netherlands. During 2011, the workshop was attended by 80 graduate students, postdoctoral researchers and faculty members from within the US and 9 foreign countries.

IBG efforts in community engagement/outreach include a Science Discovery class for children aged 12 years and older, providing research opportunities for high school students, serving as

judges at local science fairs, giving a guest lecture on genetics to high school teachers, lecturing in the Colorado Wyoming Junior Science Academy for high school students and participating in DNA Day activities at local elementary schools. The Science Discovery class was supported, in part, by IBG's Center for Antisocial Drug Dependence. During the first two years of this program, there have been 17 students. Although official statistics were not kept, the composition of these classes was just under 50% female (8 females, 9 males) with an estimated minority make-up of greater than 50% (7 Caucasian, 6 Hispanic, 3 Asian, 1 African American). IBG faculty members also have presented at the NIDA sponsored National Hispanic Science Network on Drug Abuse annual conference.

IBG plans to continue these current efforts to enhance diversity, cultural understanding and community outreach. Efforts to further develop a diverse and inclusive climate at IBG will be coordinated by a newly established standing Committee on Diversity and Engagement. This committee will have three main charges that are aimed specifically at enhanced diversity and intercultural understanding. The first charge of the committee will be to coordinate an outreach program. The outreach program will encourage greater faculty participation in programs such as the SMART program and explore, assess and implement new outreach programs to increase diversity and intercultural understanding at the Institute. The second charge of the committee will be to provide oversight and guidance during faculty recruitment efforts, particularly regarding position announcements, to reach a more diverse applicant pool. The final charge of the committee will be to serve as a resource for minority and female students. For example, when new minority graduate students and SMART students arrive, the committee will pair them with former IBG trainees who have been in a similar situation. The diversity committee also will serve as a contact point for those who wish to learn more about university resources for women and minorities.

12.4 What would be the next steps you would want to take in the areas of diversity, intercultural understanding, and community engagement? What resources would you need? What barriers do you face?

The next step will be to establish the Committee on Diversity and Engagement and define the responsibilities and specific goals of the committee. The committee will consist of five members including a faculty fellow, a post-doctoral/research associate, a PRA/SPRA, a staff member, and a graduate student representative. The Institute will be recruiting several new faculty fellows over the next 5 years and it is the objective of the Institute to have the committee in place in time to be involved with each of the new recruitments. Based on our current self-study, IBG should strive to increase female and minority representation on the Faculty and enhance minority representation at all levels through recruitment and outreach. Although we believe that intercultural understanding at IBG already is strong, improving female and minority representation will serve to enhance this understanding. Some barriers to enhancing diversity as well as potential or existing resources needed to overcome these foreseen barriers are listed below.

A major barrier to increasing diversity particularly at the faculty level is the fact that the best underrepresented minority and female job candidates are not always available during a specific

recruitment cycle. One of the charges of the Committee on Diversity and Engagement will be to identify strong candidates during both recruiting and non-recruiting cycles. However, for this to be an effective strategy there would need to be University resources available to allow the pursuit of a strong underrepresented minority or female candidate out of cycle. In addition, University resources for recruiting more than one job candidate during a recruiting cycle would be beneficial if there is a strong minority or female candidate who is not the top candidate.

Another barrier to recruiting particularly minority faculty is making them aware of the recruitment since we cannot hire those who do not apply. The Committee will attempt to overcome this barrier by ensuring that the recruitment announcement is sent to publications and job boards with high minority readership such as Diversejobs.net.

The lack of diversity as a whole in Boulder also should be considered a barrier in recruiting minority applicants at all levels. However, the University has excellent resources through the Diversity Initiative and IBG will utilize these resources to hopefully counteract, as much as possible, the reality of the lack of diversity in Boulder.

Gender Diversity											
Category	IBG / Grad School Rostered Faculty	IBG Other Faculty	IBG Emeriti Faculty	Research Associate s	Postdocs & Fellows	Graduate Students T32	Graduate Students Trainee support Unpaid/T A/T32	Professio nal Research Assistant s	Classifie d Staff	Student Hourlies	Totals
Male	8	14	4	15	2	9	0/3/6	13	1	8	74
Female	2	2	2	13	2	13	1/5/7	38	4	23	99
Total	10	16	6	28	4	22	1/8/13	51	5	31	173
percent fe	0.2	0.125	0.333333	0.464286	0.5	0.590909	0.590909	0.745098	0.8	0.741935	
Ethnic Diversity											
Category	IBG / Grad School Rostered Faculty	IBG Other Faculty	IBG Emeriti Faculty	Research Associate s	Postdocs & Fellows	Graduate Students T32	Graduate Students Trainee support Unpaid/T A	Professio nal Research Assistant s	Classifie d Staff	Student Hourlies	Totals
Asian/Asian American		1		1	1			3		5	11
Pacific Islander						1					1
Native American										1	1
African American											0
Caucasian	10	15	6	18	2	12	1/6	41	5	22	138
Hispanic				2	1		1	4		3	11
Foreign/Resident Alien				7			1	3			11
Total	10	16	6	28	4	13	9	51	5	31	173
percent m	0	0.0625	0	0.107143	0.5	0.076923	0.111111	0.196078	0	0.290323	0.138728

- **QUESTION 13: Mentoring**

TASK: Describe your mentoring process. (Keller, Ehringer)

13 The mentoring and research training of junior researchers and faculty is an integral part of the formal mission of IBG. In particular, IBG supports the development and success of its junior faculty members in the following four ways:

1) IBG Environment. Many of the members of IBG are housed in approximately 38,500 square feet of office and laboratory space on the East Campus of the University of Colorado at Boulder. Although not ideal because the Institute is fragmented over four buildings, the IBG main building has space that facilitate a collegial atmosphere, fostering exchanges of ideas and encouraging questions in a non-threatening, informal setting. Furthermore, junior faculty are encouraged to attend the interdisciplinary research group meetings that occur weekly at IBG. At these meetings, individuals raise practical and theoretical issues and seek input on issues related to their research or grant proposals, which can be especially helpful to young investigators. IBG hosts a monthly colloquium series (the “First Friday” talks), and faculty members are encouraged to invite outside colleagues to present. This is an excellent opportunity for junior faculty to host distinguished colleagues and to begin building professional networks that will be integral to their success in academia.

2) Mentoring. IBG currently has an informal mentoring program, whereby junior faculty members seek out mentorship from senior faculty members to discuss issues surrounding professional progress, promotion, and tenure. The current junior faculty have their academic tenure homes in either Psychology and Neuroscience or in Integrative Physiology, both of which have formal mentoring programs. IBG now plans to formalize its own process (see attached proposed Mentoring policy). It is also noteworthy that several junior faculty rostered in the Graduate School or through Arts and Sciences have received NIH K awards involving formal mentoring by senior IBG faculty --- IBG faculty K award recipients include: Marissa Ehringer, Soo Rhee, Matt Keller, and Jason Boardman.

3) Training Grants. IBG currently has three training grants from the NIH that support funding for graduate students and postdoctoral researchers. These training grants are a tremendous resource for junior faculty who have not yet obtained external funding, since they allow immediate recruitment of graduate students and postdoctoral researchers.

4) IBG Resources. IBG facilities include a core genotyping and sequencing laboratory, rooms for human testing and hard copy data archives, a specific-pathogen-free mouse laboratory, pharmacological and neurobiological facilities that include tissue-culture, histological, electrophysiological, behavioral-testing, molecular genetic, and biochemical laboratories, and a state of the art computer network all housed on East Campus. Junior faculty are encouraged to utilize these resources as they relate to their research.

13.1 PROPOSED IBG POLICY ON MENTORING OF JUNIOR FACULTY*

*These policies adapted from Department of Integrative Physiology Mentoring Plan, August

13.2 Appointment of faculty mentor

Initial appointment: The faculty mentor is appointed by the Director of the Institute prior to the new faculty member's arrival on campus. Both the mentor and new faculty member are provided a copy of this policy document.

Reappointment after first year: During the second year, the Director of the Institute will consult with the junior faculty member to determine if he/she wishes to retain the same mentor or choose another. The faculty mentorship may also be reassigned at a later date if the junior faculty member requests this. In the case where the Director is the mentor, the decision regarding mentor reassignment will be made in consultation with the Associate Director.

13.3 Duties of the mentor

13.3.1 Regular meetings with junior faculty member

Mentors and junior faculty members will meet regularly to discuss issues pertinent to promotion and tenure, graduate student mentoring, and so forth. The mentor needs to be careful not to infringe on junior faculty autonomy, offering advice only when requested. The junior faculty member should be proactive in managing their career (i.e., seeking help and information) and is responsible for ensuring that mentoring takes place.

Topics for discussion should include: a) Criteria for reappointment/promotion (overview of academic advancement process); b) Research expectations: grant applications, publication expectations, junior faculty awards, recruitment of graduate students and other personnel; c) Teaching expectations: provide advice about balancing teaching with other responsibilities; d) Service expectations: emphasize need to limit service in early years in order to build a research program; e) Timelines for a personalized career advancement including: dates for starting teaching responsibilities, submission of materials for reappointment and tenure reviews and deadlines for requesting tenure-clock stops (parental leave, e.g.).

13.3.2 Recommended timeline of meetings

1) First semester: The mentor should meet with the junior faculty member as soon as possible and encourage the new arrival to attend CU's "New Faculty Orientation."

2) Second semester: The mentor and Director should meet with the junior faculty member during the second semester to discuss progress towards establishing a lab and research program, recruitment of graduate students and other trainees, and obtaining funding and, if necessary, provide advice on any areas of concern.

3) Prior to reappointment, the mentor should meet with the junior faculty member once a semester (more if necessary) with the second semester meeting coinciding with the submission of the FRPA of the junior faculty member.

4) Prior to tenure, annual meetings may be sufficient, but more frequent meetings are encouraged as appropriate.

13.3.3 Assistance with grant applications and manuscripts

If the mentor's area of expertise is relevant, he/she can provide critical comments on grant applications and manuscripts. If research areas differ, the mentor should assist the junior faculty in identifying a senior colleague who can assist with research development.

13.3.4 Advice on career advancement

The junior faculty member needs to be informed that publications should have appeared or be appearing by the time of reappointment. Junior faculty members are expected to attend conferences, give seminars (local and external), become a member of editorial boards, and become visible at the national and international level in his/her field.

13.4 Resources

The mentor should discuss the resources listed below and encourage junior faculty to utilize take advantage of these offices.

Office of Faculty Affairs/LEAP Program (Leadership Education for Advancement and Promotion)

The LEAP program offers Introductory Leadership Workshops, for junior tenure track faculty, which cover topics and skills like time management, negotiation, difficult conversations and the tenure process. Also through the LEAP Program, the Office of Faculty Affairs is available to connect interested junior faculty to a senior faculty member in a mentoring relationship. Contact Faculty Affairs if you are interested in this opportunity.

The Ombud's Office

The Ombud's office offers a faculty Ombud's program designed to assist faculty seeking information on university policies and to serve as a resource for all faculty when they are confronted with conflicts, uncertainties, and disagreements. This is an opportunity to meet directly with retired faculty to discuss issues or concerns in a one-on-one meeting. The Ombud's office provides informal, impartial and confidential dispute resolution services for students, staff and faculty.

Faculty Teaching Excellence Program

This program through FTEP engages faculty liaisons to provide support to new faculty in fulfilling the numerous responsibilities of academic life. FTEP provides a number of opportunities to faculty designed to enhance growth in teaching.

Faculty and Staff Assistance Program

Being an assistant professor can be both physically and mentally stressful. The FSAP program is a free confidential counseling/consulting/referral service designed to provide assistance to faculty and staff for personal or work-related concerns that may interfere with job performance.

- **QUESTION 14: Bylaws**

TASK: Attach a copy of your bylaws. (DeFries, Ehringer, Smolen, Hewitt, Horton)

The recently revised by-laws are now available at:

http://ibg.colorado.edu/pdf/IBG_Constitution_and_Bylaws_2011.pdf

The proposed IBG grievance procedures are:

Grievance Procedures of the Institute for Behavioral Genetics

University of Colorado, Boulder, Colorado

The Institute for Behavioral Genetics (IBG) considers grievance matters for which the University of Colorado, Boulder, CO, does *not* have an established procedure. Those grievance matters for which CU-Boulder *has* established procedures include matters involving student misconduct, which are handled by the Office of Student Conduct and/or the Office of Judicial Affairs; research misconduct, handled by the Office of Research Integrity; staff grievances or misconduct, administered by the Department of Human Resources, Office of Labor Relations; and discrimination and harassment based on membership of a protected class, and sexual harassment, which are handled by the Office of Discrimination and Harassment.

For those matters without an established procedure, IBG faculty address and attempt to resolve all disputes or grievances at the lowest possible administrative level. For example, if one faculty member has a grievance against another, the faculty members should first meet with one another and attempt to resolve their differences. If that fails, one or both of the faculty members may request that the Director of IBG meet with both parties, either individually or together, and attempt to resolve the grievance. If the Director cannot resolve the grievance, the matter shall be referred to an ad hoc IBG Grievance Committee comprised of the Director and one member from each of the standing IBG Training Program and Research Program Committees appointed by the Director. If the grievance involves a member of either of the IBG Training Program or Research Program Committees, that member shall not be appointed to the ad hoc Grievance Committee.

The decision of the Grievance Committee will represent the final level of IBG administrative review. The Committee shall meet with all parties involved in an attempt to resolve the grievance. If the Committee cannot resolve the issue to the satisfaction of all parties involved, the Director shall refer the matter to the Dean of the Graduate School who may seek the advice of an appropriate committee of the College. The decision of the Graduate Dean will represent the final level of College administrative review.

If the grievance is by a student, postdoctoral fellow/trainee, or a member of the research faculty (PRA, SPRA, RA or SRA) against a faculty member or supervisor, IBG will follow a procedure parallel to that involving two faculty members.

If the grievance involves the Director, then an impartial mediator will be identified in consultation with the Dean of the Graduate School.

[Adapted from the By-Laws of the Department of Integrative Physiology, University of Colorado at Boulder, September 6, 2011.]

- **QUESTION 15:** *Assessment*

TASK: Describe your unit's undergraduate and graduate outcomes assessment procedures. (Stallings, Cooper, Training Committee (McQueen, Keller, Smolen T, Ehringer, Rhee (BG Area in Psych Chair), Horton, Vandever)

IBG does not administer an undergraduate program. However, as noted elsewhere in this report, IBG affiliated graduate school rostered faculty members contribute to the teaching missions of the Department of Psychology and Neuroscience and Integrative Physiology. IBG courses are highly attended and receive favorable reviews by undergraduate students. In the Department of Psychology and Neuroscience, IBG faculty members offer an introductory course in behavioral genetics. Typically, three sections of this course (with 40 students per classroom) are taught each semester. In Integrative Physiology, IBG faculty members teach undergraduate statistics (~120 students per classroom) and a unique, newly developed course in Physiological Genetics.

As noted in our response to Question 4, the primary success indicators of our graduate program are the continuing demand for our training program, and the high success rate of our graduates in securing post-graduate academic and related positions. As noted there, 97% of the students completing our training program since the previous Program Review (2001-2002) currently hold academic positions (82%) or are in industry or related (but non-academic) fields (15%).

However, we have recently developed a formalized tracking procedure that will allow us to connect with our graduates annually (in the past this was done on an approximate 5-year cycle, coinciding with the renewals of our NIH training grants). This will be done annually by mailed questionnaire, but can also be accessed via our website. In addition to obtaining current position information, the survey also asks graduates about the IBG training program. This annual feedback will be important for maintaining connections, but will also provide important comments from former students who are now leaders in the field and thus in solid positions to evaluate our evolving program.

A. Appendix: Results of the town hall meetings and written surveys:

A.1 Summary of Results from the Graduate Student Survey and Town Hall Meeting

The graduate student survey consisted of 22 questions to determine how satisfied IBG grad students are with various aspects of their training and places where it could be improved. Roughly half the questions asked for a rating of 1 (worst) to 5 (best), while the other half were open ended. 16 of the 22 current students filled out the survey, with average time in the program of 2.44 years (slight bias towards more senior students).

In general, students are happy with the program, with overall approval ratings of 4.26 out of 5. Other possible important findings from the rated questions are a generally high rating of IBG faculty members, support staff, financial support and opportunities to conduct research. Lower ratings were seen for journal club, computing facilities, teaching, the IBG library and community outreach activities. Importantly, many students did not respond to questions about community outreach, computing facilities, a formalized grievance procedure and the library perhaps indicating a lack of knowledge or use of these resources. In general, students rated gender diversity of faculty, staff and students moderately low and ethnic diversity of those same groups quite low.

The open ended questions show that most students came to CU specifically because of IBG, though there was some difficulty in initially finding information about the program. Suggestions to increase the visibility of and enrollment in the program included, most notably, a greater web-presence by increasing number of websites from faculty, students and post-docs with information on the diverse research happening at the Institute. Also mentioned were having a more competitive stipend level and recruiting other current CU students who may have an interest in behavioral genetics (ie: students of IBG affiliated faculty who are not in the program, or from departments not already associated with IBG like computer science or math). Most students are clear on the requirements and think that they are appropriate, with some indicating that their home departments could learn from our example. Suggestions to improve the training included a) a more even distribution of classes across both semesters b) information on when classes are offered to allow students to take more IBG specific courses and c) a better representation/interaction between animal and human research. Along these same lines, newer students thought it would be much easier to settle in to IBG if there were more social interactions between students, which could be achieved with a graduate student lounge or perhaps a required class/seminar/week long orientation with faculty members and senior students giving brief data blitz presentations. Students also would appreciate more career development content, such as how to write CVs, how to find post-doctoral positions after graduation, etc.

Students also showed an interest in possible changes coming to IBG in the long term such as the possibility of IBG being able to grant degrees instead of having to split time between IBG and home-department related activities. The thought of a new building or part of a building is also exciting, since many students expressed concerns about current available space and building quality as well as the slight hassle of being split between different campuses.

A2. Responses of Professional Research Assistants to the PRA Self-Study.

Fifteen surveys were obtained from the PRAs at IBG.

The periods of service at IBG were as follows:

Less than 1 year:	1
1-5 years:	8
6-10 years:	4
11 or more years:	2

Six PRAs held supervisory roles, nine did not.

The following results were obtained for the survey questions on the value of IBG activities and resources (on a scale of 1-5, 5 being the best):

Inquiry	Mean±S.D.	Median	Range
Meetings with members of your laboratory	4.84±0.38	5.0	4-5
IBG Journal Club	1.78±0.66	2.0	1-3
IBG First Friday Talks	2.00±0.86	3.0	1-3
IBG Staff Support	4.42±0.65	4.5	3-5

In summary these survey results indicate a high degree of satisfaction of the PRAs with their interactions within each laboratory and also with the level of staff support. However, enthusiasm for both the Journal Club and First Friday Talks is much lower. This lower level of satisfaction probably reflects the feeling that these activities do not appeal to PRAs either owing to their scheduling (Fridays at 4:00 PM) or the level of presentation.

The following results were obtained for the survey questions on the quality of IBG personnel and facilities (on a scale of 1-5, 5 being the best):

Inquiry	Mean±SD	Median	Range
IBG faculty	4.78±0.43	5.0	4-5
IBG staff	4.78±0.42	5.0	4-5
IBG administration	4.77±0.44	5.0	4-5
IBG laboratories	3.27±1.42	4.0	1-5
IBG computer facilities	3.18±1.25	3.5	1-5

IBG web site

3.85±1.06

4.0

3-5

In summary these survey results indicated a high degree of satisfaction with IBG faculty, staff and administration. However, satisfaction with components that reflect on the actual resources is much lower. Details about the perceived deficiencies will be summarized below.

Summary of the best things about working at IBG.

In general, the responses obtained to this open-ended question were quite uniform.

1. Nearly every respondent (14/16) indicated that the work environment and the people with whom they worked were distinctly positive.
2. A significant number of respondents (10/16) appreciated the variety of the work, the flexibility of work hours and the fact that there was little unnecessary micromanagement.
3. Other comments that were frequently mentioned were the recognition of the contributions of the PRA and their accessibility to the faculty (7/16), the location (3/16) and the benefits (3/16)

Summary of the things that could be improved at IBG

The suggestions for potential improvements were more diverse than those for the positives, reflecting in part the diversity of activities performed by PRAs. However, several items were mentioned sufficiently frequently to merit attention.

1. A large fraction of PRAs (9/16) mentioned that the state of the buildings was less than ideal. These comments included the observations that the laboratory and office spaces tend to be outdated and/or overcrowded.
2. Another frequently mentioned issue (5/16) was that there is relatively poor interaction among the various components of the institute.
3. Concerns were also raised about the relatively low pay scale and lack of salary increases.
4. There were also issues with computer facilities and IT resources.

om the survey as well as in the meeting notes.

A3. Responses of Research Associates to the RA Self-Study.

It should be noted that the Research Associate (RA) classification at IBG includes a very diverse population such as relatively new, young investigators at the postdoctoral level as well as more senior investigators who have been at IBG for years. This diversity is reflected in the list below.

Eighteen surveys were obtained from the RAs at IBG.

The periods of service at IBG were as follows:

Less than 1 year:	4
1-5 years:	4
6-10 years:	3

11 or more years: 7

Ten RAs held supervisory roles, eight did not.

Six RAs have submitted grant applications.

The following results were obtained for the survey questions on the value of IBG activities and resources (on a scale of 1-5, 5 being the best):

Inquiry	Mean±S.D.	Median	Range
Meetings with members of your laboratory	4.56±0.73	5.0	3-5
IBG Journal Club	2.71±1.53	2.0	1-5
IBG First Friday Talks	3.25±1.39	4.0	1-5
IBG Staff Support	4.53±0.62	5.0	3-5
Assistance with Grant Applications	4.70±0.67	5.0	3-5
Classes taught by IBG faculty	4.00±1.00	---	2-5
Opportunities to Conduct Research at IBG	4.94±0.25	5.0	4-5
Opportunities to Participate in			
Professional Meetings	4.52±0.94	5.0	2-5
Availability of lab and/or office space at IBG	4.75±0.57	5.0	3-5

In general, these results indicate a high degree of satisfaction with the activities at IBG. As was the case with the PRAs, the exceptions appear to be for the Journal Club and First Friday Talks. It should be noted that a significant number of respondents omitted the question about classes taught by IBG faculty as being not applicable.

The following results were obtained for the survey questions on the quality of IBG personnel and facilities (on a scale of 1-5, 5 being the best):

Inquiry	Mean±SD	Median	Range
IBG faculty	4.82±0.39	5.0	4-5
IBG staff	4.82±0.39	5.0	4-5
IBG administration	4.53±0.71	5.0	3-5

IBG laboratories	2.64±1.15	3.0	1-5
IBG office space	2.68±1.53	2.0	1-5
IBG computer facilities	4.00±1.47	5.0	1-5
IBG web site	4.00±1.03	4.0	2-5

In summary, RAs are highly satisfied with the quality of the personnel at IBG including faculty, staff and administration. Satisfaction with the computer facilities and the web site was somewhat less. In particular, it was noted that the web site is quite adequate to obtain the desired information, but that is was not “exciting” in the fashion of some other sites. Rating of computer facilities seemed to vary between those who depend on the system routinely and those who do so only sporadically. Where dissatisfaction is most obvious is in laboratory and office space. In particular, those RAs who use wet laboratory and/or animal testing space noted that these resources are often overcrowded or dilapidated (these comments will be addressed in more detail below). There is also considerable dissatisfaction with office space that will also be addressed in more detail below.

Summary of the best things about working at IBG.

Several themes emerged in response to this open-ended category.

1. A significant number of RAs (12/15) commented very positively about the people at IBG and the collegiality of the environment. In a related matter, 4/15 RAs mentioned the good working environment.
2. In a similar vein, RAs (8/15) were very positive about the collaborative opportunities at IBG and the variety of research conducted at IBG (5/15).
3. In addition to the high ratings given to the staff in the question above, 6/15 RAs specifically noted their appreciation for IBG staff.
4. IBG’s commitment to quality research (3/15) and the flexibility and independence accorded (4/15) also merited specific mention.
5. In addition, RAs who interact with the animal facility recognize its unique value.

Summary of the things that could be improved at IBG

Even though this is an open-ended question, several suggests were very common.

1. A significant number of RAs (10/15) specifically mentioned the inadequacy of laboratory and office space. The condition of the laboratory space in RL4 merited specific attention. In addition on a related note 3/15 RAs noted the deterioration of the building.
2. Another common concern was the lack of interaction/communication within IBG. There was a general feeling (mentioned by 8/15 RAs) that the various components of the institute are somewhat insulated from other components. It was noted that this could happen because of the diversity of interests and also from the fact that IBG is spread among several locations.

3. The RAs involved with animal research recognize the importance of the unique facility at IBG, but did voice several concerns. Comments included observations that the barrier facility is in need of repair, that the staff is overworked leading to an occasional breakdown in communications and a delay in delivery of animals, that the facility does not allow for adequate separation of mice from rats (which have only recently been introduced into IBG).
4. Outside of concerns about the physical plant, Journal Club and First Friday talks were the lowest rated activities at IBG. Suggestions to increase the diversity of topics were made by 4/15 RAs.
5. A few comments were made about recognition of the contributions of RAs. In particular, concerns about official policies on co-authorship, providing open access to research meetings, feelings that the contributions of PRAs and RAs are not full appreciated. It should be noted that these comments were quite infrequent (mentioned by only one or two individuals).
6. There is also some concern about the salary structure in IBG compared to similar positions at CU. The restrictions on raises and salary adjustments are also a matter of concern.

A4: Responses to the staff self-Study Survey

A. How long have you been a member of IBG? Please circle one of the following:

Less than a year **(2)** 1-5 years **(3)** 6-10 years **(1)** 11+ years

6 Responses

B. Are you a supervisor of (circle all that apply): student hourly; graduate students; PRAs;

Other (Please specify):

1 person is a supervisor, of classified staff and students.

1. How do you rate the quality of IBG personnel and facilities?
(1=very low; 5=very high; N/A=not applicable to your position)

___**5**___ IBG faculty **5 Responses, Mean is shown**

___**5**___ IBG staff

___**3.3**___ IBG office space

___**4.2**___ IBG computer facilities

___**3.6**___ IBG website

___**4**___ IBG Breakroom Facilities

2. What are the three things you like best about working at IBG?

6 Responses. All mentioned that they like the people and environment here. Two mentioned that they like the variety of their responsibilities. Two mentioned that the research is very interesting to them.

3. What are three things you feel need improvement?

4.

6 Responses. The general feeling is that everyone would like their office space improved with new carpet, paint, and drywall. 2 mentioned that the IBG website is boring and unimaginative and does not do the institute justice. One mentioned that the equipment in the SPF lab needs improvement/replacement.

5. Are there equipment or space needs that you feel would be helpful to have available that are currently not available, or need replacing?

6.

4 Responses. 3 mentioned a new printer, and one feels all of the equipment in the SPF is old and unreliable and needs replacement.

7. Please note below any other comments that you may have about IBG. Attach additional pages as necessary.

1 Response. IBG is awesome

Comments from the Staff town hall meeting:

We would like a new printer for the front office to replace the 20 yr old one.

The IBG website is boring and plain looking. It could use some graphics and color.

The staff would like a teambuilding exercise, possibly in another location.

The front office needs a sign. Visitors almost always turn to the office across the hall for help.

Lighting in the offices is bad. Several people would prefer lamps.

People would like more all institute events, more of an informal event to promote interaction. Possibly a BBQ.

SPF staff want a new cagewasher and autoclave as they are breaking down more frequently.

One staff member mentioned getting a plotter to print posters.