Question 1: Unit Overview

1.1 Overview of the Institute for Behavioral Genetics (IBG)

1.1.1 IBG's Mission

Founded in 1967, IBG is one of the world's leading research institutes 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 is collaborative and interdisciplinary

There are currently 8 tenured or tenure-track faculty rostered in the Institutes and based at IBG, with one additional faculty hire in progress, for a total of 9 FTE. In total there are 32 faculty fellows, most of whom hold joint appointments in academic units on the Boulder and Denver campuses. Behavioral Genetics is at the intersection between genetics, behavioral science, and biology and our faculty comes from a broad range of backgrounds.

On the Boulder campus: Dept of Psychology & Neuroscience (8 + 1 adjunct + 5 emeriti), Dept of Ecology & Evolutionary Biology (1 + 1 emeritus), MCDB (1), Dept of Integrative Physiology (6), Dept of Sociology (1), Institutes (1 + 1 retired)

At the University of Colorado Denver: Departments of Pharmaceutical Sciences (2), Biochemistry and Molecular Genetics (1), Psychiatry (1), and the Center for Bioethics and Humanities (1). At the University of Denver: Department of Psychology (1 retired).

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

1.1.3 Graduate trainees: interdisciplinary training supported by external funding

Currently, there are 23 graduate students mentored by IBG faculty fellows; 18 participate in the IBG training program, and 5 additional students are associated with IBG. 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, NIA (jointly with IBS), and NIDA) supporting 10 graduate students and 5 postdoctoral fellows. We have recently successfully renewed our NIDA T32 on the Genetics of Substance Abuse; it received an Impact Score of 28 (Outstanding), and we have submitted our renewal application for our NIMH T32 with a requested increase from 4 to 6 graduate fellowships and from 2 to 3 postdoctoral fellowships through 2026.

For 27 years we have hosted annual NIMH-supported week-long workshops in Statistical Genetic Methods for Human Complex Traits'; this attracts about 100 trainees each year, including our own graduate students and postdoctoral trainees, and with over 2000 registrations since it has been hosted by IBG; the grant that supports this has just been renewed, with an Impact Score of 15 (Exceptional), through 2024.

Although not a degree-granting unit, the Institute has its own University of Colorado `Graduate Interdisciplinary Certificate Program In Behavioral Genetics' Program (referred to hereafter as the IBG Interdisciplinary Certificate) so that graduate trainees who meet the Institute's requirements for training in behavior genetics can be awarded an IBG Interdisciplinary Certificate in addition to their graduate degrees. The requirements of the Certificate are summarized at

https://www.colorado.edu/ibg/sites/default/files/attached-files/interdisciplinary_certificate_2018.pdf

Over 170 trainees have graduated from the IBG training program. At our 50th Anniversary jubilee celebration in 2017, we were joined by three notable alumni from three periods of our program, roughly twenty years apart, and who illustrate the successful and diverse careers that have been launched from IBG: Prof. John Crabbe, PhD (University of Colorado, 1973), Professor of Behavioral Neuroscience, Oregon Health Sciences University who is a leader in research in the genetics of alcoholism using animal models; Lon Cardon, PhD (University of Colorado, 1994), Senior Vice President & Chief Scientific Officer at BioMarin Pharmaceutical Inc and formerly Senior Vice President of Alternative Discovery and Development at GlaxoSmithKline plc, an expert in human pharmacogenomics; and Prof. Valerie Knopik, PhD (University of Colorado, 2000) Ben and Maxine Miller Professor of Human Development and Family Studies, Purdue University, a leader in research on the influence of pre-natal substance exposure on human behavioral development. Based on our tracking surveys, over 90% of our alumni work in research-related careers in academia, government, or private industry.

1.1.4 Postdoctoral Fellows and Researchers

IBG currently supports 16 postdoctoral fellows, research associates, and senior research associates.

1.1.5 Other Researchers, Administrative, and Student Hourly Employees

There are currently 28 Professional Research Assistants, 5 administrative staff members, and 11 undergraduate student or temporary employees.

1.1.6 Research Funding

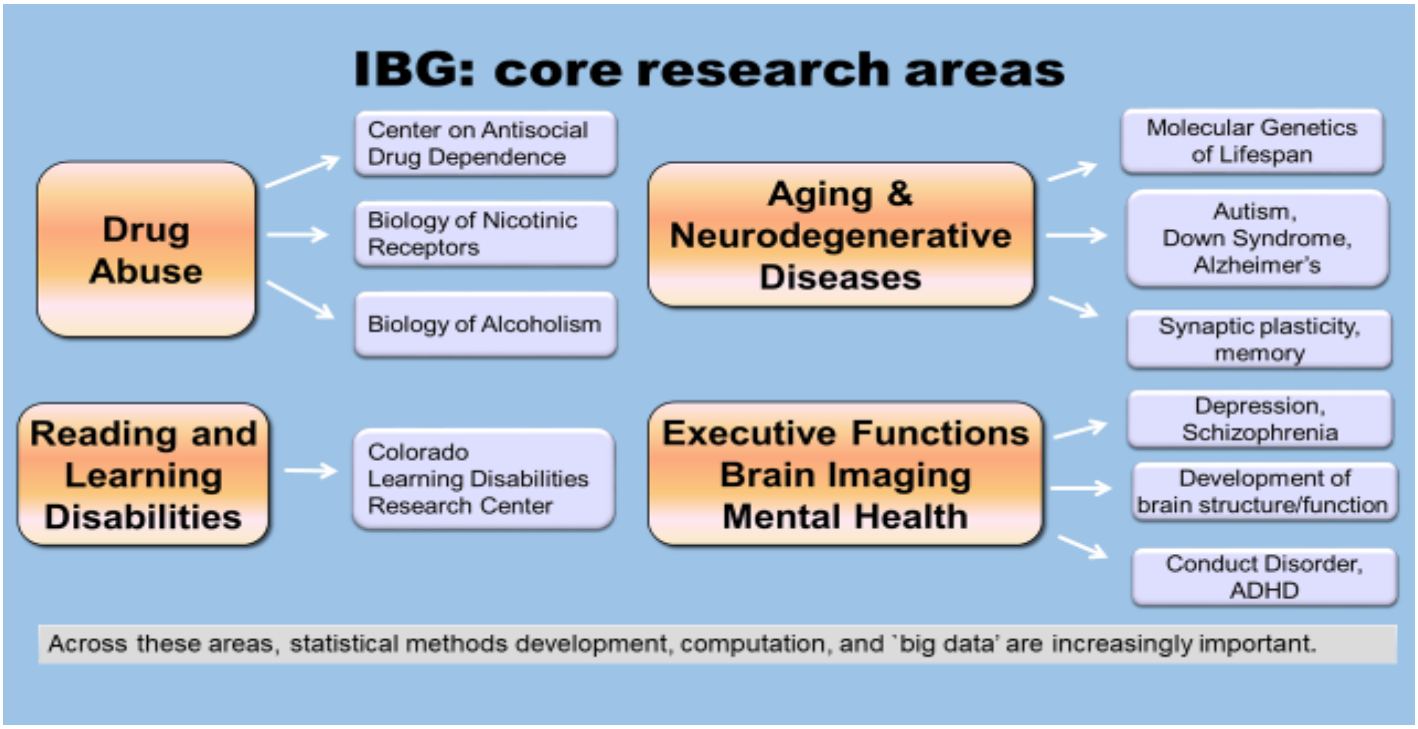
IBG administers about 45-50 grants (including Center components and subcontracts), with external support of $6-8 million per fiscal year currently, and expenditures ranging from $6-14 million annually over the past decade. We direct two NIH pre- and postdoctoral training grants (from NIMH (Mental Health) and NIDA (Drug Abuse)) supporting 8 graduate students and 3 postdoctoral fellows, and we provide NIMH-supported methodology workshops for about 100 scientists annually. An NIA (Aging) training grant, in collaboration with IBS, has recently been funded, supporting 2 pre- and 2 postdoc trainees.

Our faculty have directed two major NIH supported research centers: The Learning Disabilities Research Center (LDRC; P50HD027802) and the Center on Antisocial Drug Dependence (CADD; P60DA011015). The LDRC has recently been renewed, while the CADD has now ended but will, hopefully, be replaced by a new P50 Translational Research Center on the Genetics of Nicotine Dependence that is being developed to take advantage of our historical strength in animal models of nicotine-related behaviors and our growing strength in human statistical and computational genetics; the proposal for this new Center is being submitted in September, 2019.

1.1.7 Physical Infrastructure

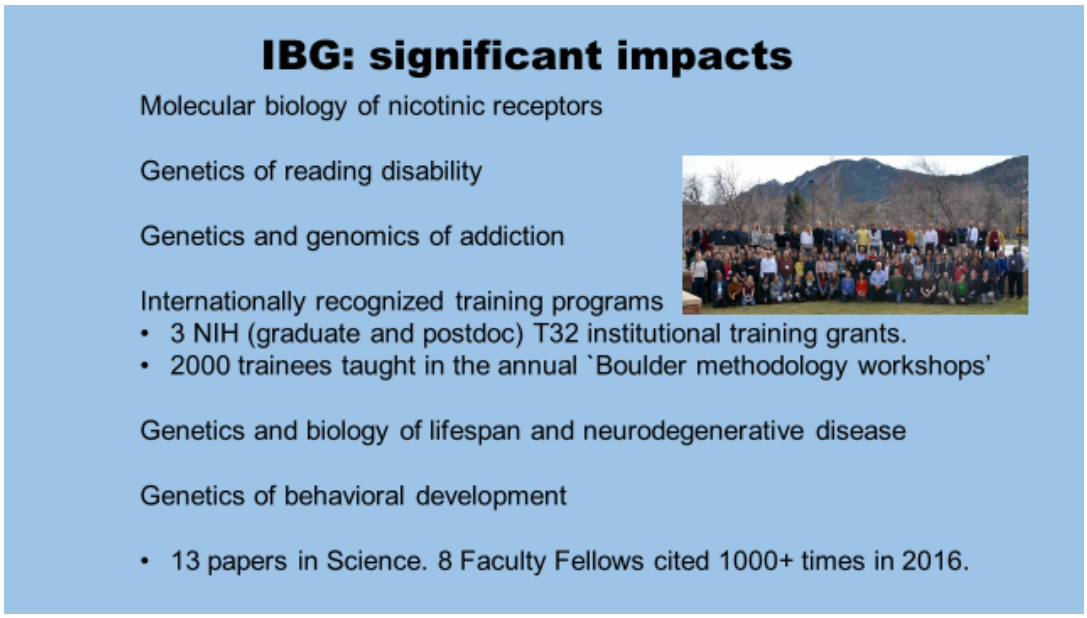
IBG occupies 33,400 sf in three buildings on the East Campus of CU Boulder: the IBG building (17,200sf), RL4 (7,700sf), ARCE (8,490sf). Our goal is a new IBG building consolidating our operations, enhancing collaborations, facilitating faculty recruitment and retention, and providing an appropriate world class physical profile for the Institute.

1.1.8 Research overview



Internationally renowned research projects include the Colorado Adoption Project, the Colorado Twin Study and Longitudinal Twin Study, the Colorado Learning Disabilities Research Center, the Colorado Drug Research Center, and the Adolescent Brain and Cognitive Development (ABCD) Study. IBG is home to a DNA repository (about 40K samples) for research on human behavior, as well as studying behaviorally and genetically defined lines of selected, recombinant inbred, and other various genetically modified mice. Current research areas include aging, alcohol, behavioral development, brain structure and function, cognitive abilities and executive functions, drug abuse, evolution, neurodegenerative disease, nicotinic receptors, personality, psychopathology, reading and learning disabilities, and synaptic plasticity.

1.2 Overview of accomplishments of the Institute



Since the last Program Review (2011-12), the Institute has continued to build on its 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 2011-12. In its summary findings, the Program Review Panel stated that `` The [External Review Committee] describes the Institute for Behavioral Genetics as 'a world-leader that is unique in its extensive combination of human and animal model research studies of human behavioral variation.' Throughout its […] history, IBG has been characterized by its high-caliber interdisciplinary research and the strength of its pre- and postdoctoral research training. By any measure, this institute is an outstanding asset for the University. IBG Faculty members are strong and productive, the environment supportive of research and administrative staff, and the training programs highly competitive.'' (ARPAC. Final Report, February 2013, Page 1)

1.2.2 External research funding

IBG has, on average, 45-50 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 seven years, the total expenditures for those projects have averaged $7.0 million and netted an average of $1.76 million in F&A to the university. Of that amount, approximately 29% is returned to IBG and forms our operating expense budget. Our updated grant revenues for FY13 through FY19 are as follows.

	FY13	FY14	FY15	FY16	FY17	FY18	FY19
Direct	6,015,713	5,822,984	4,735,480	5,340,846	5,037,784	4,509,275	4,850,289
Indirect	1,859,738	1,695,147	1,460,287	1,681,535	1,904,815	1,717,310	2,002,880
Total	7,875,451	7,518,131	6,195,767	7,022,381	6,942,599	6,226,585	6,853,169

1.2.3 Scholarship

The productivity in scholarship approximately matches the productivity in funding. In the Office of Data Analytics unit profiles over the past five years, IBG ranks consistently in the top quartile or much better 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 have been edited in the Institute: *Behavior Genetics* (Editor-in-Chief: John Hewitt) and *Experimental Gerontology* (Editor-in-Chief, Thomas Johnson).

Based on data and analyses from the Thomson-Reuters Web of Knowledge (rather than the higher Google scholar estimates), conservative estimates of the current h-indices for our tenure track faculty rostered in the graduate school are:

Full Professors: John Hewitt 59; Tom Johnson 57; Michael Stallings 30

Associate Professors: Marissa Ehringer 24; Jerry Stitzel 29

Assistant Professors: Naomi Friedman 23; Charles Hoeffer 21; Luke Evans 10

1.2.4 Faculty recruitment

Since 2011, there have been four new IBG faculty hires rostered in the Institutes; two (Naomi Friedman and Scott Vrieze) with tenure homes in Psychology and Neuroscience, one (Charles Hoeffer) in Integrative Physiology, and one (Luke Evans) in Ecology and Evolutionary Biology. Of these, Scott Vrieze has relocated to Minnesota. Additionally, one faculty member (Cooper) resigned and one (DeFries) is retired though still active in research at IBG. We are in the process of recruiting one new faculty member. With the new appointment, we will have 4 Assistant Professors, 2 Associate Professors, and 3 Full Professors among the Graduate School rostered TTT faculty. This continuing process of renewal of faculty, with a predominance of junior faculty, is essential to the future of the Institute in a rapidly changing interdisciplinary field. It is a strategy with long term benefits but also has contributed to a short-term decline in grant funding, publications, and other metrics while more junior faculty establish themselves. It is also the case that while some highly productive senior faculty have retired, the remaining more senior faculty have not always been able to consistently maintain their previous levels of funding and scholarly productivity. Together these factors explain at least some of the moderation of our research and scholarly productivity. We fully expect a return to upward trajectories as our junior faculty become more established.

1.2.5 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 (22 excluding emeriti, adjunct, and retirees) with a broad range of disciplines represented. IBG faculty currently or recently participate in externally funded research and training in collaboration with Psychology and Neuroscience, Integrative Physiology, Molecular Cellular and Developmental Biology, Ecology and Evolutionary Biology, Sociology, the Institute of Behavioral

Science, and the Institute of Cognitive Science, on the Boulder campus, and many 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, and the Animal Colony facilities, no longer operational, were reconfigured for office and wet laboratory space in 2017. This coincided with the decommissioning of RL1, reducing our total space to 33,400sf (from 38,500sf), but increasing our usable office and laboratory space. IBG has continued to improve its laboratory space, investing in renovations and improvements for its wet laboratories and for the Information Technology infrastructure that underpins much of the work in biometrical and statistical genetics and `big data'.

However, much of our space is old and in need of further expensive repair and renovations, and the Institute is fragmented across three 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 NIMH, NIDA, and NIA (jointly with IBS)) supporting a total of 10 graduate fellowships and 5 postdoctoral fellowships. IBG currently has 13 graduate students enrolled in its certificate program, 4 additional students affiliated with IBG, and 5 postdoctoral trainees.

1.2.8 Diversity

Through new faculty recruitment, we have increased our faculty diversity in age, rank, and gender, making progress with junior faculty representation, ethnic diversity, and female representation. One of our three Assistant Professors hired since the last review is Hispanic (Hoeffer) and one is female (Friedman). Our currently pending hire is also female. The Department of Psychology and Neuroscience is hiring a new African American faculty member in the Behavioral, Psychiatric, and Statistical Genetics area; he will also be invited to become a Faculty Fellow of IBG.

1.2.9 Summary

Since the last program review in 2011, IBG has maintained external funding at steady but lower levels, reflecting our continued transition from mostly senior to mostly junior faculty as we build new areas of expertise. We anticipate renewed growth of funded research activity in the next period as we take advantage of new opportunities for research in high priority areas (for funding) that match our expertise. IBG 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 sustained strong externally funded training programs in drug abuse, mental health, and aging, and has worked to increase its diversity.

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

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.

More specifically, we predict that our animal model research will be of increasing importance as our field moves beyond statistical discovery of genetic variation through large scale Genome Wide Association Studies (GWAS) and back to the experimental revelation of the functional significance of this genetic variation.

We have identified pharmacogenomics (for mental health and drug abuse), and epigenetic mechanisms, as two important areas of growth for behavior genetics where we should invest in new faculty hiring. A third area of need is integrative genomics, supporting the translation between animal and human behavioral and genomics and other -omics. These new hires, inasmuch as they involve laboratory science, will only be possible if we can improve and expand our wet laboratory and animal behavioral testing facilities. A corollary of this is that such hires incur expensive start-up costs that will likely go beyond IBG's resources and will thus need a new model for funding these costs.

In addition to the new hiring targeted at animal model and translational research, we see an important opportunity for expansion of our focus on genetics and behavioral aging --- an area that is increasingly well funded at NIH as the nation focusses on its aging population.

Finally, we also face the need for a leadership succession plan when Dr. Hewitt comes to the end of his current Directorship appointment in 2021.

Therefore we are requesting five new lines --- three in specific areas of animal model and translational research, one in genetics and aging, and one that could be a senior hire to recruit a new Director if an external search is recommended.

1.3.2 Research infrastructure

1.3.2.1 Space

Although the Institute has adequate amounts of space for its existing programs, the space is aging and spread over three buildings on the old East Campus. Our goal is not to maintain an excellent steady state, but to expand our externally funded research and training enterprise, building on existing strengths and new technologies and methodologies, attracting world class faculty and researchers in a highly competitive environment, and fostering the interdisciplinary collaboration that underpins our unique contributions to science and our ability to increase our external funding, Achieving this will require, at the very least, realistic plans for a consolidated state-of-the-art building incorporating all aspects of the Institute's activities.

One vision for the future of the Institute is not so much as a stand-alone research unit (albeit spread over three different buildings), but as an Institute that brings its unique strengths to collaborations across the life sciences. To this end, the Director has in the past advocated for the development of a Life Sciences Research complex on the East Campus. Our ability to do cutting edge science and to attract funding --- especially for larger scale projects and Centers --- would be enhanced by such a Life Sciences Research Complex, and especially a Bio-Behavioral Research 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.

However, despite some support from the university's higher administration in the past, the goal of an integrated Bio-Behavioral Research Cluster is probably beyond our reach. Given this, we are now promoting the more modest goal of a consolidated state-of-the-art IBG building to replace our current aging and dispersed infrastructure.

1.3.2.2 Diversity

The Institute continues to have as a 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 with regards to competing needs of family and career. We are actively recruiting more diverse faculty, and we appear to have achieved some recent success through the Department of Psychology and Neuroscience diversity hiring program.

Gender Diversity

Category	IBG / Grad School Rostered Faculty	IBG Other Faculty	IBG Emeriti Faculty	Research Associates	Postdocs & Fellows	Graduate Students	Graduate Students (break down) Trainee support Unpaid/TA/T32	Professional Research Assistants	Classified /University Staff	Student Hourlies	Totals
Male	6	17	3	4	5	7	0/1/6	5	1	0	48
Female	2	3	2	5	2	10	2/6/2	21	4	7	56
Total	8	20	5	9	7	17	2/7/8	26	5	7	104
proportion female	0.25	0.15	0.4	0.56	0.29	0.59	0.59	0.81	0.8	1	0.54

Ethnic Diversity

Category	IBG / Grad School Rostered Faculty	IBG Other Faculty	IBG Emeriti Faculty	Research Associates	Postdocs & Fellows	Graduate Students	Graduate Students Trainee support Unpaid/TA/T32	Professional Research Assistants	Classified Staff	Student Hourlies	Totals
Asian/Asian American		1		1	1			1		1	5
Pacific Islander											0
Native American											0
African American					1					2	3
Caucasian	7	19	5	8	4	16	2/6/8	23	5	3	90
Hispanic	1					1	0/1/0	2		1	5
Foreign minority					1						1
Total	8	20	5	9	7	17	17	26	5	7	104
proportion minority	0.125	0.05	0	0.11	0.43	0.06	0.06	0.12	0	0.57	0.13

1.3.2.3 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, but we recognize the challenges of being almost completely dependent on external funding, and the need for a solution to the problem of funding the escalating start-up costs for new faculty, especially in the area of animal model research.

1.4 Final word.

IBG was founded in 1967 and so we celebrated our 50 year `golden jubilee' anniversary last year. To commemorate the event, we published our `50 years of excellence' report which can be found at:

https://www.colorado.edu/ibg/sites/default/files/attached-files/web_version_final_final.pdf

This is a celebratory report with vignettes, reminiscences, and highlights, rather than a more exhaustive historical document or comprehensive catalogue of accomplishments. Nevertheless, if you haven't seen this before, we hope you will enjoy reading it.

`Fifty years after its founding, the record of the institute continues to be outstanding. I must thank our faculty, staff and students of the institute, who have contributed to this superb professional and scientific performance and to the collegiality that remains a distinguishing and necessary characteristic of the institute.' John K. Hewitt, Director, `50 years of excellence', p2.

Question 2: Strategic Planning: Describe the unit's strategic goals and aspirations, linking them to the priorities set by the chancellor and the provost.

2.1 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, and increase its diversity at all levels.

2.1.1 Faculty.

We request that five new lines be created, including those needed to address replacing the current Director (see 2.1.2 below). These appointments will allow us to increase the diversity of our faculty, to extend our traditional research strengths and rebuild our increasingly important animal model translational research program, 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.

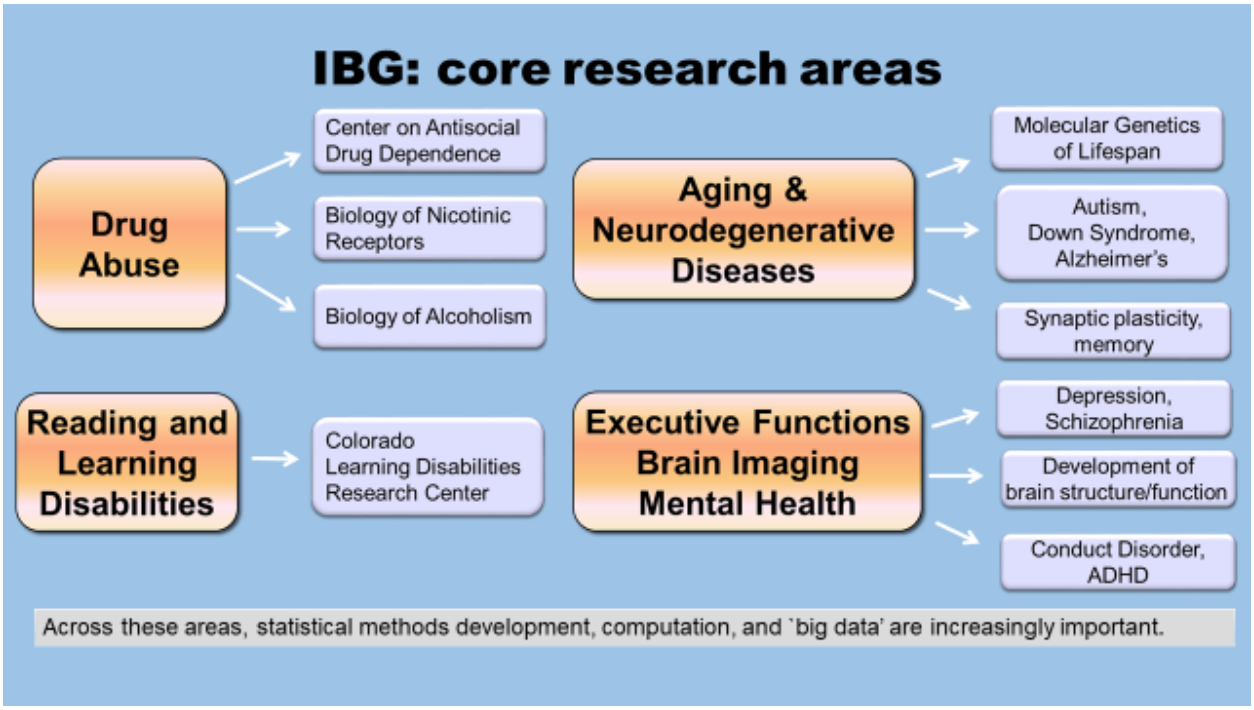
2.1.2 Directorship succession.

John Hewitt has been the Director of IBG since 2001 and his four year current term ends in 2021. He has indicated that 20 years is long enough, it is time for new leadership with fresh ideas and energy, and he wishes to step down at that time. The faculty of IBG asks that the University works with the Institute to develop a plan for recruiting his successor, with adequate financial support and in a timely manner.

2.1.3 Facilities.

At the very least, IBG needs to begin realistic planning, in conjunction with the University, for a consolidated state-of-the-art building incorporating all aspects of the Institute's activities. Beyond this, we continue to advocate for the development of a Bio-behavioral Research Cluster, accommodating the highly collaborative research enterprises of IBG, ICS, Integrative Physiology, and Psychology and Neuroscience, but we recognize that this is a long term goal that should not impede achieving a building to house the Institute.

2.2 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 at IBG, include the Colorado Adoption Project, the Colorado Longitudinal Twin Study, the Colorado Learning Disabilities Research Center, the Adolescent Brain and Cognitive Development (ABCD) study, and the Colorado Center on the Genetics of Antisocial Drug Dependence. IBG is also home to a large DNA repository for genetic research on deeply phenotyped 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 utilizes a wide array of behaviorally and genetically defined lines of selected and genetically modified mice.

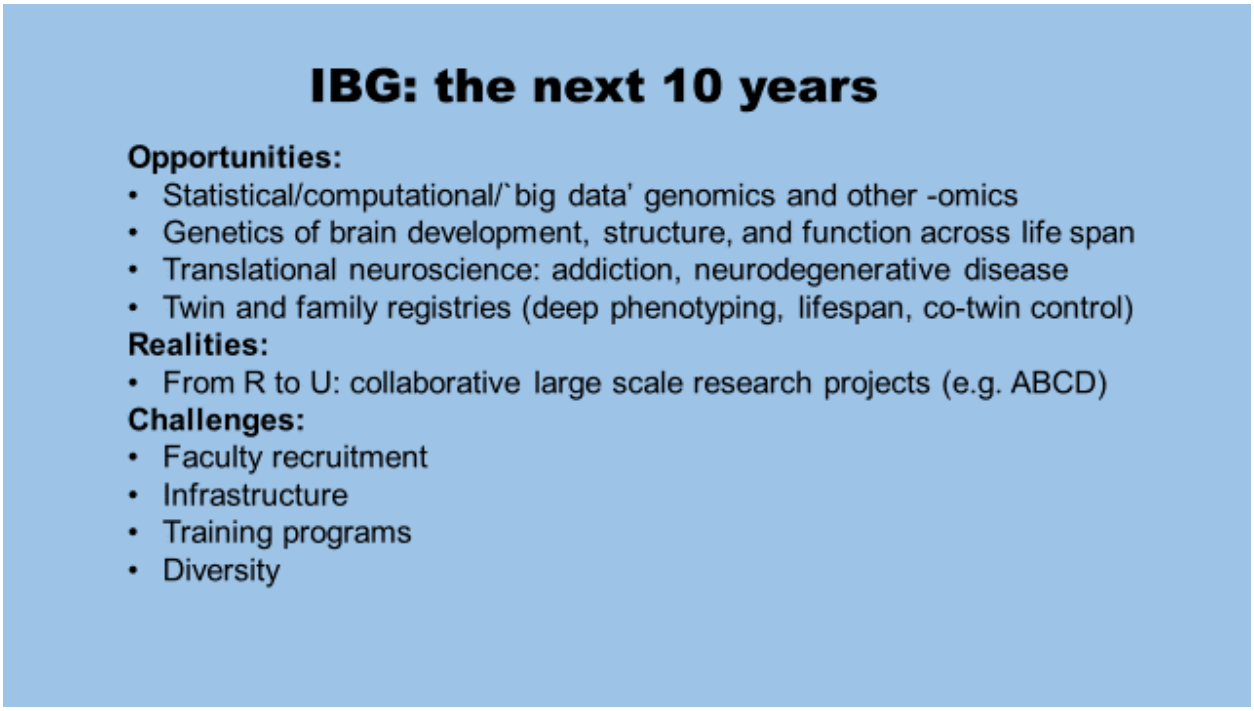
IBG is unique among its peers in its potential for integrating animal model and human research. Historically, the major research foci of IBG have been quantitative behavioral genetics (e.g. twin, family, and adoption studies of human behavioral development, and, more recently, statistical genetics using genome wide `big data') 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 using animals to model human clinical problems and by examining the biological mechanisms of individual human genes in animal models. A conspicuously successful example of this is in the genetics of addiction where animal studies of nicotinic receptors at IBG motivated human genetic studies of these genes, which have now been widely replicated for their role in addiction. Using a “humanized” mouse containing a human genetic variant, IBG investigators and collaborators at other institutions have published papers that begin to identify molecular mechanisms, which may ultimately guide development of new treatments. Currently, another “humanized” mouse is in development, using CRISPR-Cas9 technology, to study a gene associated with alcohol use disorders in humans by IBG human geneticists and collaborators. A new proposal for a P50 Translational Research Center on the Genetics of Nicotine Dependence, to be funded by the National Institute on Drug Abuse, is currently in the review process. If funded, it would establish formal support for these kinds of interdisciplinary efforts.

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 longitudinal human adoption, twin and family studies, behaviorally and genetically defined mouse models, 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.

The next decade will bring new opportunities and new challenges:



To maintain and expand its world class research and training, the Institute must renew its efforts in faculty recruitment, significantly improve its physical accommodation, strengthen the infrastructure and activities that support its scientific and educational endeavor, and increase its diversity at all levels of the Institute, These are all areas where strategic institutional investment would likely be repaid many times over.

2.3 Faculty recruitment. IBG tenure track faculty rostered in the Institutes are among the best investments at the University of Colorado. With seven such faculty rostered during 2017, IBG generated $1,904,815 in indirect costs in FY2017. Given that 29% of ICR earned was returned to IBG to run the Institute, this still represents a net ICR of $1,352,418, or an average of $193,202 per faculty member. The General Fund salary support for those seven faculty, including the Director, totaled $833,355 in salaries, or an average of $119,050 (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.

The background to our hiring plan is that the field of behavioral genetics is rapidly evolving from its historical roots in the `nature nurture' debate in the pre-genomics era, to being a highly effective interdisciplinary contributor to understanding the relationship between brain and behavior from the perspective of the interaction of genetic and environmental inputs. The early history of IBG (1967 through about 1980) emphasized selection and crossbreeding experiments in mice, pharmacogenetics, twin and adoption studies of personality and cognition, structural equation modeling. The next two decades saw an increasing sophistication of genetic manipulation (Knock-out knock-in mice), and use of recombinant inbred lines in mice (and C. elegans). In human research, DNA collection became routine, and made possible linkage studies in human samples, to augment twin, family, and adoption studies of behavioral development. In the current century, genetic

manipulation to study the molecular biology of individual genes became possible in animal models, and in human research IBG participated in large scale national collaborations (e.g. AddHealth, National Youth Family Study, ABCD) the development of corresponding DNA repositories. The first successes in translational behavior genetic studies across animal models and humans led to an understanding of the molecular biology of the nicotinic receptors and their critical role in human addiction and its consequences. Building on this background, the field is now advancing to next generation genetic manipulation (e.g. CRISPR, optogenetics), genome-wide genotyping and targeted and whole-genome sequencing, computational biology, brain imaging, computational neuroscience, participation in and utilization of national and international collaborative databases (`big data'), new twin and family studies of brain and behavioral development, and a renewed emphasis on translational human - animal studies (e.g. gene pathways, stress responses, drug effects).

To participate in this next generation of human research the Institute has a continuing 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. 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 the university's strategic investments in brain imaging and supercomputing.

We also predict that our animal model research will be of increasing importance as human behavioral genetics moves beyond statistical discovery of genetic variation through large scale GWAS (Genome Wide Association Studies) and back to the experimental revelation of the functional significance of this genetic variation. We have identified pharmacogenomics (for mental health and drug abuse), and epigenetic mechanisms as two important areas of growth for animal behavior genetics where we should invest in new faculty hiring. Pharmacogenomics is a longstanding strength of IBG animal research and this expertise is critical for translation of human GWAS results to biological mechanism. Current IBG faculty with pharmacogenomics expertise are mid to late career. Therefore, we seek to hire a junior faculty member in pharmacogenomics to not only maintain our expertise in this field, but also to bring new ideas and technologies to IBG. The interaction between environment and genome also has been a longstanding interest of IBG. However, until recently, this interaction could only be described by statistical analyses. Epigenetics/genomics is a quickly emerging field that addresses environment by genome interactions at the molecular level. Consequently, we plan to recruit a new faculty member in epigenomics to enhance our translational efforts towards understanding the interaction between the environment and genome.

A third area of need is integrative genomics, supporting the translation between animal and human behavioral and genomics and other -omics. The number of available -omic data sets from humans, mice, rats and other species seems to increase by the day. We envision this hire as an individual with the skillset to integrate these -omics data sets both within and between species to advance the translational mission of IBG.

We expect that these hires will boost the Institute, affiliated Departments, and the University in several ways. As mentioned above, we expect new hires to develop their own research support that is a net budgetary gain for the University. Further, the proposed hires would enhance the translational

mission of IBG and create more opportunities for large translational grants such as Center and U mechanism grants. This has the potential to substantially increase grant dollars to IBG and F & A to the University. The new hires also will contribute to the teaching mission of both IBG and the academic departments in which the faculty members are rostered. Some courses taught by the new faculty could be new courses that may draw significant interest. For example, there currently is not a single expert in epigenomics at CU Boulder (or any CU system affiliate). The epigenomics hire could develop new undergraduate and graduate courses in epigenomics. These classes would likely be of high interest. In addition, a recent survey of IBG graduate students indicated that students would like 1) IBG-relevant courses to be taught more frequently 2) more shared coursework between human and animal researchers and 3) more hands-on computational courses. With the three proposed hires, IBG could meet all of these requests.

These new hires, inasmuch as they involve laboratory science, will only be possible if we can improve and expand our wet laboratory and animal behavioral testing facilities. A corollary of this is that such hires incur expensive start-up costs that will likely go beyond IBG's resources, and will thus need a new model for funding these costs.

In addition to the new hiring targeted at animal model and translational research, we see an important opportunity for expansion of our focus on genetics and behavioral aging --- an area that is increasingly well funded at NIH as the nation focusses on its aging population.

Finally, we also face the need for a leadership succession plan when Dr. Hewitt comes to the end of his current Directorship appointment in 2021.

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.

Thus we are requesting five new lines --- three in specific areas of animal model and translational research, one in genetics and aging, and one that could be a senior hire to succeed the current Director. The timeline for these new lines will be bound up with the Directorship succession --- perhaps one senior and two junior hires at that time, retirements of other senior faculty leading to one or two junior hires, and, of course, the financial condition of the University.

All of these hires will be interdisciplinary, and so it is possible that some or all of these could be joint hires co-ordinated with Psychology and Neuroscience, Integrative Physiology, the Institute of Cognitive Sciences, the Institute of Behavioral Sciences, Ecology and Evolutionary Biology, Computer Science, or MCDB.

2.4 Infrastructure/Space. Although the Institute has adequate amounts of space for its existing programs, the space is aging and spread over three buildings on the old East Campus. Our goal is not to maintain an excellent steady state, but to expand our externally funded research and training enterprise, building on existing strengths and new technologies and methodologies, attracting world class faculty and researchers in a highly competitive environment, and fostering the interdisciplinary

collaboration that underpins our unique contributions to science and our ability to increase our external funding, Achieving this will require, at the very least, realistic plans for a consolidated state-of-the-art building incorporating all aspects of the Institute's activities.

One vision for the future of the Institute is not so much as a stand-alone research unit (albeit spread over three different buildings), but as an Institute that brings its unique strengths to collaborations across the life sciences. To this end, the Director has in the past advocated for the development of a Life Sciences Research complex on the East Campus. Our ability to do cutting edge science and to attract funding --- especially for larger scale projects and Centers --- would be enhanced by such a Life Sciences Research Complex, and especially a Bio-Behavioral Research 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.

However, despite some support from the university's higher administration in the past, the goal of an integrated Bio-Behavioral Research Cluster is probably beyond our reach at this time. Given this, we are now setting our sights on the more modest goal of a consolidated state-of-the-art IBG building to replace our current aging and dispersed infrastructure.

2.5 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, 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. We are aware that this issue is also one that has been raised by the Biofrontiers' IQ Biology program and so it may be that a common solution for theirs, ours, and other such programs could be found.

In the meantime, one way we have addressed this need is to create a formal Graduate Interdisciplinary Certificate Program in Behavioral Genetics (IBG Interdisciplinary Certificate) that has its own requirements that cut across traditional disciplinary boundaries and emphasizes participation in the Institute's research and training activities.

Secondly, support for graduate students is derived largely from our three NIH training grants (one jointly with IBS), 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. However, an Institute could be awarded teaching assistantships to support graduate students mentored by its faculty, which could then be associated with the courses the faculty member teaches, or with other courses as determined by a student's Department. The difference is that the Institute would have some control over the number of students its faculty could mentor with TA support, rather than this being determined by the allocation to a specific Department. 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.

2.6 Diversity

To help ensure that we are doing all we can to promote diversity at all levels of the Institute, we have established a Committee on Diversity and Engagement. The committee consists of five members including a faculty fellow, a post-doctoral/research associate, a PRA/SPRA, a staff member, and a graduate student representative. 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.

2.7 Immediate collaborative opportunities and specific opportunities for growth.

While we pursue the strategic goals outlined above, we will conclude this plan by highlighting collaborative growth opportunities, both in general terms, and quite specifically.

We see the areas outlined in the next figure as general opportunities.

We have identified three areas of IBG strength, in collaboration with other units, which offer immediate opportunities for growth.

IBG: Three areas of collaborative growth in the next 5 years.			
	Genetic vulnerability to drug use/abuse	**Genetics of cognitive decline/ Alzheimer's**	**Genetics & brain imaging**
Current activity/strength	Translational genetics Nicotinic receptors Cannabis legalization ABCD	Cognitive aging Synaptic plasticity & behavior Neural cell death in Alzheimer's	ABCD Twin studies of development, structure, function
Current funding:	R01 (DA) $2.5M R01 (DA) $2M) U01 (DA) $7.7M UH (DA) $1M R21 (DA) $.4M U01 (AA) $3M T32 (DA)	R01 (AG) $6M R01 (NS) $1.6M T32 (AG) R01 (AG) $1M (Link, IPHY)	U01 (DA) $7.7M R01 (MH) $3.5M T32s (MH,DA) P50 (HD) $8.5M R01 (AG) $6.0M R01 (MH) $3.4M
Multidisciplinary collaboration:	IPHY Statistical genetics Molecular genetics Molecular biology Psychiatry (Anschutz) Psychology ICS	Psychology, IPHY Statistical genetics Molecular genetics Social science Molecular biology IBS, INC, Anschutz	Neuroscience Statistical genetics Molecular genetics Psychiatry (Anschutz) Psychology (PSYC) ICS, INC
Growth opportunities:	Genetics of vulnerability and resilience Animal models Applications of big data-omics Opioid crisis Marijuana legalization	Translational neuroscience, Applications of big data – omics. Prospective `clinical' studies of human twins/families	Drug use and brain function, model systems (rodents), age related structure and function, genetic influences vulnerability/resilience
Unique Institute resources:	GMOs (rodent models). Twin/family population registries. DNA repositories. Deep phenotyping for decades long existing samples.Multidisciplinary collaboration and training culture.	Twin/family population registries. DNA repositories. Deep phenotyping for decades long existing samples. Multidisciplinary collaboration and training culture. GMOs (rodent models).	Twin/family population registries. DNA repositories. Deep phenotyping for decades long existing samples. Multidisciplinary collaboration and training culture
'big data':	Yes	Yes	Yes
Funding opportunities:	NIDA commitment Opioid crisis Legalized cannabis (NIDA and State funds).	$400M increase in FY 2017, +$414M in FY 2018, +$425M in 2019 for NIA Alzheimer's research. Pay lines go from 6% to 20% and to 38% for Alzheimer related. More is likely.	NIDA ABCD $350M over 10 years. NIMH increasing funding for basic neuroscience and genetics. NIA increasing Alzheimer related funding (see next column).

2.8 Relationship to the campus mission, vision, and priorities.

Campus Vision: To be a leader in addressing the humanitarian, social, and technological challenges of the twenty-first century.

IBG addresses issues of major societal importance in the twenty-first century: addiction, aging, mental health, cognitive abilities, and brain development. Each of our current and proposed new faculty addresses one of more of these issues in his or her research. IBG brings to these issues a unique perspective from genetics research. Recognizing this, our graduate and postdoctoral training programs are externally funded by the National Institutes on Drug Abuse, of Mental Health, and on Aging, representing three of only five graduate and postdoctoral training programs funded by the NIH on the Boulder campus.

Who we are: CU Boulder is a leading global comprehensive research university.

IBG is recognized as a world leader in its area of interdisciplinary research and training. For example during the past 26 years IBG has hosted a weeklong methods workshop (funded by the National Institutes of Health) that now attracts about 100 scientists each year from across the globe and has registered over 2000 participants since its inception.

Values—the Colorado Creed:

IBG emphasizes collegiality, integrity, and inclusiveness. These are necessary characteristics for successful interdisciplinary collaborative science, and are emphasized as we train the next generation of researchers and scholars.

Student Success, Revenue Diversification, Reputation, and Strategic Imperatives:

1. Shape tomorrow's leaders:

Through nationally and internationally recognized training programs, IBG is providing the next generation of leaders in research and scholarship on the genetics of behavior, an area of science that is increasingly understood to be a foundation for understanding behavioral issues of relevance to modern society.

2. Be the top university for innovation:

IBG is constantly renewing itself, combining strength in methods development (e.g. statistical methods for `big data' genomics), with innovative translational studies (e.g. the biology of addiction in animal models), and use of new technology (e.g. brain imaging). We have systematically replaced retiring senior faculty with junior faculty expert in innovative methods and approaches, and our strategic hiring plan for new faculty is designed to accelerate that process of renewal and innovation.

3. Impact humanity:

The research and scholarship of IBG's students, postdocs, and faculty create new perspectives on health and society. IBG has made major contributions to understanding such things as reading disabilities, vulnerability to addiction, and mental illness as genetically influenced conditions, rather than as the result of laziness, moral failure, or poor parenting. This change in perspective alleviates the distress experienced by individual sufferers and their families, and creates the conditions for development of effective therapies that provide real benefits for humanity.

2.9 Addendum on the strategic plan process.

The current strategic plan results from discussions among the Director and the Faculty Fellows, primarily the `core faculty' who include the Institute rostered faculty along with Drs. Keller and Rhee who have permanent offices located in the Institute, beginning in 2017 when VC Fiez encouraged each Institute to identify its strengths and opportunities for growth. On the basis of this, together with the previous strategic plan which is still being pursued, the Director presented on overview of a plan and issues that was discussed at a dedicated 2 hour meeting open to all Faculty Fellows on October 5th, 2018. Specific ideas that were raised at that meeting, and incorporated into the plan were: the need for faculty hiring in the area of animal model research to rebuild this program, the need for additional investment in start-up funds and space to accommodate those hires, an emphasis on the need for a new building, and an emphasis on collaboration with other units. Following this, the Director in consultation with the members of the self-study steering committee (Dr. Stitzel, Mr. Shelby) drafted a written plan that was circulated to the core faculty for comments and revisions on November 20th, and to the self-study committee (including representatives of research staff, research associates, students, and administrative staff) on November 28th. Following this, a special meeting of the core faculty was held on Monday December 3rd to discuss and vote on self-study as a whole (with unanimous approval).

3.0 Addendum: brief description of decision making with IBG.

Decision making at the Institute for Behavioral Genetics ultimately rests with the Director in broad consultation with the Faculty, formalized in Faculty meetings and votes as needed. Faculty recruitment proceeds with the approval of the Faculty for a hiring plan (which areas are being targeted) and a search committee chair. The search committee is convened and conducts the process until a short list can be brought to a Faculty meeting for approval. After the interviews have taken place, the search committee brings its recommendations back to the Faculty for approval. The Director then conducts the negotiations with candidates based on the instructions from the Faculty.

Budgetary issues are the responsibility of the Director. As a general rule, IBG DAICR funds are used to support administrative staff, space and infrastructure, computing, start-up funds for faculty recruitment, matching funds for University initiatives, and some equipment purchases, that will benefit the Institute as a whole; support for individual programs is expected to come from external grant funding. Each year, the Director identifies an amount of DAICR, usually between $50k and $100K,

that the Institute can afford to distribute to individual PIs. The proportion received by each PI is equal to the proportion of IBG ICR generated by the PI in the most recent grant accounting year for which final figures are available.

Training support decisions are recommended by IBG's standing training program committee, a committee of faculty members, currently Chaired by Dr. Stitzel. The committee reviews progress of all individual trainees and recommends assignment of traineeships based on progress and fit to the specific source of support (NIDA, NIMH). Ultimately, the PI of the T32 grants (Hewitt in both cases at present) has to approve the recommendations, but there has not been any instance when he did not.

Question 3: Describe the unit's current and proposed contributions in research and scholarship.

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 include the Colorado Adoption Project, the Colorado Longitudinal Twin Study, and the Colorado Learning Disabilities Research Center. IBG also is one of 21 research sites for the Adolescent Brain Cognitive Development (ABCD) study, the largest long-term study of brain development and child health in the United States. IBG is also home to a large DNA repository 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 utilizes a wide array of behaviorally and genetically defined lines of selected, recombinant inbred, transgenic, and genetically modified mice.

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). 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 have been directly integrated with research on the role that polymorphisms in these genes play in human addiction and related behaviors. Current efforts include an attempt to obtain funding for a translational Center on the genetics of nicotine dependence to formalize the integration of human and animal research conducted at IBG.

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.

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 only 55th out of 66 CU Boulder Departmental and Institute units in terms of number of tenure and tenure track faculty. Yet, IBG ranked 16th in grant expenditures for the five year period ending in FY 2017. IBG was 9th and 14th in 2017 and 2018 in average number of refereed articles and chapters per faculty member, and has consistently been in the top quintile or better over the preceding decade. Finally, it has been estimated that research at IBG has a local economic impact of over $20 million. (This estimate of the annual economic impact is based on the methodology presented in the report: `The Impact of Public Higher Education on the State of Colorado', prepared for Colorado Department of Higher Education December 2007. It is available on-line at: http://highered.colorado.gov/Publications/Studies/2007/200712_ImpactofHE.pdf In this report, the economic impact of higher education is estimated by using the Regional Input-Output Modeling System (RIMS II), which applies a multiplier (2.4763) to higher education expenditures to estimate their total economic impact. For IBG, our annual expenditures are approximately $8.1 million, leading to an estimated economic impact on the regional economy of 2.4763 X $8,100,000 = approx $20,000,000.)

The past decade has 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 with hundreds of thousands of subjects, and now deep sequencing of whole genomes. Datasets of human and animal transcriptomes from multiple cell types and tissues, methylomes and epigenetic signatures are now available and continuously expanding. 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 even more tractable with the development of Crispr/cas9 genome editing. In addition, the development of powerful tools such as optogenetics, chemogenetics and two-photon imaging of neurons in awake rodents will allow for translating human statistical associations to real biological knowledge. Our ambition is to harness these emerging technologies and datasets across species for cutting edge translational research that will advance our understanding of the genetics of behavior. This goal is consistent with our culture of translational research and will ensure our continued leadership in research and training in the genetics of behavioral traits.

As indicated in our strategic plan (see Q2), we see opportunities for collaborative growth in:

Statistical/computational/`big data' genetics of addiction and mental health (with Psychology and Neuroscience, EE Biology, Computer Science, Economics, MCD Biology, Integrative Physiology, Institute of Cognitive Science, Institute of Behavioral Science, BioFrontiers, and the Anschutz Medical Campus);

Genetics, brain development, structure and function (with Institute of Cognitive Science, Psychology and Neuroscience, Integrative Physiology, and the Anschutz Medical Campus);

Translational/animal model research on addiction (with Integrative Physiology, Psychology and Neuroscience, and the Anschutz Medical Campus);

Learning disabilities and neuroscience (with Integrative Physiology, Psychology and Neuroscience, and Institute of Cognitive Science);

and Genetics of healthy and unhealthy aging (with Institute of Behavioral Science, Integrative Physiology, and Psychology and Neuroscience).

We have identified three areas of IBG strength, in collaboration with other units, which offer immediate opportunities for growth: Genetic vulnerability to drug use/abuse, genetics of cognitive decline and Alzhiemer's and related diseases, and genetics and brain imaging. The details of our current strengths and the immediate opportunities are described in the strategic plan (Q2).

Question 4: Interdisciplinary Research and Teaching.

4.1 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 and alcohol abuse, psychiatric disorders, reading disability, aging, risky behavior, personality, and cognition. IBG also has a long history of developing cutting-edge methods in the field of behavioral and statistical genetics, and this continues in the development of methods for analysis of twin, family, and whole-genome data.

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. As recent large-scale human genetics studies have begun to reveal convincing evidence for associations between genetic variants and various psychiatric disorders, including addiction, IBG is in a unique position to help elucidate the biology underlying these genetic associations by building on our longstanding combination of expertise in both human and mouse genetics. Several faculty members recently submitted a NIDA P50 Center grant application that proposes to combine these approaches in order to better characterize underlying genetic architecture related to nicotine dependence and to perform functional laboratory studies to understand biological mechanisms. Another example of this kind of interdisciplinary science is the Adolescent Brain and Cognitive Development (ABCD) Project that involves a close collaboration with the Institute of Cognitive Science. This project is a landmark $350million NIH study of brain development in over 11 thousand children nationwide, studied at 21 different sites, and followed for 10 years into young adulthood. Our site is one of the twin study sites, in collaboration with Washington University St. Louis, Minnesota, and the Virginia Institute for Psychiatric and Behavioral Genetics. Being selected as a site for this study was only possible because we were able to combine expertise in brain imaging (ICS) with expertise and experience in conducting longitudinal twin and family studies of behavior (IBG).

4.2 IBG Faculty Fellows are drawn from multiple disciplines

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

4.3 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 novel approaches in our field, such as approaches for analyzing whole-genome sequencing data and 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. As described above, faculty fellows who conduct human genetics collaborate frequently with those performing lab-based studies using mouse behavioral models. Our graduate and postdoctoral trainees are exposed to and participate in this kind of interdisciplinary research as a normal part of their experience. Interdisciplinary approaches to research questions are the norm, rather than the exception.

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

IBG has been at the forefront of interdisciplinary research and training in behavioral genetics for 50 years. For IBG to continue to be a leader in this rapidly evolving field, it is necessary that we identify the future directions our field is taking and move aggressively ahead of them. In particular, 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: “-omics” including DNA genomics, RNA transcriptomics, proteomics, metabolomics, brain imaging, and supercomputing. The fast-paced developments in genomics dictate commensurately educated personnel who can manage the large scale data generated by new technologies. Since our previous review, we have expanded our “-omics” expertise with the recent recruitment of two new Assistant Professors. We have also strengthened our collaboration with ICS and neuroimaging experts through recently funded projects (e.g., the national ABCD project (Banich, Hewitt, Friedman), and R01 projects on brain and cognitive executive functions (Friedman, Hewitt, Banich), and on brain and genetic predictors of individual differences in pain and placebo analgesia (Wager, Friedman, Keller).

As a unit, IBG needs to foster additional interactions with colleagues from Biofrontiers, Computer Science, Applied Math, and with experts at the Anschutz School of Medicine. “Gene hunting” is not an

end in itself, and recent findings have emphasized the importance of “gene networks” as being critical units of study for complex behaviors. Hence, novel statistical modeling and machine learning approaches will be critical to advance our understanding of biological systems, along with expertise in neuroscience for experiments to test specific hypotheses generated from such approaches. 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. Although IBG trainees complete requirements to obtain an IBG Interdisciplinary Certificate, it might be time to consider 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 meeting the requirements of individual departments. However, there are some logistical constraints associated with negotiating support for students, who often serve as teaching assistants during at least part of their graduate research experience.

Third, as we have expressed in several places in this self-study, we believe that the time is right for the construction of new Life Sciences Research complex on the East Campus, and we are especially interested in the development of a Bio-behavioral Research Cluster, 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 5: Undergraduate Education

Although IBG does not have an undergraduate program *per se*, IBG-rostered faculty have the same undergraduate teaching expectations as Departmental faculty, and participate fully in the undergraduate teaching mission of the University, currently in the Department of Psychology and Neuroscience, the Department of Integrated Physiology, and the Department of Ecology and Evolutionary Biology. They also participate by providing research experiences for undergraduates through such programs as SMART, BURST, SURF and UROP, and through the supervision of honors theses.

In the view of IBG faculty, undergraduate education could be enhanced through greater emphasis on quality over quantity of experience, e.g. through reinstatement of the critical thinking courses that have been cut from the curriculum because of their smaller class sizes and, hence, greater cost, or through crediting faculty who provide research experience opportunities, as distinct from traditional classroom teaching.

Question 6. **Please describe your unit’s contributions to enhancing graduate education and its goals and ambitions for doing so.**

6.1 IBG is not a degree granting unit. However, one of the major functions of the Institute is to foster the next generation of behavioral geneticists through an interdisciplinary training program. Towards this goal, IBG

faculty administer a structured training program that results in an IBG Interdisciplinary Certificate. This program is specifically designed to provide graduate students across multiple disciplines the opportunity for interdisciplinary training in behavioral genetics. As part of the certificate program, students are exposed to a broad range of research areas in behavioral genetics through coursework, journal club, colloquia and student organized mini conferences.

The training program is currently supported by NIH training grants from the National Institute of Mental Health (NIMH), the National Institute on Drug Abuse (NIDA), and, jointly with the Institute of Behavioral Science, from the National Institute on Aging (NIA). **It is noteworthy that there are currently only five NIH training grants awarded to departments and/or research units at CU Boulder — and IBG holds two of those, and co-directs one other.** These training grants support 10 pre-doctoral trainees and five post-doctoral trainees. Students not supported by our NIH training grants are supported via home department teaching assistantships or graduate research assistantships.

The academic homes of recent students include Psychology and Neuroscience (students from the BG, clinical and behavioral neuroscience areas of this department) IPHY, Sociology, MCDB, Pharmacology (UC Denver) and Human Genetics (UC Denver). In addition to completing requirements for their academic department, students complete coursework in topics relevant to behavioral genetics. Although a few of the courses for the certificate are required, a majority of the courses the student take to complete the certificate are flexible in order to meet the individual training interests of the students. A list of requirements (https://www.colorado.edu/ibg/sites/default/files/attached-files/interdisciplinary_certificate_2018.pdf) as well as a checklist for completing the requirements (https://www.colorado.edu/ibg/sites/default/files/attached-files/ibg_certificate_program_checklist-2018.pdf) for the BG certificate are available on the IBG website. Further, IBG has a meeting with graduate students at the beginning of every academic year to review program requirements.

Former students indicate a high level of satisfaction with the certificate program. Among 21 former students in a recent survey (2017-2018), the average satisfaction with the program was 4.81 out of 5. For current students in the same survey, the level of satisfaction was a bit lower (4.38 out of 5). Another recent student survey also indicated some level of dissatisfaction with the program (3.1 out of 4). Some reasons for the somewhat lower rating by current students and efforts to address some of the student concerns are discussed below.

Overall, the IBG certificate program has been very successful. Over 170 students have graduated from the program and based on our tracking surveys, greater than 90% of graduates have research-related careers in academia, government, or private industry. As highlighted in the most recent program review, “graduates of the program are over-represented among nationally recognized leaders in the field. Thus, the IBG training program continues to be highly competitive, and the quality of the students accepted into and graduating from the program remains very high”.

6.2 What are the main opportunities or challenges facing your current graduate programs?

There are three main challenges to the behavioral genetics certificate program. The first was described in the strategic plan. Namely, since IBG is not a degree granting unit, students must complete the requirements of both their “home” academic department as well as the certificate requirements. Although this has generally worked, it often increases the coursework burden of IBG trainees and in some cases deters them from taking classes they would prefer to take based on their interests so that they can complete their degrees in a timely manner.

Related to this issue, because students come from different departments and areas within departments, the requirements for comprehensive/qualifying exams, dissertation proposals, etc. vary considerably. This is very confusing to students and mentioned in the student survey as an area for improvement in the certificate program. Having an interdisciplinary PhD with flexible coursework requirements and common requirements for comprehensive exams, etc. would be of great benefit to the students.

A second challenge, as raised by current students in two recent surveys and in a town hall meeting for the self-study is related to course work. More specifically, students would like a) more shared coursework between human and animal trainees to bridge the knowledge gap b) more frequent offering of IBG certificate classes and c) new classes that teach students how to perform contemporary statistical and experimental methods for their research.

To address items a and c relating to coursework, IBG faculty have met and have devised a plan to develop a new methods course that will include a broad range of methods from statistical to molecular. The course will include introductory lectures on methodologies, tutorials, and hands-on practical application of select methods. The course is designed to be an elective for more advanced PhD students and it is anticipated that students from both human genetics and animal model labs will enroll. The course will be co-directed by two IBG faculty fellows, one with expertise in human genetic/statistical methodology and the other with expertise in animal models/molecular methods. The pilot version of the course has been registered as PSYC7200 and will be taught in the Fall of 2019, initially co-directed by Drs. Matt Keller (statistical geneticist) and Jerry Stitzel (animal model/molecular geneticist).

With respect to the frequency of graduate coursework offerings, we are limited by the small number of IBG faculty fellows as well as undergraduate teaching commitments within academic departments. Also, the minimum class size limitation imposed by the college often prevents us from teaching some graduate courses every year due to the small size of our program. We see the best solution to this problem as recruitment of new faculty. The faculty would not only contribute to teaching BG-relevant courses but also would increase the size of our graduate student population. The increase in student numbers would likely provide sufficient demand for courses so that they could be taught more frequently.

A third challenge relates to the mechanism of student support. As mentioned in the strategic plan, support for graduate students is derived largely from our three NIH training grants (one jointly with IBS), 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.

6.3 Describe ways in which your unit fosters a positive climate for its graduate students

One way that IBG attempts to foster a positive climate for its graduate students is by providing financial support for all students. The support comes from training grants and IBG-funded supplementation of TA stipends and summer financial support for students not on training grants or not supported by research grants. IBG also provides travel funds to help students attend scientific meetings. Across student surveys, IBG financial support is considered a highly valuable aspect of the program.

IBG also supports student organized and run an annual mini-conference and a bi-annual NIMH symposium. The former is organized and run by a group of student volunteers while the latter is organized and run by students supported by the NIMH training grant. In both instances, students work together to identify speakers, set the schedule and moderate the events. Both of these events are highly attended by IBG faculty, students and staff and often individuals not affiliated with IBG.

IBG also attempts to foster a positive climate for our students is our weekly journal club. The journal club is an informal gathering with beverages and snacks and provides an opportunity for IBG students, post-docs and faculty to get together. Students, post-docs and occasionally faculty present a recent paper or their research. Unfortunately, recent surveys suggest that the journal club is not fostering as positive a climate as desired. Only 2 of 8 current students who responded to the survey rated journal club as valuable. In contrast, in a companion survey of former students, 17 students out of 21 rated the journal club as either valuable or extremely valuable.

To better understand this change in attitude regarding journal club, students were given a short online survey. Results of the survey were discussed during our first journal club of the semester. For the first half of journal club, students and post-docs discussed the survey results and other concerns not raised in the survey. Dr. Andy Reineberg, a Research Associate, moderated this discussion and took notes. Following this discussion, the faculty joined the discussion led by Dr. Reineberg. Although not all concerns were addressed in this initial meeting, some action items were identified and will be implemented immediately. Others will be addressed throughout the semester as we continue discussions on improving journal club while others, such as a potential change in the time of journal club, will not occur until next semester.

6.4 Given current resources, what efforts could you engage in to further enhance the climate for graduate students in your unit?

As discussed above, one area where we hope to enhance the student climate at IBG is through improving student enjoyment and engagement in journal club.

Based on recent surveys, students also would like a forum for IBG faculty to present their research so that students have a better idea of the breadth of research conducted at IBG. Therefore, efforts to develop and organize such a forum will be discussed amongst IBG faculty.

Also based on recent surveys, students would like more outside speakers for our First Friday talks. We will encourage students, post-docs and faculty to identify and invite more speakers from outside IBG and CU.

6.5 What collaborations with the Graduate School, the Graduate Teacher Program, CU schools/colleges, or with other units or offices might be helpful to you in improving graduate student climate?

As discussed above and elsewhere in this self-study, the development of an interdisciplinary PhD program that allows students to design their own course of study (with some minimal required courses) would be of significant benefit to IBG trainees. This would require collaboration/cooperation between the Institute and departments within multiple colleges to allow Institute trainees to take departmental coursework necessary to complete the needs of the student. Also, establishing TAships that are administered by the Graduate School and allotted to Institute trainees so that they can TA courses more aligned to their interests would benefit IBG (and other Institute) trainees.

6.6 Chancellor's strategic plan: 80 percent 6-year graduation rate by the year 2020.

The graduation rate among IBG trainees vastly exceeds this goal. Over the past 10 years all but one student completed their degree in six years or less. In Fact, IBG trainees graduate, on average, within 4.9 years of entering the program.

Question 7: Enhancing Library Resources

IBG, indeed CU-Boulder, needs improved online access to journals. Increasingly, journals, and other publications used in science education and research have moved to on-line digital formats for publication and distribution. The CU online library catalog is only marginally effective at providing access to journals that require paid access. As the 'paywall' model is likely to only increase over time, institutions are going to have to increase and maintain access to online scholarly material. Accessing individual articles on a per fee basis is of course very expensive and is not usually included in the budgets of most if not all grant submissions, and is beyond the reach of most individual researchers. Free or reduced cost library exchange services are slow and also only offer a limited remedy to journal access. In summary, online journal access is a barrier to improved scholarship, as it stymies access to good papers in journals with less library access and visibility.

Separate from the issue of access to the scientific literature are questions about the role of the library in data storage, management, curation, and archiving. Increasingly, researchers are expected to make large datasets, protocols, original documents, and supplementary material, available for open access by other researchers. Until now, this obligation has largely fallen to individual researchers and their units, although there are both private and public platforms for some of this archival work. The question for broader discussion is whether and how the CU library might participate in or facilitate this endeavor.

Question 8: Non-Departmental Unit Role

8.1 Research Interests of IBG

Most of the effort of IBG is focused on analysis of behavior using genetically informative designs. 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, aging, and cognitive decline. 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 integrating animal model and human research.

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

IBG is a Research Institute administered under the office of Vice Chancellor for Research and Innovation. The Director of IBG reports to the Vice Chancellor, as do the research and support personnel via the Institute Director. Under the current arrangements, nine IBG TTT faculty lines (with one currently unfilled) are rostered in the Institute and paid by General Fund money allocated to the Vice Chancellor for Research and Innovation. However, also under the current arrangements, IBG TTT faculty must have a tenure home in a degree granting academic department. IBG faculty are

currently rostered in three departments: Psychology and Neuroscience (3), Integrative Physiology (4, with an additional hire pending), and Ecology and Evolutionary Biology (1). 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 Institute-rostered faculty, there is a sense of `serving two masters'.

Outside of these 8 Faculty Fellows paid through the Institute, there are 25 additional Faculty Fellows associated with the Institute through their research and training collaborations. Some are retired, but most are rostered in other units on campus, other campuses of CU, or even, in one case, another University. Five of the Faculty Fellows are rostered at the Anschutz Medical Center in Denver in a variety of Departments (Pharmaceutical Sciences: 2, Biochemistry and Molecular Genetics: 1, Psychiatry: 1, The Center for Bioethics and Humanities: 1). One is at the University of Denver, in the Department of Psychology. The remaining 19 are in Departments at UC Boulder (Psychology and Neurosciences: 5 + 1 adjunct + 5 emeriti, Ecology and Evolutionary Biology: 1 + 1 emerita, Sociology / Institute for Behavioral Science: 1, Molecular, Cellular and Developmental Biology: 1, Integrative Physiology: 2, and two are not affiliated with an academic department). This extraordinary mix of Faculty Fellows gives IBG its resilience and flexibility, but also creates some administrative complexity.

8.3 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 have led to difficulties in the past and/or could do so in the future.

1. IBG is not a degree granting program and 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 because nearly all of our students come from two departments (Psychology & Neuroscience and IPHY), 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. This may be particularly challenging as we attempt to forge collaborations or hire faculty in departments with very different expectations, such as Computer Science or Applied Math.

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 IBG over the last three decades, due to a lack of compatibility with a degree-granting Department, and some IBG faculty or faculty recruits have found themselves in what they consider to be inappropriate academic appointments; this can lead to

loss of potential hires, difficulties with promotion and/or tenure, and difficulty in graduate student recruitment.

3. Related to the above, recruitment of faculty who specialize in development of statistical methods has been challenging because the CU, almost alone among state flagship universities, has neither a statistics or biostatistics department. Applied Math is not a statistics department and, at least when we last approached them, did not appear to be a good tenure home for the types of statistical genetics faculty we wanted to hire.

4. Tenure decisions for faculty rostered in the Institutes are still made by individual Departments and thus place faculty under the burden of proving their merit in both the Department and the Institute. 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 instances in which faculty rostered through IBG are unable to vote on promotion and tenure of their colleagues whose work they are uniquely qualified to assess. This represents an odd situation in which tenure decisions are made by departmental colleagues less familiar with the field of study than other (institute but non-departmental) colleagues who may be more suitable judges of the research and its impact.

5. Faculty salaries are determined through the `pool' allocated to each Department and Institute. Typically, these pools are the same or very similar. However, there is a narrower range of merit among the Institute-rostered faculty, 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, Institute-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 found mechanisms to correct imbalances from time to time. But the University might consider alternatives to the current system.

Question 9: Space and Staffing.

9.1 Background.

Growth of IBG is an essential feature of our Strategic Plan. At the present time IBG has 33 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 8 TTT faculty fellows, 5 support staff, 17 graduate students, 16 postdoctoral Research Associates, 26 Professional Research Assistants, 7 undergraduate student employees and additional undergraduate volunteers occupy approximately 33,400 sf in three buildings on the East Campus of CU Boulder: the IBG building (17,200sf), RL4 (7,700sf), and ARCE (8,490sf). Because of a move from RL1, the space occupied by IBG has been reduced approximately 13% (38,500 sq. ft. in 2011 vs. 33,400 sq. ft. today) since the last self-study in 2011.

9.2 Space needs.

The housing of IBG in three 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. IBG also has

invested substantially in self-funded 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 five members over the next several years.

Analysis of current space utilization.

Although the Institute has adequate amounts of space for its existing programs, the space is aging and spread over three buildings in the older part of the East Campus. Our goal is not to maintain an excellent steady state, but to expand our externally funded research and training enterprise, building on existing strengths and new technologies and methodologies, attracting world class faculty and researchers in a highly competitive environment, and fostering the interdisciplinary collaboration that underpins our unique contributions to science and our ability to increase our external funding, Achieving this will require, at the very least, realistic plans for a consolidated state-of-the-art building incorporating all aspects of the Institute's activities.

There really is no realistic alternative to this request. Not only has it has 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 two of the three buildings that are currently occupied by IBG: the IBG building (Bldg #560) and RL4 (Bldg #562) 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 many years to implement, our immediate needs are becoming urgent. We currently lack sufficient space to attempt to recruit even a single new faculty member in the area of animal behavior/molecular genetics. As outline in our strategic plan, it is imperative for the translational mission of IBG to recruit additional animal model researchers. Through retirements (and one resignation), the once thriving and highly regarded animal research community at IBG is at a critical stage. New animal model focused faculty are not only necessary to create a critical mass of active animal model researchers to re-invigorate this crucial component of the translational mission of IBG but also are essential for graduate training.

The need for space for wet lab research is due, in part, to the fact that IBG, at the University's behest, vacated a little over 3,700 sq. ft. of assignable space in RL1 (Bldg # 566). This space included over 2300 sq. ft. of assignable laboratory space. Although the former IBG rodent barrier facility was recently renovated to include an approximately equal amount of assignable sq. ft. (3,600 sq. ft.), this renovation only maintains the status quo. Further, only a small portion of this space (364 sq. ft. was renovated for animal procedural space and 521 sq. ft. for an ultra-freezer farm) was specifically renovated to be laboratory space. Nonetheless, the IBG genotyping lab, formerly located in RL1, has set-up in this space due to the lack of sufficient space specifically designed for laboratory use at IBG. In order to recruit new animal model researchers, we cannot maintain the status quo with sub-par facilities.

Another space issue relating to the recruitment of animal model researchers is the loss of the IBG barrier rodent facility. This facility was de-commissioned due to the potential cost of renovating to

bring to AAALAC standards. As a result, IBG faculty currently house most of their animals at either the Biofrontiers (JSCBB) or Gold vivaria. This is not ideal for multiple reasons. First, lab staff have to travel to these facilities on a regular basis to check on animals and, in some cases, to run experiments. Second, there is insufficient testing space in these vivaria so mice need to be transported from these facilities to IBG. Because transport of animals is a factor that is known to impact animal behavior, this is a serious concern for an Institute that focuses on behavior. Having a single animal facility where all research animals are housed and tested that also is in close proximity to the Investigator's laboratories should be a future objective for not only IBG but for any Department or Institute that does animal research.

Currently, there are four Institute rostered TTT faculty that conduct animal and molecular research at IBG. All wet lab space for these investigators is located in RL4 (Bldg #562). This building has sufficient assignable wet lab space (approximately 4,800 sq. ft.) for these investigators although much of the space is in need of renovation and modernization. However, the ability to upgrade and modernize is limited by the electrical capacity of the building which already is at maximum. Again, any renovation of RL4 would simply maintain our current level of space which would severely limit our ability to recruit new faculty that conduct animal and/or molecular research.

Our vision for the future of the Institute is not just as a stand-alone research unit, 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. The idea of a research cluster is shared with the 2011 Campus Master Plan's Task Force Report on the East Campus Vision which states "We envision shared buildings that promote cross-disciplinary interactions, and clusters of academic units that physically represent the academic strengths of the University". One cluster explicitly mentioned in the report is a Life Sciences Cluster which would include CIMB, ChBE, CHEM, MCDB, IPHY, Neuroscience, IBG and IBS and was proposed to occupy 3 buildings totaling 400K assignable sq.ft. Of this group, CIMB, ChBE and the Biochem division of CHEM have moved to JSCBB on the East Campus, Neuroscience (as well as some IPHY labs) has moved to a newly renovated WILD, a new building was constructed for IBS on main campus and a new wing of RMLY is planned for IPHY (although IPHY will still be spread across multiple buildings on main campus as well as East Campus and WILD). Consequently, the fate of the proposed life sciences cluster is unknown. Therefore, how IBG will meet its essential space needs in the near future remains unclear.

9.3 Staff needs

We currently have 4.0 staff positions total (not including the Chief Financial Manager), of which IBG pays for 3.5 from our DA-ICR and the general fund pays for 0.5 position. With the addition of new faculty members over the next several 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 two administrative positions: one currently held administrative position and a new position following our

next faculty recruitment. That would provide a total of five staff positions: 2.5 general fund positions and 2.5 FTE positions paid by IBG"s DA-ICR.

Question 10: Online initiatives

The Institute does not yet teach any online courses, although many of our offerings make use of online materials and/or materials distributed electronically.

Perhaps the best illustration of this comes from our NIH-supported annual week long workshop on Statistical Genetic Methods for Human Complex Traits. For each workshop, all materials used in the workshop, including all presentations, computer scripts, and example datasets are placed in the public domain via the workshop website at https://www.colorado.edu/ibg/workshop . All analysis software used in the workshop, including widely used genetic analysis software packages such as OpenMx, umx, R, QTDT, PLINK, Metal, MAGMA, FUMA, Haploview, Hail, and many more, are made available free from the appropriate websites. A complete list of software and links is provided after each workshop, for example at https://ibg.colorado.edu/dokuwiki/doku.php?id=workshop:2018:cdrom

This does not yet have all the characteristics of an online course, but these materials are the essential building blocks for such a course. Indeed, courses taught in the IBG graduate program, e.g. PSYC5242 Biometrical Genetics, do make use of these materials.

Question 11: Outreach initiatives

In addition to faculty participation in various outreach activities on an ad hoc basis, such as judging high school science competitions, involvement in a Community Liaison board for the Adolescent Brain and Cognitive Development (ABCD) study, and media outreach through news releases and interviews, the Institute's most significant outreach to the general public is through its human research programs that bring several thousand Coloradoans into contact with the University each year, in many cases in face-to-face interviews or in-person testing and often on the CU Boulder campus. Institute researchers are fully aware that they represent the University with each contact, and we are often reminded of this informally when we encounter members of the public who comment that their family has participated in this or that study run by IBG. These research programs are usually longitudinal --- in some studies, like the Longitudinal Twin Study and the Colorado Adoption Project, we have worked with hundreds of Colorado families for as long 30 years or more. Participants receive birthday and/or holiday cards, and newsletters providing information about the research findings. These efforts represent a unique kind of outreach that we hope complements the many other kinds of activities more usually associated with the term.

Question 12: Budget

12.0 Overview

With the exception of AY salaries for TTT faculty rostered in the Institutes, and 1.5 non-faculty positions, IBG is funded from its external grants and a proportion of the indirect costs recovered from those grants (ICR).

12.1 IBG's current budget model:

IBGs 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 45-50 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 seven years, the total expenditures for those projects have averaged $7.0 million and netted an average of $1.76 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 seven-year average across these various accounts is around $510,000 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 these funds in the past 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, in some instances, undergone 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 is 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 the Chief Financial Manager of IBG which are paid by the university and dispersed in separate general fund accounts.

By agreement between the Director and the Vice Chancellor for Research and Innovation, if any of the nine IBG faculty members who are rostered in the Institutes can 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.

Faculty salary savings have in the past 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. 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 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 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 CU supercomputer; or upgrades to the genotyping facility ($150,000+).

As with faculty salary savings, DA-ICR funds have also contributed towards paying for construction projects, new faculty start-up, and remodeling of laboratory space. A portion of DA-ICR is returned to individual faculty and researchers based on how much of these they generated. During the past year, $60,000 of DA-ICR was returned to individual faculty or researchers. The proportion received by each PI is equal to the proportion of total IBG ICR generated by the PI in the most recent grant accounting year. 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.

12.2 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 transferred to the general fund accounts at the close of the academic year.

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

These resources are adequate to meet some program needs, but do not ensure financial stability or allow for sustaining the program at high levels or for growth and development. Additional resources are needed immediately in several areas outlined below.

12.3.1 Administrative staff

IBG spends over $165,000 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 and grant coordination. 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 addition of one new faculty member and one faculty recruitment in process, our administrative staffing may need to increase to accommodate the expected increase in purchasing, payroll, and other administrative needs.

Additional support from CU for two permanent administrative staff would alleviate some of this financial burden and allow us to plan for a stable level of staffing.

12.3.2 Student support

The need for additional assistance from CU becomes even more necessary, given the fact that IBG has been required to absorb a major portion of **the costs for students in our Predoctoral Training Program, $80,000 annually.**

Although IBG has two NIH-funded training grants that fund 8 students in our training program, we spend an additional $80,000 per year supporting these students. To maintain equity among all students, IBG supplements stipend amounts for students on training grants up to the campus minimum level, and also offers summer support for those students not on training grants. 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.

Unfortunately, IBG can no longer afford to appoint out-of-state graduate students during 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, historically black, universities, may not be comfortable with a teaching assistantship at CU right out of their undergraduate programs.

These problems would be mitigated 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.

12.3.3 Start-up costs and faculty recruitment

Under the current model, the primary source of funding for faculty recruitment and start-up costs is the accrued surplus from our operating budget. On only one occasion in the past 16 years (since the current Director was appointed) have funds external to IBG been used for start-up (although they have been offered on one other occasion). Essentially, our ability to recruit outstanding faculty is limited by our ability to save money on operating costs in advance of such recruitment. Currently, we can afford only $300,000 per recruitment, when competitors are offering $600,000 to as high as $2,000,000. At present, we are unable to recruit in the area of animal model research because of the very high costs associated with their laboratory work.

This issue is not unique to IBG and it needs a University-wide solution. The current model for funding faculty start-up costs puts us at a distinct disadvantage in faculty recruitment. Our operating budget model is completely inadequate for this purpose.

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

We currently have 4.0 staff positions total (not including the Chief Financial Manager), of which IBG pays for 3.5 from our DA-ICR and the general fund pays for .5 positions. With the addition of two new faculty members over the next year (including our newest hire this fall), 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 two administrative positions: one currently held administrative position and a new position within fiscal year 2020, following our next faculty recruitment. That would provide a total of five staff positions: 2.5 general fund positions and 2.5 FTE positions paid by IBG's DA-ICR.

With regard to the increased costs associated with our predoctoral training program, we 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 ask that this program be extended to holders of federally-funded training grants. This would allow us to appoint first year students to our training grants and thereby help to increase student diversity in our program by making our program more attractive to a broader applicant pool.

Finally, we advocate for a University-wide change in the sources of funds to provide start-up packages for faculty recruitment. One proposal might be that from the 71% of ICR that the University retains, some proportion, perhaps 25%, is saved on behalf of each Unit for its future start-up costs.

Question 13: Unit Climate.

Based on surveys conducted by ARPAC early in 2018, the climate at IBG is overall very positive. The summary data on general `treatment with respect' and positivity of social and professional climate are given below. There are some individual concerns in some categories. We might speculate that further progress in diversifying faculty --- more women and faculty of color --- might help improve this situation. We are currently expecting progress through hiring and appointment of active Faculty Fellows during this academic year.

Summary of survey responses. Percentage of respondents (excluding Don't Know/NA) who Strongly Agreed or Agreed with:

	Faculty Fellows	**Graduate Students**	**Staff, including PRAs**
I am treated with respect by:			
the Institute Director	100		97
My graduate advisor		100	
My IBG colleagues/IBG faculty	100	94	97

Institute staff	100	100	94
Students	100	94	97
The social and professional climate is generally positive for:			
Faculty members of all ranks	100		
Women faculty members/graduate students/staff	100	83	94
Faculty members/graduate students/staff of color	100	86	96
Faculty members/graduate students/staff of different sexual orientations	100	100	100
Faculty members/graduate students/staff regardless of political affiliation	100	83	96
Faculty members/graduate students/staff of different religious views	100	100	96
Graduate students from countries other than the U.S.		100	

In response to more detailed questions, all but one (out of 25 Faculty Fellow respondents) did not endorse `one or more faculty members say things or behave in ways that intimidate' other faculty members, staff members, or staff. No faculty endorsed `Faculty incivility is having a disruptive effect on institute functioning', 92% thought IBG faculty were friendly and supportive of one another, and 83% feel like a valuable member of the unit. Three of 25 respondents `feel excluded from informal networks in IBG', but 96% said there is a positive sense of community in IBG.

Among graduate students, two (out of 18 graduate student respondents) endorsed `one or more IBG faculty members say things or behave in ways that intimidate' graduate students, but 6 of them endorsed `one or more IBG graduate students say things or behave in ways that humiliate or intimidate other graduate students'. However, only one respondent and two respondents respectively thought that this faculty or graduate student incivility is having a disruptive effect on institute functioning. All graduate student respondents thought that IBG faculty members were friendly and supportive of one another, all but one felt that they were friendly and supportive of graduate students, and all but one thought that graduate students were friendly and supportive of one another. 78% felt like a valued member of IBG, 86% did not feel excluded from informal networks at IBG, 94% reported a positive sense of community in IBG.

In a similar survey of the graduate students was conducted in January 2019 by the Internal Review committee, They commented: Although a 2018 climate survey indicated 88.3% of graduate students agreed that there was a strong sense of IBG community, this number dropped to 63% in the most recent graduate survey in 2019. IBG should examine the surveys for the possible cause(s) of this disparity and address several graduate student suggestions related to the curriculum and journal club.' We were surprised by this result as we also surveyed our graduate students in October 2018, as part of our self-study. We did not repeat that specific climate question, but logged a high level of satisfaction with program. However, we also noted some specific suggestions about the curriculum and the journal club. We are implementing a new course this Fall (2019) specifically to begin to address the curriculum needs, and are making changes to our journal club format,

following an open forum we held on January 25th, 2019, to discuss this. Unfortunately, ARPAC does not share qualitative responses to the internal reviewers' survey, and so we aren't able to get any additional insights from those. We were informed that that concerns were expressed about sexual harassment at the field's national conference. `While this does not appear to be a problem that arises from the behavior of members of the Institute itself, the unit's strong presence in the field suggests that it should take a leadership role in mitigating the problems.' We note that IBG developed its own `Guidelines for positive, inclusive, and responsible conduct' that are posted, since 2017, on our website at

https://www.colorado.edu/ibg/about-ibg/guidelines-positive-inclusive-and-responsible-conduct

These mirrored those developed in the context of our annual statistical genetics workshop, e.g. for the 2019 workshop they are at:

https://www.colorado.edu/ibg/international-workshop/2019-international-behavioral-genetics-workshop/guidelines-positive-inclusive

For the 2017 workshop and subsequently, this statement is also included in the information packet and the local host (Hewitt) draws attention to it specifically in his introductory remarks to the workshop. He developed the statement in consultation with OIEC in attempt to be proactive, and shared it with BGA ExCom when they were developing their own guidelines that would apply to their national conference.

Additionally, we are now working with OIEC to provide Bystander Intervention Training for faculty and students.

Among staff and PRAs, five (out of 32 respondents) endorsed `one or more IBG faculty members say things or behave in ways that intimidate' staff, and three of them endorsed `one or more unit staff members say things or behave in ways that humiliate or intimidate other staff members'. However, only three respondents and two respondents respectively thought that this faculty or staff member incivility is having a disruptive effect on institute functioning. All but three staff respondents thought that IBG faculty members were friendly and supportive of one another, and all but one felt that staff members were friendly and supportive of one another. 82% felt like a valued member of IBG, 79% did not feel excluded from informal networks at IBG, 89% reported a positive sense of community in IBG.

Summary

Overall, these anonymous survey responses suggest that IBG Faculty, students, and staff are treated with respect, there is a positive social climate for all groups, civility prevails, and there is a supportive and cordial environment.

However, there are several individuals who do not agree with all aspects of that positive summation, and IBG should address individual concerns as they arise. Trainees should be encouraged to talk about perceived issues or suggestions for improvement with our Training Committee, faculty postdoctoral liaison, or the Diversity and Engagement Committee or the Director. Staff should also be encouraged to talk with their supervisors and/or the Director. There are also concerns about conduct at national meetings, and we are working with OIEC to address these. Faculty have a highly positive view of the climate at IBG. Faculty Fellows who might have suggestions for improvement in specific areas can bring these to faculty meetings or talk to the Director.

Question 14: Inclusiveness

IBG defines inclusive excellence as the identification of inequities that serve as obstacles to student success and the implementation of educational and institutional practices aimed at rectifying inequities. It is defined at IBG as a commitment to identify, recruit, and promote 'diversity' in its scientific and outreach efforts. Diversity broadly defined is differences between individuals based on

ethnicity and nationality, socio-economic background, gender or sexual orientation, as well as cultural, political and religious affiliation.

The Institute's website prominently displays our statement on `Guidelines for positive, inclusive, and responsible conduct' at:

https://www.colorado.edu/ibg/about-ibg/guidelines-positive-inclusive-and-responsible-conduct

> `At IBG, we are committed to inclusiveness, non-discrimination, and fostering a positive climate that promotes excellence, respect, and responsible conduct in our teaching, research, and our professional and social interactions.
>
> All of our trainees receive training in the Responsible Conduct of Research covering such topics as protecting human subjects, data sharing, authorship, rigor and reproducibility, and truthful reporting.
>
> We are also committed to creating a positive social climate that is welcoming for everyone and promotes successful learning and professional development. We are therefore intolerant of any form of unfair treatment, abusive or demeaning words or expressions, or intimidating behavior aimed at others on the basis of race, color, national origin, disability, age, sex, pregnancy, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation, or political philosophy; and we are committed to maintaining a safe and respectful environment for all IBG personnel, free from discrimination and harassment, sexual or otherwise.
>
> We are proud of the diverse and international character of our Institute, and we ask that faculty, staff, and trainees be polite, friendly, and respectful in all of their interactions. Our demonstrated success, over 50 years since our founding in 1967, can be eroded through inconsiderate treatment of others. Valuing individuals and their contributions and working to earn the respect of others underlies the success of our Institute.
>
> If you feel that these guidelines are not being followed, or have concerns about your experience at IBG, please bring them to the attention of the Director, Prof. John Hewitt, or contact the University of Colorado Office of Institutional Equity and Compliance at
>
> http://www.colorado.edu/institutionalequity/contact-us
>
> Thank you, and we wish everyone success in their endeavors.'

To help ensure that we are doing all we can to promote diversity at all levels of the Institute, in 2011 we established a Committee on Diversity and Engagement. The committee consists of five members including a Faculty Fellow, and representatives from among our post-docs and research associates, professional research assistants, staff members, and graduate students. This committee has a budget to allow members to travel to appropriate meetings or events that promote diversity.

Since 2011, IBG has made some progress to improving diversity in both graduate student and faculty areas. Currently, 59% (10 out of 17) of our graduate students are female. However, only one graduate student identifies as minority, while 43% (3 out of 7) of our postdocs identify as minority. One of this year's graduates identified as LGBTQ. Two of our current faculty members were recruited since 2011, one is female and one is of Hispanic descent. If successful, our pending recruitment will add another female, bringing female representation among the Institute-rostered faculty to 33%. Finally, an ongoing recruitment effort through the College of Arts and Sciences may yield a new faculty member who will be IBG's first African American Faculty Fellow.

We continue to strive to make improvements in our recruitment of diversity and underrepresented minority student candidates. This has taken the form of faculty participation in SACNAS meeting, presentations at minority socials at the annual Society for Neuroscience Meeting, and participation in both the Colorado Advantage initiative and the CU-Boulder Diversity & Inclusion Summit (2018). We have consistently participated in the University's SMART (Summer Minority Access to Research Training) program that brings undergraduate students to CU and has led in the past to successful recruitment of minorities into our graduate program --- one such alumn may well end up as the new faculty recruit alluded to above, a fitting culmination to one of our decades-long efforts to recruit minorities at IBG.

The Table below represents IBG's current Gender and Ethnic Diversity. IBG is very excited to embrace the University's Inclusion, Diversity and Excellence in Academics (IDEA) Plan, and looks forward to participating fully in its implementation.

Gender Diversity

Category	IBG / Grad School Rostered Faculty	IBG Other Faculty	IBG Emeriti Faculty	Research Associates	Postdocs & Fellows	Graduate Students	Graduate Students (break down) Trainee support Unpaid/TA/T32	Professional Research Assistants	Classified /University Staff	Student Hourlies	Totals
Male	6	17	3	4	5	7	0/1/6	5	1	0	48
Female	2	3	2	5	2	10	2/6/2	21	4	7	56
Total	8	20	5	9	7	17	2/7/8	26	5	7	104
proportion female	0.25	0.15	0.4	0.56	0.29	0.59	0.59	0.81	0.8	1	0.54

Ethnic Diversity

Category	IBG / Grad School Rostered Faculty	IBG Other Faculty	IBG Emeriti Faculty	Research Associates	Postdocs & Fellows	Graduate Students	Graduate Students Trainee support Unpaid/TA/T32	Professional Research Assistants	Classified Staff	Student Hourlies	Totals
Asian/Asian American		1		1	1			1		1	5
Pacific Islander											0
Native American											0
African American					1					2	3
Caucasian	7	19	5	8	4	16	2/6/8	23	5	3	90
Hispanic	1					1	0/1/0	2		1	5
Foreign minority					1						1
Total	8	20	5	9	7	17	17	26	5	7	104
proportion minority	0.125	0.05	0	0.11	0.43	0.06	0.06	0.12	0	0.57	0.13

Question 15: Mentoring

The mentoring and research training of junior researchers and faculty is an integral part of the formal mission of IBG, and to date, all junior institute faculty have been successful in securing tenure in their home departments. This success is due in part to the support that junior faculty receive from the Institute. 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 33,400 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 three 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 a formal mentoring program (see 15.1), and the current junior faculty have their academic tenure homes in Psychology and Neuroscience, Integrative Physiology, and Ecology and Evolutionary Biology. On appointment, new faculty identify one mentor from among the IBG graduate school rostered faculty and one from within their tenure home department. The goal is to provide guidance towards meeting the expectations of both IBG and the tenure home department.

3) Training Grants.

IBG currently has three training grants from the NIH that support funding for graduate students and postdoctoral researchers. IBG also provides additional financial support for graduate students including summer stipends and travel funds for students not on training grants. The training grants and other financial support 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.

Administrative support.

IBG provides "full service" grants coordination support, with two full time staff dedicated to the preparation, organization, and submission of grant applications, as well as similar support for post award progress reporting. This is clearly an important resource for IBG faculty that is not provided in all other units.

Technical support

IBG technical facilities include a core genotyping and sequencing laboratory, rooms for human testing and hard copy data archives, use of the mouse breeding facilities in the Biofrontiers Building, 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.

15.1 IBG policy on mentoring of junior faculty

The faculty mentor is appointed by the Director of the Institute prior to the new faculty member's arrival on campus. However, at the request of the mentee, a different faculty mentor can be appointed. The duties of the mentor are as follows:

1) 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. Prior to tenure, annual meetings may be sufficient, but more frequent meetings are encouraged as appropriate. 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 his or her 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 personalized career advancement including: dates for starting teaching responsibilities, submission of materials for reappointment and tenure reviews and deadlines for requesting tenure - clock stops (e.g. parental leave).

2) 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.

3) 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), contribute service to manuscript and grant reviewing, and so become visible at the national and international level in his or her field.

15.2 Additional resources

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

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 (FTEP). 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 (FSAP). 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.

15.3 Junior faculty success

As a matter of record, no Institute-rostered IBG faculty member has failed to achieve tenure in his or her tenure-home department, a record that is far better than that for non-Institute departmental faculty. The reasons for this success are complex and difficult to identify, but likely contributors are: the availability of Institute support and resources, a culture that encourages research collaboration, and one that explicitly places the highest priority on establishing an externally funded research program. We are proud of the mentoring our junior faculty receive, and the success they have achieved.

Question 16: Bylaws

CONSTITUTION OF THE INSTITUTE FOR BEHAVIORAL GENETICS (IBG)

I.MISSION

The mission of the Institute for Behavioral Genetics (IBG), established in 1967 by the University of Colorado Board of Regents, is to conduct and facilitate research on the genetic bases of individual differences in behavior and to conduct research training in this interdisciplinary area.

II.ORGANIZATION

IBG, as a unit of the University of Colorado at Boulder (UCB), is subject to the Rules of the Regents, the po1icies of the University, and the Institute's By-Laws. The Director of IBG is its principal executive officer and is responsible for its overall leadership. A Directorate, composed of the Director and all IBG Faculty Fel1ows, is responsible for planning and performing the research and educational programs of IBG and ensuring stability of these programs. IBG, through its Director, reports to the Vice Chancellor for Research and Innovation. (hereafter referred to as the Vice Chancellor).

III.BY-LAWS

Internal regulations and more detailed operational procedures for IBG are specified in the By-Laws adopted by the Directorate and approved by the Vice Chancellor. Changes to the By-Laws require written notice of motion to be submitted and circulated to all Faculty Fellows at least two weeks prior to the meeting of the Directorate at which they are to be considered. An absentee or electronic ballot will be provided for any member who is unable to attend such a meeting. Changes to the By-Laws require approval by a two-thirds majority of the Directorate in a written or electronic, secret ballot, and will not take effect until approved by the Vice Chancellor. If the Vice Chancellor does not approve the recommended changes in the By-Laws, the Directorate may appeal directly to the Provost and Vice Chancellor for Academic Affairs.

The procedures for appointing IBG Faculty Fellows, the Director, and other IBG personnel, are detailed in the By-Laws. Participation in IBG is open to University faculty and other scientists based upon their credentials and on the formal criteria specified in the By-Laws.

BY-LAWS OF THE INSTITUTE FOR BEHAVIORAL GENETICS (IBG)

I. ADMINISTRATIVE STRUCTURE

A. Directorate

The Institute is organized in the form of a Directorate composed of the Director and the IBG Faculty Fellows. The Directorate is responsible for designing, initiating, and carrying out the research and educational programs of the Institute, for ensuring continuity in the nature of the scientific tasks and in the resources for conducting them, and for coordinating the work with relevant University of Colorado units and external organizations.

1. The Director is the principal executive officer and appointing authority, responsible for the overall leadership of the Institute within the Rules of the Regents, the policies of the University, and the By-Laws of the Institute. The Director reports to the Vice Chancellor for Research and Innovation (hereafter referred to as the Vice Chancellor) on matters pertaining to the Institute's administrative, management, research, and teaching programs. The Director shall be rostered in the Institute and shall also be a member of an academic unit in which he or she has a professorial appointment. The Director is the official spokesperson and representative of the Institute and may appoint an Acting Director during periods of absence.

2. IBG Faculty Fellows are appointed by the procedures outlined in Section II of the By-Laws. A Faculty Fellow's position (full-time-equivalent: FTE) may be rostered, either wholly or in part, in IBG or in a cognate academic unit.

B. Other IBG Personnel

1. Research Professors

IBG Research Professors are appointed by the procedures outlined in Section II of the By-Laws.

2. Research Associates and Senior Research Associates

Research Associates are appointed by the appropriate Principal Investigator or Faculty Fellow sponsor with the concurrence of the Director. Senior Research Associates are Research Associates who have met the requirements described in Appendix 1 (Criteria for promotion to Senior Research Associate). These are University titles and must be approved by the Vice Chancellor for Research.

3. Staff

The IBG staff comprises:

a. State-funded support positions in the State Personnel System and professional exempt class.

b. Grant- or contract-funded positions of an administrative, support, or research nature in either the State Personnel System or the Special Faculty (e.g. Professional Research Assistant or Senior Professional Research Assistant) category.

4. Graduate Research Assistants

Research Assistants are appointed by the appropriate Principal Investigator with the concurrence of the Director.

5. Graduate Students (not Graduate Research Assistants)

Graduate Students who are not Research Assistants, but who are under the direction of the IBG faculty, may also affiliate with IBG upon the recommendation of the faculty sponsor and with the concurrence of the Director.

C. Visiting Professors and Visiting Fellows

Visitors to the Institute may, upon the recommendation of the Directorate, be accorded the Title "Visiting Fellow" or designated "Visiting ---" (academic title indicating the visitor's rank at his or her home institution) as specified in Part II, Section 3, of the University of Colorado Faculty Handbook.

II. APPOINTMENTS

A. Directorate

1. Faculty Fellows

At least once a year the Directorate will meet to discuss applications for membership in the Institute. Membership as a Faculty Fellow is awarded for a term consonant with the need of the Institute and the need of the candidate, but shall in no case be longer than for a five-year term. Members may be considered for additional terms so long as their needs and interests and those of the Institute remain consonant. Accommodations will have to be made between those academic units involved and IBG when a faculty FTE is rostered either wholly or in part in the Institute. It is understood that membership is limited to the number of people that the resources of the Institute can help support. Recommendations for membership are forwarded to the Office of the Vice Chancellor for final approval.

IBG Faculty Fellows conduct research in IBG and may be salaried (either wholly or in part) through IBG or through another academic unit. The academic units involved are encouraged to facilitate released-time arrangements for IBG Faculty Fellows.

B. The procedures for appointment, reappointment, non-reappointment, termination, and dismissal of faculty at UCB are defined in the University of Colorado Faculty Handbook, under Principles & Policies Related to Appointment, Reappointment, Promotion and Tenure.

2. Director

a. Selection and Appointment of a Director

When the selection of a Director is to be made, the IBG Faculty Fellows will establish or constitute themselves as a search committee which will work according to UCB affirmative action procedures. The Fellows shall submit the name of their nominee to the Vice Chancellor, who shall make the final determination.

As the Directorship carries an FTE position with it, accommodations will have to be made between the academic units involved when a new Director replaces a Director from a different unit.

The Director is appointed by the Vice Chancellor for a four-year term, with the concurrence of the Associate Vice Chancellor for Faculty Affairs and subject to approval by the Chancellor of the University of Colorado at Boulder. The Director is eligible for reappointment following the procedures outlined above (Section II, A, 2, a). The Director shall have a professorial appointment in an academic department and shall hold research credentials relevant to the Institute's mission.

b. An Acting Director may be appointed by the Director from among the IBG Faculty Fellows during periods of absence.

c. In the event of incapacity, death, or resignation of the Director, the IBG Faculty Fellows will recommend to the Vice Chancellor the appointment of an Interim Director, pending the appointment of a new Director. Procedures for the selection and appointment of a new Director must be started expeditiously.

B. Other IBG Personnel

1. Research Professors

Criteria and procedures for the appointment of Research Professors are the same as those employed for appointment of IBG Faculty Fellows. This policy is subordinate to that described in the document, "Faculty Research Titles: Boulder Campus Implementation Policy."

2. Research Associates and Senior Research Associates

Appointment of Research Associates (subject to the concurrence of the Director) are at the discretion of the Principal Investigator or Faculty Fellow sponsor, who may stipulate the conditions of the award appropriate to a particular grant or contract. Senior Research Associates are Research Associates who have met the requirements described in Appendix 1 (Criteria for promotion to Senior Research Associate). These are University titles and must be approved by the Vice Chancellor.

3. Staff

Staff appointments are made in accordance with the appropriate State and University regulations, contingent upon availability of funds.

4. Graduate Research Assistants

Appointment and reappointment to Graduate Research Assistantships (subject to the concurrence of the Director) are at the discretion of individual Principal Investigators, who may stipulate conditions for the award appropriate to a particular grant or contract. Research support may not be offered prior to acceptance of the student by an academic unit of the University.

5. Graduate Students (not Graduate Research Assistants)

Graduate Students affiliated with IBG may hold Fellowships, Traineeships, or Teaching Assistantships. Their appointment to such positions is the responsibility of the relevant awarding body.

III. ANNUAL EVALUATION

A. Directorate

1. Director

Evaluation of the Director will be made by the Vice Chancellor..

2. Faculty Fellows and Research Professors

Each year during the Spring Semester, Faculty Fellows and Research Professors rostered in the Graduate School shall provide the Director with a copy of his or her Faculty Report of Professional Activities). Evaluations by the Director based upon this information, and the recommendations of the IBG Salary Committee, may be provided to the heads of the cognate academic units for their consideration concerning tenure, promotion, or salary adjustment decisions, and will also be provided to the Vice Chancellor.

B. Other IBG Personnel

1. Research Associates and Senior Research Associates

Research Associates and Senior Research Associates are evaluated annually in writing by their supervisor or the Principal Investigator of the grant or contract on which they are employed. The annual evaluation forms part of the Research Associate’s or Senior Research Associate’s personnel file. The renewal of such appointments is conditional upon satisfactory performance and contingent upon availability of funds. In the event that the Research Associate or Senior Research Associate is Principal Investigator, the Faculty Fellow sponsor is responsible for this evaluation.

2. Staff

Staff are evaluated annually in writing by their supervisors. Procedures for evaluation and requirements for notifying staff of the results will follow the most current rules appropriate for their status (professional exempt, classified, professional research assistant).

3. Graduate Research Assistants

Graduate Research Assistants are evaluated by the Principal Investigator of the grant or contract on which they are employed. The renewal of such assistantships is conditional upon satisfactory performance and contingent upon the availability of funds.

4. Graduate Students (not Graduate Research Assistants)

Graduate Students who are not employed as research assistants are evaluated according to the procedures of the academic unit in which they are registered for an advanced degree.

IV. PROMOTION AND TENURE

A. Rules for tenure of faculty members rostered in the Graduate School and promotion of Research Professors follow the University of Colorado Faculty Handbook, under Principles & Policies Related to Appointment, Reappointment, Promotion and Tenure. Tenure normally resides in an academic department, and therefore tenure and promotion is the responsibility of the academic department.

Promotion of Research Associates to Senior Research Associates is at the discretion of the supervising Faculty Fellow, subject to University policy, the criteria set out in Appendix 1, and the concurrence of the Director.

V. RESEARCH ORGANIZATION

New proposals for research by Faculty Fellows and Research Associates which would use IBG resources are submitted to the Director for initial approval in abstract and outline form, including budget information, prior to their submission to the Office of Contracts and Grants. Particular attention will be paid to their relevance to the Institute's mission. Budgets are to be developed in consultation with the Institute's Administrative Officer (currently the Assistant Director) so as to ensure essential support for Institute facilities, staff positions, and Graduate Students according to any guidelines that may be enacted by the Directorate. The Director is administratively responsible for expenditures on research grants and contracts administered through IBG. The Principal Investigator (PI) on a grant or contract is directly responsible for all expenditures made from grant monies awarded to the Regents in the name of the PI.

Fellows of IBG discharge their special responsibility for graduate education by supervising and guiding Graduate Student research, independently or in group projects, and by teaching formal courses in their respective academic units. As an important teaching responsibility, Faculty Fellows provide a series of courses tailored to the general mission of the Institute. IBG Faculty Fellows contribute to the formal graduate and undergraduate programs of their academic units by teaching courses and serving on thesis, dissertation, and other departmental committees.

All courses taught by IBG Faculty Fellows are evaluated by the standard procedures of the academic units in which they are offered.

VII. FINANCES

The Director is administratively responsible to the Vice Chancellor for all expenditures within IBG accounts.

General fund budgets and allocations are prepared by the Director.

VIII. MEETINGS OF THE DIRECTORATE

Meetings of the Directorate are chaired by the Director or his/her designee and will usually be held at least once each semester or more frequently as required.

A quorum for a meeting of the Directorate consists of one quarter of the Directorate , not counting for this purpose Faculty Fellows on leave or retired, although those individuals may attend and vote. Items moved and seconded for consideration in any meeting are voted on and will carry by a simple majority vote of the members of the Directorate present, except as specified below:

A. Changes to the By-Laws

Changes to the By-Laws require written notice of motion to be submitted and circulated to all Faculty Fellows at least two weeks prior to the meeting of the Directorate at which they are to be considered. An absentee or electronic ballot will be provided for any member who is unable to attend such a meeting.

Changes to the By-Laws require approval by a two-thirds majority of the Directorate in a written, secret ballot and will not take effect until approved by the Vice Chancellor. If the Vice Chancellor does not approve the recommended changes in the By-Laws, the Directorate may appeal directly to the Provost and Vice Chancellor for Academic Affairs.

B. Requests for Written, Mail, or Electronic Ballots

For items moved and seconded for consideration, a written ballot will be held at the request of any member.

Also, for any item in which a vote by the quorum could be nullified by a vote of the full Directorate, a mail or electronic ballot may be requested by any member present.

IX. COMMITTEES OF THE DIRECTORATE

Members of IBG standing committees and their chairpersons are appointed by the Director. New committees may be created, or current committees disbanded, by the Directorate.

A. The IBG Research Program Committee is responsible for advising the Directorate regarding space and facilities allocations, requirements, utilization, and acquisition; fostering collaborative research; and other duties as may be assigned from time to time by the Director.

B. The IBG Training Program Committee is responsible for advising the Directorate regarding changes in training program requirements, selection of trainees, monitoring the progress of IBG trainees, and other duties as may be assigned from time to time by the Director.

C. The IBG Salary Committee is responsible for advising the Director on the evaluation of tenured or tenure-track faculty rostered in the Graduate School, and making recommendations for the distribution of merit raises among those faculty.

D. The IBG Committee on Research Faculty Appointments and Titles is responsible for making recommendations about the promotion of Research Faculty from Research Associate to Senior Research Associate and from Professional Research Assistant I to Professional Research Assistant II to Senior Professional Research Assistant.

E. The IBG Information Technology Committee advises the Directorate on information technology policies, procedures, and infrastructure that supports the common activities of the Institute.

Revised: 06-03-2011, as amended 12-01-2018 (without faculty vote) to update Administrative Titles as needed.

Appendix 1. Criteria for promotion to Senior Research Associate.

The criteria for this title will normally include the following: a minimum of five years employment at IBG, a minimum of five years since award of the PhD, and the competitive acquisition of peer reviewed funding. In addition, note may be made of other accomplishments, including publication record, supervisory capacity, listing as co-investigator, and teaching or service contributions. The positive recommendation of the supervising Faculty Fellow is required for promotion to the Senior Research Associate title. The final decision on any recommendation rests with the Vice Chancellor, and requires the submission of: current cv, two letters of reference, and a letter from the Director stating the Institute's support of the recommendation, and explaining the Institute's criteria and how the individual has met them.

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 17: Assessment

17.1 Undergraduate.

IBG does not administer an undergraduate program. However, IBG rostered faculty members contribute to the undergraduate teaching missions of the Department of Psychology and Neuroscience, Integrative Physiology, and Ecology and Evolutionary Biology. 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 both Psychology and Neuroscience, and Integrative Physiology, IBG faculty members teach undergraduate statistics (~100 to 120 students per classroom). In Integrative Physiology we teach a unique course in Physiological Genetics and Genomics and a course in Immunology. In Ecology and Evolutionary Biology, our most recent faculty member will teach a course in Quantitative Biology. Graduate-rostered IBG faculty also contribute to undergraduate education by providing research experience. At any given time, there are approximately 25-30 undergraduates gaining research experience at IBG. The majority of undergraduates that participate in research at IBG do so as volunteers while some conduct research for Independent Study credit or are paid either through an internship (BURST, HHMI, UROP, etc.) or by grant funds. Several of these students have completed Honor's thesis based on their research in an IBG lab.

17.2 Graduate.

IBG is not a degree-granting unit. Therefore, graduate students that work with IBG faculty must complete the requirement of their respective home academic departments. Learning outcomes assessment within the departments is through comprehensive/preliminary exams, dissertation defense and other items that are specific to departments and even areas of specialty within departments.

Although not a degree-granting unit, IBG does offer a formal Graduate Interdisciplinary Certificate Program In Behavioral Genetics. As indicated on the prospective student tab of the IBG website (https://www.colorado.edu/ibg/prospective-students), "IBG trains graduate students in research on the nature and origins of individual differences in behavior". For assessment relating to the certificate program, students meet annually with an advisory committee that consists of their advisor and two additional IBG faculty chosen by the student in consultation with their advisor. During this advisory meeting, the student and committee discuss progress towards completion of the certificate as well as PhD program. This not only includes discussion of completed requirements, but also development of plans for future coursework, research, etc. These meetings are aided by a check-list that the student must complete prior to the meeting. The checklist can be downloaded from the IBG website (https://www.colorado.edu/ibg/sites/default/files/attached-files/ibg_certificate_program_checklist-2016.pdf) and includes all requirement for the certificate.

Although students have been asked to prepare individual development plans (IDPs) for the past several years, there was no formal IDP so each student's IDP differed significantly in form and content. Beginning this fall, IBG is implementing a standard individual development plan (IDP) for all students. The IDP will initially be completed as students enter the program and will be discussed annually during advisory committee meetings. The IDP will supplement the checklist and will be used to assess progress towards broader goals than specific coursework, etc. For example, the IDP will address goals such as has the coursework taken by a student helped them achieve a particular learning goal or has their training helped in other aspects of their goals (writing competitive grant proposals, teaching, etc.).

Every year students also submit annual progress reports to the IBG graduate training committee in early January. In addition, IBG recently instituted the requirement that all IBG trainees submit advisor-approved summer training plans to the graduate training committee in April. In the fall, the summer training plans are updated to indicate actual accomplishments. Based largely on the annual progress report, the committee evaluates each student's progress based on completed coursework, publications, presentations, awards and participation in the program (attending journal clubs, seminars, etc.). This evaluation process not only helps recognize top students for training grant positions but also helps identify any potential concerns for individual student progress.

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. Over 170 students have graduated from the program and based on our tracking surveys, greater than 90% of graduates have research-related careers in academia, government, or private industry.

Lastly, we have recently developed a formalized tracking procedure that will allow us to connect with our graduates This is done on a four-year cycle by mailed questionnaire. The questionnaire can also be accessed via our website. In addition to obtaining current position information, the survey asks graduates about the IBG training program. This feedback will be important for maintaining connections and 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.

Question 18: Centers

IBG currently does not have any formal Centers that need to be reauthorized.

It does recognize two Centers that correspond to NIH Center grants currently or previously funded: the Colorado Learning Research Center, funded by P50 HD027802 from the National Institute of Child Health and Human Development, and the Center on Antisocial Drug Dependence previously funded by P60 DA011015 from the National Institute on Drug Abuse. However, neither of these has formal Center status.