Institute for Behavioral Genetics

50 years of excellence

1967–2017

Institute for Behavioral Genetics

UNIVERSITY OF COLORADO **BOULDER**

Institute for Behavioral Genetics

50 years of excellence

1967–2017

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.

IBG is one of the top research facilities in the world for genetic research on behavior. Data collection and analysis are ongoing for several internationally renowned studies, including the Colorado Adoption Project, the Longitudinal Twin Study, Colorado Twin Registry, the Colorado Learning Disabilities Research Center, the Colorado Center on Antisocial Drug Dependence, and the Adolescent Brain and Cognitive Development (ABCD) study. IBG is home to one of the nation's largest DNA repositories for genetic research on detailed, longitudinal studies of human behavior, and houses a wide array of behaviorally and genetically defined lines of selected, transgenic, knock-out and knock-in mice.

Throughout its history IBG has been characterized by the breadth of its interdisciplinary research and training programs. Although the methodology of behavioral genetics is generally applicable to the study of individual differences for any characteristic, research at IBG is focused on behaviors of societal relevance. Current research includes studies of aging, neurodegenerative disease, psychopathology, reading and learning disabilities, substance abuse, behavioral development, cognition, and brain structure and function.

Institute for Behavioral Genetics, 2017

A message from the director

I am delighted to share with you a copy of our Jubilee report on the occasion of the 50th anniversary of our founding in 1967. We decided to make this a celebratory report with vignettes, reminiscences and highlights, rather than a more exhaustive historical document or comprehensive catalog of accomplishments. We hope you enjoy it!

But to start at the beginning, what motivated the founding of an institute devoted to research and training in behavioral genetics? The late Gerry McClearn wrote in his original proposal to found our Institute of [sic] Behavioral Genetics: "The principle that much of the variability in learning ability, in perceptual acuteness, in personality, in susceptibility to mental disorder, is a necessary consequence of polygenic segregation has implications for education, for law, and, indeed, for most social institutions." There were, to be sure, detailed technical and scientific arguments for the timeliness of studying genetic influences on both animal and human behavior, but it was surely the broader societal and public health implications of this area of research that made it so appealing to the regents of the university, who approved McClearn's proposal in January 1967, and make it perhaps even more compelling 50 years on. If you ask how genetic factors can affect your risk for drug and alcohol addiction, whether genes are involved in learning disabilities, how the course of Alzheimer's or other diseases of aging are affected by your genetic make-up, whether some people might be at genetic risk for disorders such as schizophrenia or depression, or how genes influence your brain or cognitive functions, then you are asking the kinds of questions that behavioral geneticists look to answer. And these are questions that are important to individuals, to families and to society.

During the 50 years since the institute's inauguration, there have been many significant milestones and accomplishments. Among them are the founding of the journal Behavior Genetics by John DeFries and Steven Vandenberg in 1970, along with the founding of the Behavior Genetics Association. The Hawaii Family Study of Cognition, the Colorado Family Reading Study and the Colorado Adoption Project were each initiated in the early 1970s, and 1977 saw the establishment of the Alcohol Research Center. DeFries and McClearn began a classic series of textbooks on behavior genetics in 1973, which has continued to the present, with its most recent manifestation written by Valerie Knopik and Jenae Neiderhiser, Robert Plomin and John DeFries, and published this year. The MacArthur Longitudinal Twin Study was founded in 1986, and these twins and subsequent extensions of the sample are, like the families in the Colorado Adoption Project, still being studied today. The Colorado Learning Disabilities Center was founded in 1990 and resulted in the first report of a quantitative trait locus, localized to chromosome 6p, contributing to reading disability (Cardon, et al, *Science*, 1994).

In 1988, a third major interdisciplinary research center, the Drug Abuse Research Center, was founded, and this line of research continues in the form of the Colorado Center on Antisocial Drug Dependence, founded in 1997 and focusing on the genetic contributions to the pattern of behavior in adolescents characterized by a range of externalizing problems including drug abuse and conduct disorder.

The International Workshop on the Methodology of Twin and Family Studies was first held in Boulder in 1990, and continues as the annual one-week training Workshop on Statistical Genetic Methods for Human Complex Traits, supported by the National Institute of Mental Health. This is now internationally recognized as the one of the premier short courses in human statistical genetics for the study of behavior, and each year attracts about 100 students, together with about 20 of the world's leading statistical and behavioral geneticists to serve as teaching faculty.

In recent years, research at the institute has focused on animal model research on the genetics and biology of the nicotinic receptors, and on increasingly sophisticated explorations of the genetics of aging and neurodegenerative diseases, using both the nematode worm *C. elegans* and the mouse models that were so important to the original conception of the institute. The study of aging also continues in the human twin and adoption samples that have been followed for past 30 years or so. Additionally, new work in brain development, structure and function is being conducted in collaboration with the Institute of Cognitive Science, both in our longitudinal twin samples, who have been studied for many years, and in newly recruited 9- and 10-year-old twins as part of the Adolescent Brain and Cognitive Development study—a nationwide, 10-year study of 10,000 children who will be followed for the next 10 years. Alongside these advances in the phenotypes we study, the institute has embraced genome-wide and "big-data" approaches that are yielding fresh insights into the polygenic segregation that Gerry McClearn alluded to 50 years ago, and real knowledge about individual genetic variants that influence complex traits.

The institute has been home to many of the classic research studies, methods and publication milestones in behavior genetics, but it continues to advance as new areas of research, technologies and methods present themselves.

Alongside its research, IBG continues to advance its mission of excellence in graduate education and research training. In recent years the institute held three training grants awarded by the National Institute on Mental Health (NIMH), the National Institute of Child Health and Human Development (NICHD) and the National Institute on Drug Abuse (NIDA). Together these awards allowed the institute to fully support 13 graduate students and five postdoctoral trainees in behavior genetics. Recently, our NICHD support ended, temporarily, we hope, but a new training programing in demography and genetics, in collaboration with the Institute of Behavioral Sciences and supported by the National Institute on Aging (NIA), is being initiated, and so our training support levels will be maintained going forward.

IBG and other life science units on campus last underwent an extensive program review about five years ago. I entered into the process with some enthusiasm and optimism that it might result in positive recommendations for a more integrated approach to life sciences research across the campus, and a vision for the infrastructure and resources needed to maintain CU Boulder as a world-class research campus. Some of this cause was advanced in the final recommendations, but the protracted and

demanding review process primarily underscored our view of IBG as an institute that continues to achieve remarkable things with limited resources.

"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)

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. A special thanks also goes to our retired former associate director, Toni Smolen, and our current chief financial manager and assistant to the director, Sean Shelby, along with other members of the Jubilee Committee—Marissa Ehringer, Mike Stallings and Jerry Stitzel—for their work in preparing this report.

John K. Hewitt
Director

Faculty Fellows

Ryan K. Bachtell

Associate professor, Department of Psychology and Neuroscience, University of Colorado Boulder; member of the Center for Neuroscience; PhD, Oregon Health & Science University, 2004. Bachtell's research focuses on the neurobiology and neurogenetics of drug addiction using behavioral models of addiction such as drug self-administration, place conditioning and drug sensitivity paradigms. His lab is interested in the predictive role of dopamine D2 receptor function in psychostimulant sensitivity, reward and relapse.

Jason Boardman

Professor, Department of Sociology; research associate, Institute of Behavioral Science, University of Colorado Boulder; PhD, University of Texas, 2002. Boardman is the associate director of the NICHD-funded University of Colorado Population Center. His research focuses on the social determinants of health with an emphasis on the gene-environment interactions related to health behaviors. He teaches undergraduate and graduate courses in statistics, social demography, and the sociology of race and ethnicity.

Michael D. Breed

Professor, Department of Ecology and Evolutionary Biology, University of Colorado Boulder; PhD, University of Kansas, Lawrence, 1977. Breed's research emphasis is the genetics of social recognition system in animals. His current interests include behavioral and genetic studies of recognition cues used by honeybees to discriminate nestmates from non-nestmates. He is presently engaged in investigating the role of cuticular compounds in recognition, and the patterns of inheritance of chemical cuticular signature.

Gregory Carey

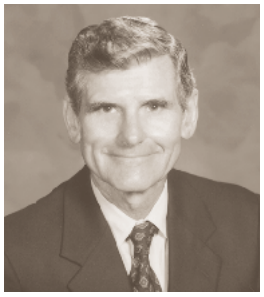
Associate professor, Department of Psychology and Neuroscience, University of Colorado Boulder; PhD, University of Minnesota, 1978. Carey's research interests are in the areas of genetics and human psychopathology. His work concentrates on anxiety disorders and on the development of externalizing behavior (antisocial tendencies, drug abuse and alcohol abuse) during adolescence. A second major interest is the use of quantitative models to represent mechanisms of assortative mating, development, cultural transmission and sibling interaction.

Allan C. Collins

Professor emeritus of psychology and pharmacology, Department of Psychology and Neuroscience, University of Colorado Boulder; PhD, University of Wisconsin, 1969; NIAAA Research Scientist Award, 1978–83; NIDA Level V Research Scientist Award, 1993–2003. Collins is a biochemical pharmacologist whose primary research specialization was neurochemistry. His research interests have included neurochemical correlates of nicotine use, tolerance development and withdrawal; neurochemical bases of alcohol tolerance; biochemical bases of behavior; and use of genetics as a tool to determine the mechanism of action of drugs.

Marilyn E. Coors

Associate professor, Department of Psychiatry and Center for Bioethics and Humanities, University of Colorado Anschutz Medical Campus. Coors' research interests include the ethics of human genetic modification, informed consent in genetic research and the ethical issues in broad data sharing for genetic research on addiction.



John C. DeFries

Professor emeritus, Department of Psychology and Neuroscience, University of Colorado Boulder; PhD, University of Illinois, 1961; president of the Behavior Genetics Association, 1982–83; Distinguished Research Lectureship, Council on Research and Creative Work, University of Colorado at Boulder, 2001–02; fellow, American Association for the Advancement of Science, 1994, and Association for Psychological Science, 2009. DeFries' primary field of specialization is quantitative behavioral genetics. His current research interests include twin and adoption studies of human cognitive abilities and the genetics of learning disabilities.

Richard A. Deitrich

Professor emeritus, Department of Pharmacology, University of Colorado at Denver and Health Sciences Center; PhD, University of Colorado, 1959; NIGMS Research Career Development Award, 1965–75; NIAAA Research Scientist Award, 1986–2001; president of the Research Society on Alcoholism, 1981–83; co-scientific director of the University of Colorado Alcohol Research Center, 1977–2002; NIAAA Merit Award, 1996–2004. Deitrich is a pharmacologist whose research concerns the molecular basis of the actions of alcohol. His research uses genetically selected lines of mice and rats to discover mechanisms of central nervous system depression, tolerance and dependence. These data are used to identify specific genes responsible for these actions in animals, and eventually to identify similar genes in humans at risk for development of alcoholism.

Marissa A. Ehringer

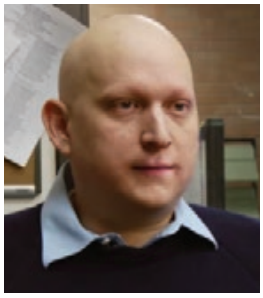
Associate professor, Department of Integrative Physiology, University of Colorado Boulder; PhD, University of Colorado at Denver and Health Sciences Center, 2001. Ehringer is a molecular geneticist who uses a multifaceted approach to study behavior genetics. Her research is focused on understanding the underlying biological mechanisms that contribute to substance abuse, primarily tobacco, alcohol and marijuana use. Her laboratory has identified genetic associations between genes coding for neuronal nicotinic receptors and drug behaviors in humans. Ongoing work uses *in vitro* approaches and mouse models to study the effects of variation within the genes on molecular function and behavior. Another project in her lab examines the effects of exercise on voluntary alcohol behaviors in a mouse model and associated neurobiological changes. Her research has been funded by the Colorado Tobacco Research Program and the National Institutes of Health.

Naomi Friedman

Assistant professor, IBG and Department of Psychology and Neuroscience, University of Colorado Boulder. BA, University of Texas at Austin, 1996; PhD, University of Colorado Boulder 2002. Friedman's research focuses on mechanisms (neural and genetic) underlying individual differences in executive functions and their relations to everyday self-regulation as well as various forms of psychopathology.

John K. Hewitt

Director of IBG and professor of psychology and neuroscience, University of Colorado Boulder; PhD, University of London, 1978; editor-in-chief, *Behavior Genetics*, 2001–present; president of the Behavior Genetics Association, 2000–01; Dobzhansky Award, 2008. James Shields Award, 2016. After 40 years as a faculty member with universities in the U.K. and U.S., the last 25 at IBG, he is thrilled to still be starting new research projects, like the Adolescent Behavior and Cognitive Development (ABCD) study, and to be extending his work in graduate and postdoctoral training as director of IBG's NIMH and NIDA training programs and the NIMH-supported annual Boulder workshops.



Charles Hoeffer

Assistant professor, Department of Integrative Physiology, University of Colorado Boulder; PhD, University of Arizona, 2004. Hoeffer is a molecular biologist who works primarily on neuroscience questions related to memory formation and neurological disease and disorders. His work combines mouse models with biochemical, electrophysiological and behavioral assays. Hoeffer's research is focused on two primary scientific areas of interest: the regulation of protein synthesis by neuronal networks, and the molecular signaling pathways involved in age-related neurodegeneration. His project areas include research related to schizophrenia, Alzheimer's disease, autism and Down syndrome. Hoeffer's work has been funded by the National Institutes of Health, Alzheimer's Association, Simon's Foundation, Linda Crnic Institute and the Brain & Behavior Research Foundation.

Christian Hopfer

Professor of psychiatry, University of Colorado at Denver Anschutz Medical Center; MD, Case Western Reserve University, 1992; executive director, Developmental Psychobiology Research Group. Hopfer uses genetically informative cross-sectional designs to study the development of behavior problems in adolescence and young adulthood, in particular substance use and substance use disorders and antisocial/externalizing behaviors. He is involved in epidemiological and genome-wide association studies of these disorders.

Thomas E. Johnson

Professor of behavioral genetics, Department of Integrative Physiology, University of Colorado Boulder; PhD, University of Washington, 1975. Johnson saw the potential for the nematode *C. elegans* in developing an experimental approach to studies of aging. He has played a key role in the modernization of aging research. He identified and mapped the first gerontogene (age-1),which doubles the maximum lifespan. He found that this gene and others regulate response to environmental stress and play an integral role in numerous other discoveries. His focus now is on fetal alcohol syndrome and biomarkers for aging. His research has received more than $30 million of NIH funding, almost entirely in RO1s. He received the Kleemeier and Harman awards for his lifetime contribution to aging research, and has been recognized in many other ways, including the Boulder Faculty Excellence in Research, Scholarly and Creative Work Award, and in 2010 he was made a fellow of the American Association for the Advancement of Science. He has served as an officer of numerous professional organizations and is editor-in-chief of Experimental Gerontology, the oldest and largest journal in the field. For more information, visit his website at http://ibgwww.colorado.edu/tj-lab.

Matthew C. Keller

Associate professor, Department of Psychology and Neuroscience, University of Colorado Boulder; PhD, University of Michigan, 2004. Keller uses twin and molecular genetic data to understand the genetic etiology of complex disorders. In particular, his research has focused on understanding the evolutionary causes of genetic variation underlying human disorders.

Kenneth Krauter

Professor, Department of Molecular, Cellular, and Developmental Biology, University of Colorado Boulder; PhD, Albert Einstein College of Medicine, 1980. Krauter is a molecular biologist whose research focuses on two aspects of human genomic research. The first is in the area of comparative genome analysis using “high-throughput” mapping and DNA sequence analysis to examine similarities between human and mouse genes, including the skeletal myosin heavy chains. By developing high-resolution maps and complete DNA sequence of the analogous genes in the two species, it is possible to identify potentially important elements responsible for regulation and the function of the genes. The second area of interest is the use of genetic analysis to identify genes involved in complex traits such as adolescent antisocial behavior. This latter study is done in collaboration with the Center for the Genetics of Antisocial Drug Dependence at the University of Colorado Anschutz Medical Campus and the Institute for Behavioral Genetics at the University of Colorado Boulder.

Chris Link

Associate professor, integrative physiology. Link is a molecular biologist who studies the basic biology underlying common neurodegenerative diseases such as Alzheimer’s disease. His primary experimental approach is to genetically engineer a well-studied model organism (the nematode worm C. elegans) to express human proteins believed to cause neurodegenerative diseases, with the goal of understanding how these proteins cause neuronal dysfunction. These studies have helped to identify both the toxic form of a protein associated with Alzheimer’s disease, as well as physiological processes that can help protect against this protein. Current studies include characterization of a protein involved in amyotrophic lateral sclerosis (Lou Gehrig’s disease) and understanding the basic biology of Down syndrome. His work is funded by the National Institutes of Health and the Linda Crnic Institute.

Carol Lynch

Professor emerita, Department of Ecology and Evolutionary Biology; dean of the Graduate School and vice chancellor for research, emerita. PhD, University of Iowa, 1971. Lynch’s current work is in the area of higher education policy, specifically the promotion nationally of a new degree, the Professional Science Master’s (PSM). Support for the project comes from the Alfred P. Sloan Foundation through the Council of Graduate Schools. The PSM is an innovative, graduate degree designed to allow students to pursue advanced training in science or mathematics while developing workplace skills highly valued by employers, such as business, ethics, communications and regulatory affairs.

Matthew B. McQueen

Associate professor, Department of Integrative Physiology, University of Colorado Boulder; assistant professor (secondary appointment), Department of Epidemiology, Colorado School of Public Health, University of Colorado Anschutz Medical Campus; ScD, Harvard School of Public Health, 2005; director of the biostatistics core, University of Colorado Boulder Clinical and Translational Research Center (CTRC). As an epidemiologist and applied biostatistician, McQueen's research objectives are focused on the development and application of epidemiological and biostatistical methods to advance our understanding of human disease from genes to populations. Areas that broadly define McQueen's research include the epidemiology of behavior (HIV-risk behaviors, obesity), psychiatric disorders (substance use and dependence, conduct disorder, bipolar disorder, schizophrenia) and neurologic disorders (Alzheimer's disease, Parkinson's disease, multiple sclerosis).

Richard K. Olson

College Professor of Distinction, emeritus, Department of Psychology, University of Colorado Boulder; PhD, University of Oregon, 1970. Olson is a developmental psychologist whose primary research is on the varieties, etiology and remediation of learning disorders. His research has examined the component processes in reading and related language skills that are associated with both normal and subnormal development. Heritability of these component processes is being evaluated through twin analyses. Olson serves as the director of the Colorado Learning Disabilities Research Center.

Bruce F. Pennington

John Evans Professor, Department of Psychology, and director of the Developmental Cognitive Neuroscience Program, University of Denver; PhD, Duke University, 1977. Pennington is a developmental neuropsychologist whose research focuses on understanding disorders of cognitive development. The disorders he studies include developmental dyslexia, attention deficit hyperactivity disorder and several mental retardation syndromes: early treated phenylketonuria, fragile X syndrome, Down syndrome and infantile autism. The long-term goal of this work is to understand how different genetic influences alter brain development to produce the distinct profiles of cognitive strengths and weaknesses found in each of these disorders.

Richard A. Radcliffe

Professor of pharmacology, School of Pharmacy, Department of Pharmaceutical Sciences, University of Colorado Anschutz Medical Campus; PhD, University of Colorado Denver and Health Sciences Center, 1996. Radcliffe's research focuses on the genetic and molecular basis of drug and alcohol addiction with an emphasis on drug-induced behavioral plasticity such as tolerance and sensitization. A variety of neurochemical, behavioral, and genetic effects are studied using primarily genetic and genomic approaches in the laboratory mouse and rat. Current projects include RNA-Seq analysis of CNS systems involved in alcohol tolerance in mouse; the genetic basis of the interaction between methamphetamine sensitization and toxicity in mouse; QTL mapping of various alcohol-related behavioral traits in mouse and rat; and testing specific genes for their role in alcohol-related behaviors in mouse and rat.

Soo Rhee

Associate professor of psychology, Department of Psychology and Neuroscience, University of Colorado Boulder; PhD, Emory University, 1999. Rhee's primary research interests are the etiology and development of childhood disruptive disorders, the etiology and development of substance use disorders, and the causes of comorbidity between psychiatric disorders and substance use disorders.

James Sikela

Professor, Department of Biochemistry and Molecular Genetics, Human Medical Genetics and Neuroscience Programs, University of Colorado School of Medicine; PhD, Case Western Reserve University, 1983. Sikela is a genome scientist and has been a key pioneer in the development of EST technology and large-scale human gene mapping. His strategy of developing gene-based STSs to rapidly map human genes was used by an international gene-mapping consortium that determined the chromosomal location for the majority of human genes. He contributed to the discovery of the Presenilin 2 (PSN2) gene that causes Alzheimer's disease. Currently, his research involves applying genomics approaches to the discovery of genes involved in neurogenetic diseases such as autism, schizophrenia, microcephaly and other forms of cognitive disability. His laboratory has also made major contributions to the identification of genes and sequences important to human and primate evolution, including those, such as the human-specific hyper-amplification of DUF1220 protein domains, that are specific to the human lineage and related to the structure and function of the human brain.

Andrew Smolen

Senior research associate, Institute for Behavioral Genetics, University of Colorado Boulder; PhD, University of Colorado, 1979. Smolen is a pharmacologist whose primary interests are in the areas of neurochemistry and pharmacogenetics. His research activities include the assessment of the contribution of specific candidate genes to complex behaviors such as substance abuse and attention deficit hyperactivity disorder.

Toni Smolen

Associate director and chief financial manager, Institute for Behavioral Genetics (retired 2016); PhD, University of Colorado, 1981. Before her transition from research to an administrative career, Smolen's primary research interests were in pharmacogenetics and neuropharmacology, and specifically in studies of biochemical and neurochemical mechanisms responsible for the development of drug tolerance and dependence. She was particularly interested in the role of brain adenosine and purinergic systems in alcohol tolerance and dependence. She retired from active research to serve, first as the assistant director and chief financial manager of IBG and, later, as the associate director of IBG. As such, she supervised and coordinated the day-to-day administrative, research and training activities of the institute and provided oversight and approving authority for all institute business. She also contributed to the teaching mission of the institute by coordinating and participating in the NIH-mandated training of IBG predoctoral students and postdoctoral fellows in the responsible conduct of research. Although now retired from the university, she remains an active faculty fellow.

Michael Stallings

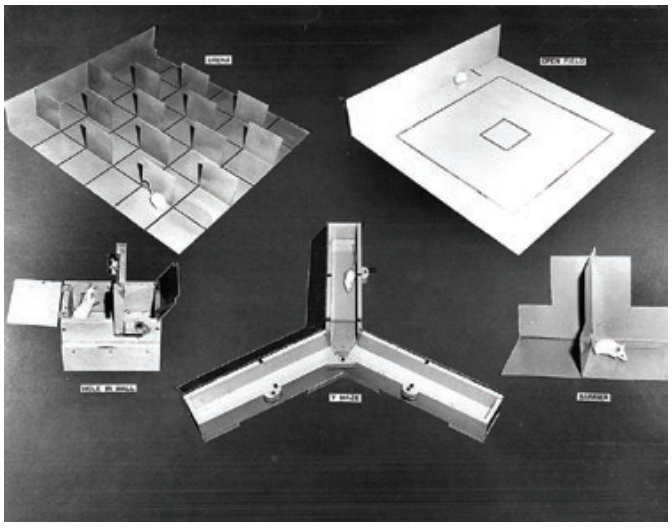
Professor, Department of Psychology and Institute for Behavioral Genetics, University of Colorado Boulder; PhD, University of Southern California, 1993. I completed my graduate work at USC under the mentorship of Laura Baker. Laura was a former student of John DeFries, so IBG was certainly on my list of places to consider for postgraduate training. However, it was not until Laura sent me to IBG for my first methodology workshop in 1990 or 1991 that I really fell in love with the field of behavioral genetics and realized that IBG was the place I needed to be. I came to IBG as a postdoc in 1993 and was appointed to the IBG faculty in 1999, so I have been at IBG for nearly half of its 50 years. I can't imagine a better academic environment anywhere. IBG faculty, research associates, postdocs, students and staff have contributed to my research career in countless ways. I thank all of you, my IBG family, for that, and I look forward to many fruitful years ahead.

Jerry A. Stitzel

Associate professor, Department of Integrative Physiology, University of Colorado Boulder; PhD, Johns Hopkins University, 1992. Stitzel is a molecular biologist whose primary interest is in understanding the molecular basis through which genetic variation influences risk for drug dependence and comorbid traits. Current projects include the molecular, biochemical and cellular characterization of naturally occurring variants of neuronal nicotinic receptors and their roles in drug dependence and schizophrenia.

Boris Tabakoff

Professor, Department of Pharmacology, University of Colorado Anschutz Medical Campus; PhD, University of Colorado, 1970; president of the Research Society on Alcoholism, 1983–85; president of the International Society for Biomedical Research on Alcoholism, 1986–90; RSA Award for Scientific Excellence in Alcohol Research and Jellinek Award for alcoholism research, 1988; Florence Rena Sabin Award, 2002; Joseph Addison Sewall Award, 2008, University of Colorado at Denver and Health Sciences Center; member, National Advisory Council for the National Institute on Alcohol Abuse and Alcoholism. Tabakoff's research concerns physiological, pharmacological and biochemical correlates of alcohol and opiate/cannabinoid abuse and major depressive disorders. His laboratory makes extensive use of genomic, transcriptome and proteome information and uses the genetical/genomic systems approach to structure its research. Current studies focus on genetic/genomic factors mediating tolerance development; the involvement of brain GABA and glutamate systems in addiction; and the interaction of addictive drugs with cyclic AMP signaling in brain. Studies are pursued with human and nonhuman subjects.



Behavioral testing apparatus

Scott Vrieze

Assistant professor, Department of Psychology and Neuroscience, University of Colorado Boulder; PhD, University of Minnesota, 2012. Vrieze's research program includes the study of genetic and environmental influences on psychopathology. He uses a variety of research designs in this effort, including genetic association studies as well as longitudinal twin and adoption designs.

Jeanne M. Wehner

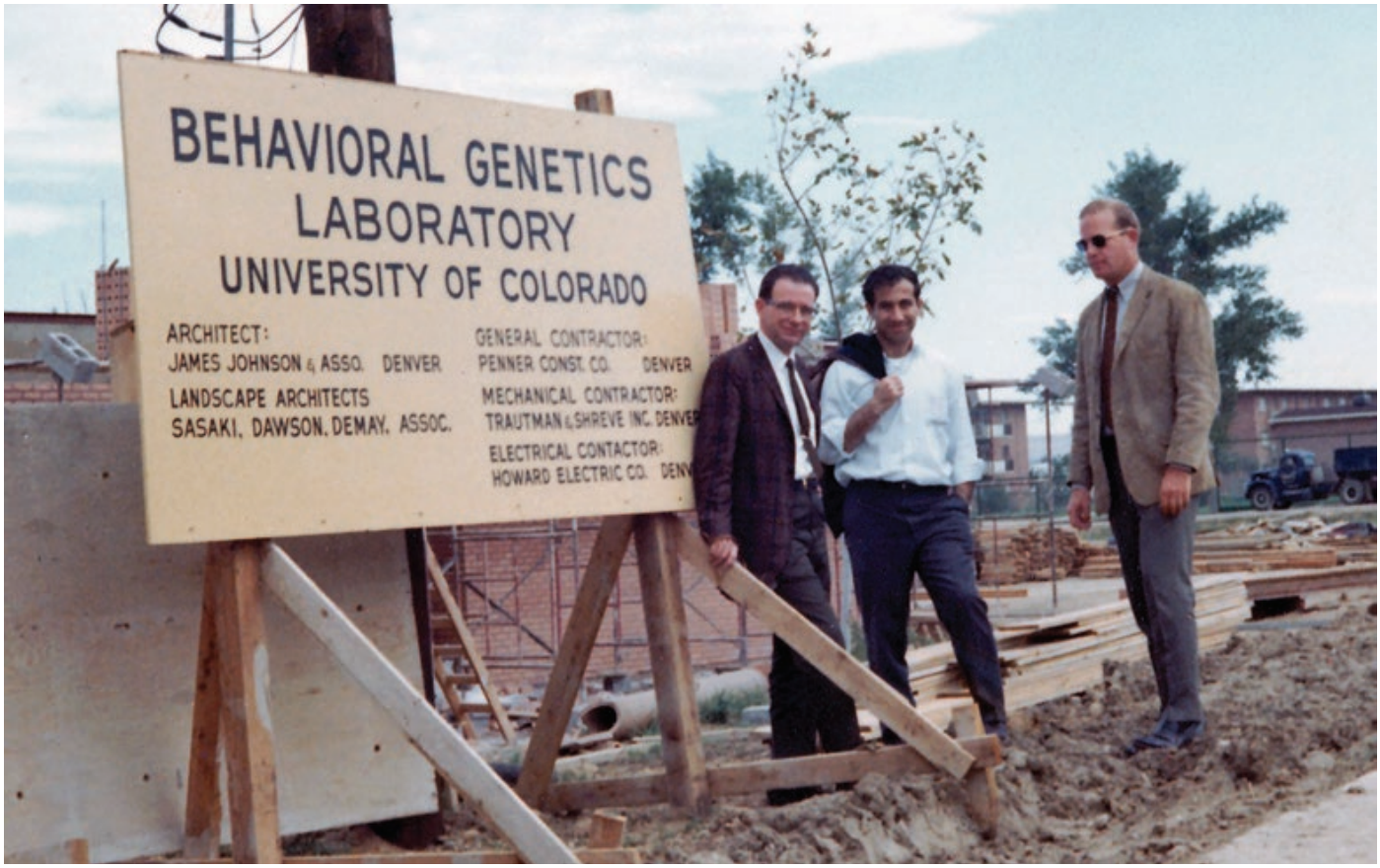
Professor emerita of psychology, University of Colorado Boulder; PhD, University of Minnesota Medical School, 1976; NIAAA Research Scientist Development Award, 1991–96, 1997–2002. Wehner is a biochemist whose primary research interests are pharmacogenetics and neurobiology. Previous projects included biochemical and genetic studies of learning and memory, as well as studies of initial sensitivity and tolerance development to alcohol.

Erik G. Willcutt

Professor of clinical psychology, University of Colorado Boulder; PhD, University of Denver, 1998. Willcutt's research focuses on the causes and consequences of attention deficit hyperactivity disorder, learning disabilities and their comorbidity. He uses genetic linkage and association techniques in studies of families and twins to identify genes that increase susceptibility to these difficulties.

James R. Wilson

Professor emeritus, Department of Psychology, University of Colorado Boulder; PhD, University of California, Berkeley, 1968. Wilson's primary field of specialization is behavioral biology. His research interests have included the endocrinological and genetic bases of maternal behavior, sexual behavior, activity differences and learning differences in mice; and genetic studies of cognitive functions in humans. Work in the mid-'90s involved genetic selection in mice for alcohol dependence, behavioral genetic studies of alcohol dosing and cigarette withdrawal in humans, and studies of neuroelectric treatment for cigarette addiction and alleviation of migraine headaches. Wilson is currently teaching online for the University of Colorado Denver.



Breaking ground: Jerry McClearn, Kurt Schlesinger and Jim Wilson

IBG staff members

Catlin Sheehan, Sean Shelby, Janna Vannorsdel and Wendy Senger

Research associates

Senior research associates

Robin Corley
Brett Haberstick
Andrew Smolen
Sally Wadsworth
Susan Young

Research associates

Nomita Chhabildas
James Cypser
Gargi Datta
Luke Evans
Christina Hewitt
Jeffrey Lessem
Josien Levenga
Heidi O'Neill
Daniel Peterson
Matthew Powers
Andrew Reineberg
J. Megan Ross
Rasool Tahmasbi
Helen Wong

Professional research assistants

Jessica Baynard
Carly Carrasco-Wyant
Corinne Gunn
Dina Huber
Jacqueline Hulslander
Anne Johnson
Elizabeth Johnson-Wold
Jennifer Keith
Sean Kelly
Lauren Laplante
Amy Ledbetter
Jill Miyamoto-Ditmon
Sherry Nasif
Christina Nelson-Goens
Alicia Pardo
Stephanie Quintana
Sally-Ann Rhea
Daniel Ryan
Michelle Stocker
Patricia Tedesco
Jasmin Torres
Patricia Townsend
Zachary Werner

IBG graduate students 2017

Sonya Belimezova
Research interests: Genetics of addiction

Chelsie Benca
Research interests: Neural correlates and genetic influences on executive functions and related maladaptive behaviors

Richard Border
Research interests: Predictors of desistance from antisocial behavior and substance use disorders

David Brazel
Research interests:
The genetics and genomics of substance use, scalable digital phenotypes and the use of geospatial data in behavioral genetic

Jordan Buck
Research interests:Epigenetics of addiction and other neuropsychological disorders

Brittany Demmitt
Research interests: Human genome influences on the oral microbiome

Sam Dolzani
Research interests: The synaptic plasticity underlying reward-related behaviors, such as psychostimulant addiction; and the comorbidity between stress and substance abuse at the molecular, cellular, systems and behavioral levels

Alta DuPont
Research interests: Genetics of rumination and psychopathology

Maia Frieser
Research interests: Return of incidental findings from genetic research studies; use of social media and novel technologies in genetic research studies; environmental risk for substance uses in adolescents

Alex Hatoum
Research interests: Genetic effects on comorbidity; the relationship between cognitive abilities and psychopathology; and longitudinal data analysis

Spencer Huggett
Research interests: Understanding the role of the immune system in cocaine addiction; conducts both human and animal studies

Brooke Huibregtse
Research interests: Genetic and environmental influences on substance use, risk behavior and related psychopathology

Emma Johnson
Research interests: Understanding the roles of runs of homozygosity (ROHs) in psychiatric disorders and how various sociodemographic factors can affect ROHs and lead to potential confounds in studies researching them

MengZhen Liu
Research interests: Genetic architecture of schizophrenia- and addiction-related endophenotypes: Whole genome sequencing of a community cohort

Kelsey Loupy
Research interests: Down syndrome-related neuronal signaling; the neurobehavioral basis for intellectual disability

Hunter Mathews
Research interests: Effect of nicotine exposure and nicotine withdrawal on sleep

Breanne Newell
Research interests: Using nematodes to investigate genetic influences on mechanisms of functional decline that occur with age

Harry Smolker
Research interests: Neural substrates of individual differences in executive functions

Robbee Wedow
Research interests: Social determinants of health with an emphasis on the gene-environment interactions related to health behaviors

Kerri Woodward
Research interests: The etiology of childhood externalizing behaviors, particularly genetic and environmental predictors of parenting behaviors and how parenting can influence child outcome

Stephanie Zellers
Research interests: Environmental effects, including drug use policy, on drug use and related illness

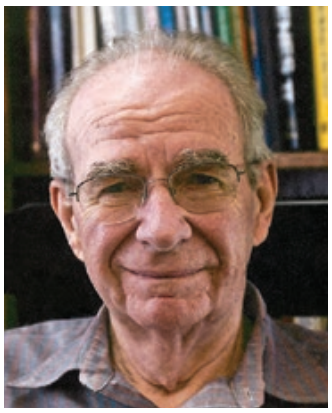
Animal care staff, circa 2003

Drs. Duhon, Long and King with Professor Saxena

IBG Family Studies

IBG directors through the years

Gerald E. McClearn
IBG founder and first director, 1967–1981



Many of you may have already heard the sad news that Gerald (Jerry) E. McClearn, IBG's founder, died on Thursday, January 5, 2017, in State College, Pennsylvania. In his 89 years, Jerry had a long and successful career as a leader in the field of behavioral genetics. He received an undergraduate degree from Allegheny College and a PhD in psychology from the University of Wisconsin, after which he spent a year as an instructor at Yale University and a year as an assistant professor of psychology at Allegheny College. Jerry also conducted postdoctoral research at the University of Edinburgh in Scotland and University College London in England. He moved on to the Department of Psychology at the University of California, Berkeley from 1956 to 1965, after which he joined the Department of Psychology at the University of Colorado Boulder as an associate and as full professor from 1965 to 1981. During his early years at CU, Jerry put together his plan to form a research institute, now known as the Institute for Behavioral Genetics (IBG), dedicated to research and teaching. It was also during those years that he became a founding member of the Behavioral Genetics Association and served as one of the first presidents of the association in 1974. He was truly a founding father of the field.

During his years at IBG, Jerry's research was focused on using mouse models to investigate the genetics of behavior, especially ethanol consumption, in seminal work begun at Berkeley using a technique known as the two-bottle choice test. He liked to refer to these mouse studies as "simulacra" (partial models) for human alcohol abuse and alcoholism. He also had a strong interest in human behavioral genetic studies, especially those characterizing the influence of genetic factors on cognition. As a result, he participated in a number of landmark studies, including the Hawaii Family Study of Cognition. This study, along with other human studies conducted subsequently, fed Jerry's interest in the genetics of cognitive aging, which was the focus of his research at Penn State.

In 1981, Jerry moved to The Pennsylvania State University as a professor of human development, nutrition and psychology and associate dean for research and graduate studies. In 1986 he was named an Evan Pugh Professor of Health and Human Development, the highest endowed chair at the university. It is interesting to note that, even at Penn State, he continued to be a founding father. In 1988 he formed the Center for Developmental and Health Genetics and served as its director from 1988 to 1990 and again from 1994 to 2002. He also established the Program in Biobehavioral Health in 1990 and served as the dean of the College of Health and Human Development. His program became a full department in 1992. Jerry retired with emeritus status from the Department of Biobehavioral Health (BBH) in July 2011 but remained active, writing and co-authoring with numerous colleagues a number of published scientific articles.

During Jerry's time at CU and Penn State, he received numerous awards and accolades. Three of his awards have special importance to IBGers: Jerry received the Dobzhansky Award in 1989 from the Behavioral Genetics Association in recognition of his lifetime accomplishments in behavioral genetics; in 2009 he received the Robert W. Kleemeier Award from the Gerontological Society of America for his outstanding research in the field of gerontology; and he was named a fellow of the American Association for the Advancement of Science in 2011 for his "distinguished contributions in research exploring the interaction of genetic and environmental factors in the development of complex phenotypes of behavior and of aging."

Jerry was an extraordinary man with an extraordinary dream of founding an institute for behavioral genetics that would be not only timely in its founding, but would benefit the university, participating departments and science in general for generations to come. Fifty years later, I think we can all say we have fulfilled that dream many times over.

John C. DeFries
IBG director, 1981–2001

Professor John C. DeFries served as the director of the Institute for Behavioral Genetics (IBG) from 1981 to 2001. Under John's outstanding leadership, IBG flourished and became an international leader in the field of behavioral genetics. We highlight here only a few of the many contributions he has made since coming to IBG in 1967.

Before his arrival at CU, John received his doctorate in agriculture, with special training in quantitative genetics, from the University of Illinois at Urbana-Champaign in 1961. He remained on the faculty of that institution for an additional six years. In 1962, he began a research program in mouse behavioral genetics and, in the following year, he took a research fellowship in genetics at the University of California, Berkeley, where he conducted research in the laboratory of Gerald (Jerry) McClearn. After Jerry moved to the University of Colorado, he recruited John, who came to IBG in the summer of 1967.

John immediately became immersed, not only in his research, but also in the promotion of this new field of behavioral genetics. In 1970, John and IBG faculty member Steven G. Vandenberg founded the journal Behavior Genetics, which has become the flagship journal of the Behavior Genetics Association (BGA). John was a charter member of the BGA when it was formed in 1971, served as its secretary in 1974–77, and president from 1982 to 1983. In 1992, John was awarded the Theodosius Dobzhansky Award for Outstanding Research, the highest award conferred by the association.

During the '70s, John's research interests took two paths. His interest in the genetics of reading disabilities resulted in the founding of the Colorado Family Reading Study in 1973. This landmark study was later subsumed by a program project on reading disabilities, and subsequently by the University of Colorado Learning Disabilities Research Center (CLDRC), both of which were funded by grants from the National Institute of Child Health and Human Development, which John directed from 1979 to 2005. The CLDRC is in its 25th year of funding. One of many noteworthy findings during this time was a publication in *Science*, with IBG graduate Lon Cardon, IBG faculty members David Fulker, Bruce Pennington, John DeFries and other colleagues, reporting the localization of a gene for reading disability to a small region of chromosome 6. This finding has been independently confirmed by a number of research groups during the past 28 years.

John DeFries and Gene Thomas

Moreover, in 1975, he and then-IBG faculty member Robert Plomin founded the Colorado Adoption Project. CAP is a longitudinal study of genetic and environmental influences that contribute to traits such as personality, intelligence and other behaviors. During the past 42 years, the CAP has been supported by multiple grants from the William T. Grant Foundation, the Spencer Foundation, the National Science Foundation, the National Institutes of Mental Health, Child Health and Human Development, and the National Institute on Drug Abuse. CAP has become not only a landmark study in child development, but a national resource. In addition to hundreds of research articles, four books have been published that summarize the results of this study. (See timeline.)

Throughout his career, John has been at the cutting edge of his field. He has written nearly 500 peer-reviewed papers, numerous chapters and 13 books (including co-writing seven editions of the standard text in the field of behavioral genetics). Of his papers, many are considered to be classics in the field, and a number have been published in *Science* and *Nature*. His outstanding research contributions have received recognition by the American Association for the Advancement of Science, which elected him a Fellow of Section J, Psychology in 199; the Association for Psychological Science, which elected him as a Fellow in 2009, and by the University of Colorado Council on Creative Work, which awarded him in 2001–2002 the 94th Distinguished Research Lectureship, the highest award the faculty bestows on one of its members.

In addition to his ongoing research contributions, when John became director of IBG in 1981, many positive changes took place within the Institute as a result of his strong leadership. These included the addition of 12 new faculty fellows, along with a ten-fold increase in research support of the institute and an increase in the physical size of IBG from approximately 22,000 square feet to nearly 40,000 square feet.

John officially retired from his academic position in 2013 but has maintained a part-time appointment within IBG, which has allowed him to continue his work with IBG faculty and postdoctoral researchers. John richly deserves the honors and recognition bestowed upon him for his distinction in research, his enhancement of the national and international reputation of the university and IBG, and his careerlong leadership in both the academic and the scientific community. We salute him for his accomplishments and look forward to continued collaborations with him during his association with IBG in the future.

John Hewitt
IBG director, 2001–present

On July 1, 2001, Professor John K. Hewitt became the third director of IBG. John is a leading authority in developmental behavioral genetics, especially twin studies of adolescent behavioral development. He has been a professor of psychology and an IBG faculty fellow since 1992. Before his arrival at CU, John received his PhD from the Institute of Psychiatry at the University of London in 1978 and was appointed that year to a permanent faculty position in the Department of Psychology at the University of Birmingham, UK. In addition to his doctoral training in psychology, John holds bachelor's degrees in psychology and mathematics, and a master's degree in applied genetics.

In 1986 John joined the faculty of the Department of Human Genetics at the Medical College of Virginia. While there, he directed the Virginia Twin Study of Adolescent Behavioral Development from its inception until 1992, when he accepted his position here at the University of Colorado Boulder. His research has the common theme of applying biometrical and epidemiological techniques to the elucidation of genetic and environmental determinants of behavioral variation and development.

John has been a member of the Behavioral Genetics Association (BGA) since 1975, and served as secretary of the BGA from 1989 to 1992, and president from 2000 to 2001. He received the Dobzhansky Award in 2008 for lifetime achievement in behavior genetics and the James Shields Award in 2016 for lifetime contributions to twin research. He is the executive editor of the journal *Behavior Genetics*, the flagship journal of the BGA.

His current research includes a co-principal investigator (PI)-ship on the National Institute on Drug Abuse (NIDA)-led Adolescent Brain and Cognitive Development (ABCD) Consortium. The IBG component of this landmark initiative is a twin study using magnetic resonance imaging to relate brain structure and function to behavioral development. In addition, he is a co-investigator on three research grants funded by the National Institute of Mental Health (NIMH, N. Friedman, PI), the National Institute on Alcohol Abuse and Alcoholism (NIAAA, S. Vrieze, PI), and the National Institute on Aging (NIA, C. Reynolds/S. Wadsworth, co-PIs). John has also supported the training activities of IBG. He is the director and PI of two T32 training grants funded by NIMH and by NIDA, and, as the PI of an R25, has received funding for and hosts an NIMH-supported international Workshop on Statistical Genetic Methods for Human Complex Traits. This weeklong workshop, which is in its 25th year at IBG, routinely draws about 100 scientists from across the nation and the world, and has become a major event in quantitative behavior genetics. With many thanks to John, such externally funded training activities have kept IBG and CU in the forefront of advanced research methodology in behavior genetics, and have enabled us to "define the subject" for a new generation of research scientists.

Scott Vrieze, 2014–2017 Psych.Neuro.

Christopher Link, 2014–present Integrative Physiology

Naomi Friedman, 2013–present Psych. Neuro., **Charles Hoeffer**, 2013–present Integrative Physiology

Ryan Bachtell, 2010–present Psych.Neuro., **Jason Boardman**, 2010–present Sociology
Marilyn Coors, 2010–present Psychiatry UCAMC, **Christian Hopfer**, 2010–present Psychiatry UCAMC

Matthew Keller, 2007–present Psych.Neuro., **Matthew McQueen**, 2007–present Integrative Physiology

Jerry Stitzel, 2004–present Integrative Physiology

Marissa Ehringer, 2003–present Integrative Physiology

Thomas Crowley, 2002–2016 Psychiatry UCAMC, **Kent Hutchison**, 2002–2007 Psych.Neuro.
Kenneth Krauter, 2002–present MCDB, **Richard Radcliffe**, 2002–present School of Pharmacy
Soo Rhee, 2002–present Psych.Neuro., **James Sikela**, 2002–present Biochem.Mol.Gen. UCAMC

Erik Willcutt, 2001–present Psych.Neuro.

Michael Stallings, 1993–present Psych.Neuro.

Adron Harris, 1992–1993 Pharmacology UCHSC, **John Hewitt**, 1992–present Psych.Neuro.
Carol Lynch, 1992–present EPOB/emerita

Boris Tabakoff, 1991–present Pharmacology UCAMC

Thomas Johnson, 1988–present Integrative Physiology

Bruce Pennington, 1987–present Psych.Neuro. DU

Sadie Decker, 1986–1988 Psychology, **Andrew Smolen**, 1986–present IBG
Toni Smolen, 1986–present IBG

Gregory Carey, 1985–present Psych.Neuro.

David Fulker, 1983–1998 Psychology

Michael Breed, 1982–present EEB, **Jonathan VanBlerkom**, 1982–1994 MCDB
Jeanne Wehner, 1982–present Psych.Neuro./emerita

Richard Olson, 1980–present Psych.Neuro.

Dennis Petersen, 1979–2012 School of Pharmacy

Lawson Crowe, 1976–1996 Philosophy

Richard Deitrich, 1975–present Pharmacology UCAMC/emeritus, **Linda Dixon**, 1975–1978 Biology, UCD
V. Gene Erwin, 1975–2003 School of Pharmacy, **Philip Groves**, 1975–1978 Psychology
Jeffrey Mitton, 1975–1980 EEB, **Robert Plomin**, 1975–1986 Psychology
Seth Sharpless, 1975–1978 Psychology

Allan Collins, 1973–present Psych.Neuro./emeritus

Herb Alpern, 1969–1983 Psychology, **Wilson Crumpacker**, 1969–1979 EPOB
William MacInnes, 1969–1973 Aerospace Engineering

Ronald Johnson, 1967–1971 Psychology
Steven Vandenberg, 1967–1992 Psychology
Kurt Schlesinger, 1967–1997 Psychology
James Wilson, 1967–present Psychology/emeritus
John DeFries, 1967–present Psych.Neuro.

Gerald McClearn, Founder and First Director, Department of Psychology, 1967–1981

IBG faculty

50 years of growth

KEY

Psychology: Department of Psychology, before name change

Psych.Neuro.: Department of Psychology & Neuroscience

EPOB: Environmental, Population, & Organismic Biology, name before EEB

UCAMC: University of Colorado Anschutz Medical Campus

UCD: Department of Biology, University of Colorado Denver

EEB: Department of Ecology and Evolutionary Biology

MCDB: Department of Molecular, Cellular, and Developmental Biology

IBG: Institute for Behavioral Genetics

Psych.Neuro. DU: Department of Psychology & Neuroscience, University of Denver

UCHSC: University of Colorado Health Sciences Center, before change to Anschutz Medical Campus

Key moments in IBG history

January 1967: University of Colorado Board of Regents approves Gerald E. McClearn's proposal for the Institute for Behavioral Genetics; he is named director

July 1968: IBG Training Program established, funded by a research training grant from NIMH

1969: Grant from National Institute of General Medical Sciences, emphasizing mouse behavior, awarded to support molecular, quantitative and population genetic levels of analyses of a variety of behavioral phenoptypes, including activity; alcohol preference and sensitivity; learning and memory; and social behavior

June–July 1969: IBG holds Summer Training Institute on Genetics and Behavior for Developmental Psychologists

January 1969: Construction of the IBG second floor is completed

Fall semester 1969: Professor John DeFries is named acting director of IBG during McClearn fellowship leave

February 1970: Professor James Wilson appointed associate director of IBG

1970: Journal *Behavior Genetics* founded by Professors John DeFries and Steven Vandenberg

March 1971: IBG holds symposium: Behavioral Genetics of Simple Systems

April 1971: IBG granted extensive space in PSRB#1 and RSRB#1 for use as a neurochemistry laboratory, a mouse behavior laboratory, and a Drosphila laboratory

June–July 1971: IBG holds Summer Training Institute on Population Genetics for Social Scientists

March 1972: IBG hosts 2nd annual meeting of Behavior Genetics Association

October 1972: IBG hosts 3rd conference of NIMH Biological Sciences Training Program directors

1972: NSF/NICHD cofunds Genetic and Environmental Bases of Human Cognition, a collaborative project between the University of Hawaii Behavioral Biology Laboratory and IBG (professors DeFries, McClearn, Vandenberg and Wilson, co-investigators), later known as the Hawaii Family Study of Cognition

1973: Colorado Family Reading Study founded by John DeFries following award from Spencer Foundation

1973: IBG faculty publish first textbook of the field: G. McClearn & J. DeFries *Introduction to Behavioral Genetics*. San Francisco: Freeman

1973: School of Pharmacy and associated IBG faculty move to LSRB#1 during renovation of Eckley Pharmacy Building on Main Campus

1974–1978: Professor John DeFries serves as secretary of the Behavior Genetics Association

June–August 1975: IBG holds Summer Training Institute on the Genetics of Developmental Processes for Social Scientists sponsored by the Social Science Research Council with financial support from the National Institute of Mental Health

July 1975: IBG holds Workshop on Behavioral Pharmacogenetics sponsored by the Social Science Research Council with financial support from the National Institute of Mental Health

1975: Colorado Adoption Project founded by Professors Robert Plomin and John DeFries

June–July 1976: IBG holds Summer Training Institute on the Genetics of Developmental Processes for Social Scientists sponsored by the Social Science Research Council with financial support from the National Institute of Mental Health

1976: Funding granted for joint application for postdoctoral training support in Drug Abuse: Mechanism, Pharmacogenetics and Behavior (Professor Richard A. Deitrich, program director); participating units: Department of Pharmacology/School of Medicine, IBG, Department of Psychology and School of Pharmacy

Spring 1976: Council on Tobacco Research support awarded to IBG faculty initiates human and mouse studies of nicotine's behavioral, pharmacological and neurophysiological effects. This award represented a new direction for research at IBG that continues today.

June 1976: IBG hosts sixth annual meeting of the Behavior Genetics Association

June–July 1977: IBG hosts Summer Workshop on Pharmacogenetics supported by a grant from the Pharmacology/Toxicology Program, National Institute of General Medical Sciences

1977: Alcohol Research Center founded by Professors Richard Deitrich and V. Gene Erwin with grant from National Institute on Alcohol Abuse and Alcoholism

1979: Reading Disability Program Project funded by National Institute of Child Health and Human Development award to Professor John DeFries

December 1979: Department of Psychology and IBG host Symposium on Behavioral Aging

1980: R. Plomin, J. DeFries, & G. McClearn publish *Behavioral Genetics: A Primer* (1st ed.) San Francisco: Freeman

July–August 1980: IBG and School of Pharmacy host Summer Workshop on Pharmacogenetics supported by Pharmacology/Toxicology Program, National Institute of General Medical Sciences

1981: Professor John DeFries becomes director of IBG

May 1981: IBG and School of Pharmacy host Symposium on Biogenic Amines: Biochemistry, Genetics, and Psychopathology

1982–83: Professor John DeFries serves as president of Behavior Genetics Association

1985: R. Plomin, J. DeFries & D. Fulker publish *Origins of individual differences in infancy: The Colorado Adoption Project.* Orlando, FL: Academic Press

May 1985: IBG and Department of Psychology host Symposium on Multivariate Behavioral Genetics and Development: Change and Continuity supported by grant from MacArthur Research Network on the Transition from Infancy to Early Childhood

1986: MacArthur Longitudinal Twin Study founded by Professors John DeFries and Robert Plomin

1988: Drug Abuse Research Center funded by National Institute on Drug Abuse

1988: R. Plomin, J. DeFries, & D. Fulker publish *Nature and nurture during infancy and early childhood*. Cambridge: Cambridge University Press

1989–1992: Professor John Hewitt serves as secretary of Behavior Genetics Association

1990: Colorado Learning Disabilities Research Center founded by John DeFries following award by National Institute of Child Health and Human Behavior

1990: R. Plomin, J. DeFries, & G. McClearn publish *Behavioral Genetics: A Primer* (2nd ed.) San Francisco: Freeman

Mike Marks

1990: First annual (from 1993) International Workshop on the Methodology of Twin and Family Studies hosted by Professor David Fulker and subsequently by Professor John Hewitt till the present

July 1992: IBG hosts conference, Genetics and Alcoholism, commemorating 25th anniversary of IBG's founding, before Behavior Genetics Association annual meeting

July 1992: IBG hosts 22nd annual meeting of the Behavior Genetics Association

July 1992: Professor John DeFries receives Behavior Genetics Association Dobzhansky Award for Outstanding Research Accomplishments in the Field of Behavior Genetics

1992: Professor Carol Lynch returns to IBG and University of Colorado as dean of the Graduate School, vice chancellor for research and IBG faculty fellow

1993: Professor Thomas Johnson receives the Busse Research Award for Biomedical Gerontology, International Association for Gerontology

May 1993: Professors John Hewitt and David Fulker co-host fifth International Workshop on Methodology of Twin and Family Studies

1994: J.C. DeFries, R. Plomin, & D. W. Fulker publish *Nature and nurture during middle childhood*. Oxford: Blackwell Publishers

1994: IBG graduate Lon Cardon, with Professors David Fulker, Bruce Pennington, John DeFries and colleagues, publishes paper in *Science* reporting localization of gene for reading disability to small region of chromosome 6, a result independently confirmed throughout past 23 years

1994: Professor David Fulker receives the second annual Psychology Department Faculty Award in Research

1995: Professor David Fulker receives the Dobzhansky Award for career contributions to field of behavioral genetics by Behavior Genetics Association

1995: Professor Thomas Johnson presents the sixth annual Nathan Schock Award Lecture in gerontology at National Institute of Aging, Baltimore, Maryland

1995: Professor John DeFries elected fellow of Section J (Psychology), American Association for the Advancement of Science

1996: Professor James Wilson receives Psychology Department Faculty Service Award

1996: Professor James Wilson serves as president of Behavior Genetics Association

1996: Graduate student Stephanie Schmitz receives Dozier Award from Department of Psychology for outstanding academic and research accomplishments, and W.R. Thompson Award from Behavior Genetics Association for paper, "Family environment and children's problem behavior," co-written by Professor David Fulker

1996: Agnes Conley retires from IBG

1996: Toni Smolen appointed IBG assistant director and chief financial manager

Spring 1997: Professor Jeanne Wehner serves as acting director of IBG during DeFries sabbatical

1997: Colorado Antisocial Drug Dependence Center founded by Professor Thomas Crowley

1997: Maricela Alarcon receives Graduate Student Award for Excellence in Research and Creative Work from Graduate School and is co-recipient of Dozier Award from Department of Psychology for outstanding academic and research accomplishments

1997: Professor David Fulker elected fellow of Section J (Psychology) of American Association for the Advancement of Science

1997: Two founding IBG faculty members, Professors Kurt Schlesinger and James Wilson, officially retire from University of Colorado

1997: R. Plomin, J.C. DeFries, G. E. McClearn, & M. Rutter publish *Behavioral Genetics* (3rd ed.). New York: W.H. Freeman and Co.

1997: Professor Allan Collins receives NIAAA Lifetime Merit Award for pioneering studies on the interactions of alcohol and nicotine

1998: Professor V. Gene Erwin receives 1997 University Faculty Award for Excellence

1998: Graduate student Javier Gayan receives Thompson Award from Behavior Genetics Association for presentation "Quantitative Trait Locus for Specific Language and Reading Deficits on Chromosome 6p"

1998: Eugene Thomas, Specific Pathogen Free (SPF) Laboratory supervisor, retires from IBG

1998–1999: Dean of the Graduate School and Faculty Fellow Carol Lynch elected fellow of the American Association for the Advancement of Science for her research accomplishments in evolutionary behavioral genetics

1999: Behavior Genetics Association votes to present annual David W. Fulker Award for best paper published each year in journal Behavior Genetics, for which he had served as executive editor since 1986

1999–2000: Professor Allan Collins is recipient of National Institute of Drug Abuse Research Scientist Award and National Institute on Alcohol Abuse and Alcoholism MERIT Award, as well as recipient of 2000 Distinguished Coloradan Award from School of Pharmacy, CU Health Sciences Center, Denver

2000–2001: Professor John Hewitt serves as president of the Behavior Genetics Associate

January 2000: IBG acquires 2,000 square feet of space in addition to second floor of IBG building; also acquires 10,000 square feet of office and laboratory space in newly renovated Administrative and Research Center on East Campus

2001: Professor John Hewitt becomes director of IBG

2001: Professor John Hewitt co-edits *Infancy to Early Childhood: Genetic and Environmental Influences on Developmental Change,* published on the Macarthur Longitudinal Twin Study

2001: R. Plomin, J.C. DeFries, G.E. McClearn, & P. McGuffin publish *Behavioral Genetics* (4th ed.). New York: Worth Publishers

2001-2002: Professor John DeFries awarded 94th CU Boulder Distinguished Research Lectureship from Council on Creative Work

2002: Professor Thomas Johnson receives Robert W. Kleemeier Award from Gerontological Society of America

2002: Graduate Student James Cypser and Professor Thomas Johnson receive Sam Goldstein Award for best paper in *Journal of Gerontology: Biological Sciences*, May 2001–March 2002

2003: Professor Michael Breed elected fellow, American Academy for the Advancement of Science

2003: Professor Allan Collins receives Langley Award from Society for Research on Nicotine and Tobacco

2003: S. Petrill, R. Plomin, J. DeFries, & J. Hewitt (Eds.) publish *Nature, nurture, and the transition to early adolescence*. New York: Oxford University Press

2003: R. Plomin, J. DeFries, I. Craig, & P. McGuffin publish *Behavioral genetics in the postgenomic era*. Washington, DC: American Psychological Association

2004–2007: Professor Michael Stallings serves as secretary of the Behavior Genetics Association

2005: Heather Gelhorn wins Dozier Award for best graduate student in Department of Psychology and Thompson Award for best presentation by associate member at Behavior Genetics Association annual meeting

2005: John DeFries and co-authors (Henderson, Turri, Flint) win Fulker Award for best paper published in *Behavior Genetics* in 2004

2006: Professor James Sikela receives Award for Excellence in Research from Department of Pharmacology

2006: Professor Richard Olson receives Geschwind Memorial Lecture Award from International Dyslexia Association

2006: Professor Michael Breed elected fellow of the Entomological Society of America; receives Robert Stearns Award for service to the University of Colorado and Herd Teaching Recognition Award

2006: Professor Thomas Johnson serves as president of the American Aging Association

2006: Annual research awards surpass $12 million

2006: Completion of second-floor expansion to IBG building adds 5,700 square feet of testing, wet laboratory and office space

2007: Professor Erik Willcutt receives American Psychological Association Division 53 (Child Clinical Psychology) Early Career Research Award

2007: Professor Erik Willcutt receives University of Colorado Department of Psychology Faculty Research Award

2007: Professor Michael Stallings receives Fulker Award for best paper published in *Behavior Genetics* during 2006

2008: Professor Thomas Johnson becomes editor-in-chief of *Experimental Gerontology*

2008: Professor John Hewitt receives Dobzhansky Award from Behavior Genetics Association for outstanding lifetime research accomplishment in field of behavioral genetics

2008: Professor Greg Carey receives James Shields Award from International Society for Twin Studies for his lifetime contributions to twin research

2008: R. Plomin, J. DeFries, G. McClearn, & P. McGuffin publish *Behavioral Genetics* (5th ed.). New York: Worth Publishers

2008–2009: Professor Michael Breed receives Boulder Faculty Assembly Award for Excellence in Service

2008–2009: Professor Allan Collins receives Boulder Faculty Assembly Award for Excellence in Research, Scholarly and Creative Work

2009: Professor John DeFries elected fellow, Association for Psychological Science

2009: Professor Thomas Johnson receives Glenn Award for Research in Biological Mechanisms of Aging from Paul Glenn Foundation

2009: Professor Gregory Carey receives award for his dedication and service to Boulder Faculty Assembly

2010: Professor Thomas Johnson elected fellow of American Society for the Advancement of Science

2010: Professor Thomas Johnson awarded Denham Harman Research Award by American Aging Association

2010: Professor Thomas Johnson receives Boulder Faculty Assembly Award for Excellence in Research, Scholarly and Creative Work

2010: Professor John Hewitt awarded Department of Psychology and Neuroscience's Faculty Research Award

2011: Professor Matthew Keller receives Fulker Award (with S. Medland & L. Duncan) for best paper published in *Behavioral Genetics*, 2010

2012: Professor Matthew Keller awarded Behavioral Genetics Association's Fuller/Scott Early Career Award

2013: R. Plomin, J. DeFries, V. Knopik, & J. Neiderhiser publish *Behavioral Genetics* (6th ed.); New York: Worth Publishers

2013: Professor Charles Hoeffer receives Blas Frangione Young Investigator Merit Award

2014: Professor Charles Hoeffer receives Essel Investigator Award from Brain & Behavior Research Foundation

2016: Professor John Hewitt receives James Shields Award from International Society for Twin Studies for lifetime contributions to twin research

2016: Professor Thomas Johnson receives 2016 Outstanding Career Achievement Award from International Dose Response Society

2017: V. Knopik, J. Neiderhiser, J. DeFries, & R. Plomin publish *Behavioral Genetics* (7th ed.): New York: Worth Publishers

2017–2018: Professor Marissa Ehringer serves as president of International Behavioral and Neural Genetics Society

IBG laboratories

Friedman Lab

Ehringer Lab

Stitzel Lab

Hoeffer Lab

Link Lab

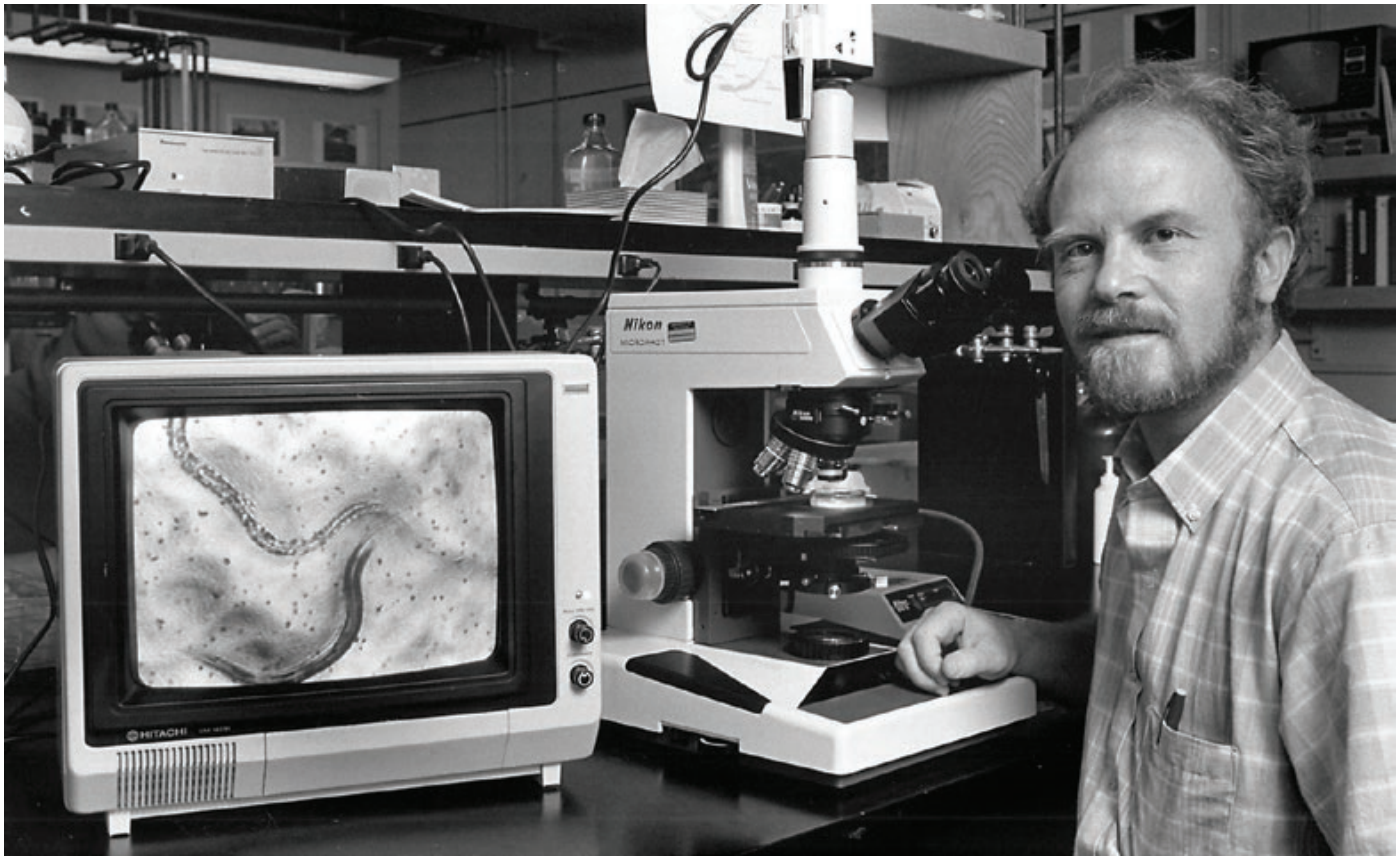
Catslife Project

From left to right: Amy Ledbetter, Brett Haberstick, John DeFries, Lize Muñoz Diaz, Paige Trubenstein, Corinne Gunn, Chandra Reynolds, John Hewitt, Sally Wadsworth, Mike Stallings, Naomi Friedman, Robin Corley, Soo Rhee and Andy Smolen. (Not shown, Robert Plomin and Saskia Selzam.)

Adolescent Brain and Cognitive Development (ABCD) study

The research team for the ABCD study, along with the MRI scanner that provides images of the participants' brain structure and function. Back row (l to r): Nicole Speer, Jen Keith, Kai Wang, Carly Carrasco-Wyant, Teryn Wilkes. Front row (l to r): Marie Banich (PI), Michelle Stocker, Dina Huber, Naomi Friedman, Megan Ross, Jasmin Torres, Ogechi Hippolyte, John Hewitt (PI).
Photo by Teryn Wilkes.

Chris Link



Tom Johnson

Memories from the IBG family

Tom Gould

I can truly say that my career would be much different if it were not for IBG. While doing my postdoc at another CU campus, my wife, Sheree, who was doing her postdoc with Jeanne Wehner, made an offhand comment that Jeanne and Al Collins were thinking about looking at the effects of nicotine on learning but might need some help setting it up. It quickly went from "well, I have no expertise in nicotine or genetics but could help" to "the combined approach of behavior, genetics and neuroscience is really exciting, and the integrative focus on nicotine and learning is something I might be able to build a career upon." I could not have predicted that 20 years later I would be writing this note as the department head in biobehavioral health at Penn State and as a past president of the Society for Research on Nicotine and Tobacco. While I sometimes think that a simple twist of fate opened pathways that led to opportunities I would have never thought possible, it really was the IBG experience that shaped where I am today. The excellent scientific environment created opportunities for growth and independence while also fostering a sense of community and family that allowed people to be more than they dreamed possible. I look back fondly on our time there with gratitude for all that I learned, especially from Jeanne and Al, who set standards of excellence in all domains that continue to inspire me to attempt to achieve them.

John DeFries

Nancy McClearn, me, and Jerry McClearn in the newly founded IBG, probably during the fall semester of 1967, already planning the first addition to the building.

Jim Wilson

In 1957, stationed in Stockton, California, I asked the Army for an early release so I could attend college. They indicated a general willingness and asked, "What college?" I had seen the Berkeley campus, knew little about it, but said, "Berkeley." With an "OK" I applied, was accepted and finished a bachelor's degree in psychology in mid-1958. It was interesting, so I applied for grad study and was accepted.

Professor Frank Beach wrote me a letter offering an RA-ship. I accepted and started a series of studies under him. The department then hired a young assistant professor in the unusual area of behavior genetics, to wit, Jerry McClearn. Jerry's approach was new to many, and he was a popular teacher and successful researcher. In the course of time, I was offered a position of supervising the lab that he and his colleague, Professor Bill Meredith, had started.

And then, feeling that BG should work across disciplines, McClearn asked for establishment of an institute, to include academic geneticists. Berkeley said no; Jerry looked elsewhere and found Colorado. They seemed much more receptive. So Jerry moved to Colorado.

He soon asked me to join him to help in starting an institute. I accepted before finishing my PhD and was soon busy ferrying lab equipment by truck and research mice by private plane. Mainly, these were Jerry's new short-sleep and long-sleep selected lines, the new HS heterogeneous stock that Bill Meredith, McClearn and I had developed over several years, and several inbred lines. The idea was to avoid the contamination and disease risk to the special mouse lines and stocks by avoiding airlines and using me as pilot in a private plane.

We first set up in the basement of the Ketchum building in a "pretty good" mouse lab pulled together using money from psychology's share of a big development grant to CU. And Jerry, with my help, started writing a proposal for an institute. As part, a mouse research facility was to be specific-pathogen-free (SPF), meaning a high level of protection for the mouse stocks against some common serious diseases, but not claiming to be completely germ-free. In the course of this planning, we undertook private plane trips to the University of Utah and the University of Texas Medical School to study their labs. The proposal was approved by the CU regents, and IBG was born. Jerry appointed me associate director and we began recruiting staff, faculty and students. John Belknap was one of the earliest students accepted. McClearn's Berkeley student Kurt Schlesinger accepted an offer early on and arrived from his assistant professor position in North Carolina in summer 1967. John DeFries was also an early recruiting success. I believe John asked for a short delay to obtain his tenure from the University of Illinois before coming. In the meantime, R.C. Roberts, a mouse geneticist from the University of Edinburgh, came and served at geneticist during 1966–67. Another early recruit was Steve Vandenberg from the University of Louisville. The CU administration had kindly appointed me as a research associate—a bit irregular, since I still had not completed a PhD.

But, working at night, when mice prefer to conduct their activity and sex lives, I did write a mouse sex dissertation, awarded in absentia by UC Berkeley, in 1968. I still recall the awkwardness of being called "doctor" by many of the students and associates—a bit early when I was a research associate, and before appointment to assistant professor.

I think it highly appropriate to comment on two early staff appointments: Agnes Conley had served as part-time secretary to McClearn at Berkeley while undertaking her own PhD in political science (Supreme Court specialty). Jerry recruited her to Boulder in summer 1966, and she was a strong right arm for the institute proposal and for many others for many years. I had hoped Agnes would complete her PhD, but she never did. And John DeFries asked to bring with him two students, Joe Hegmann and Linda Dixon, and his lab chief, Gene Thomas. Gene was a strong right arm in running the SPF lab for many years.

Early in the operation of IBG, McClearn became interested in the research approach of some faculty members in the School of Pharmacy. I remember particularly the early meetings with Assistant Professor (later Professor and Dean) Gene Erwin. Ensuing from this was the appointment of pharmacy student Boris Tabakoff as an IBG trainee. I have not searched for Boris just now, but last I saw, he was still the long-serving chair of pharmacology, UC Medical. And associated with both Erwin and Tabakoff was Professor Richard Deitrich, who for many years was a close collaborator and the PI of the Colorado Alcohol Research Center.

Dick Deitrich

The collaboration between IBG, the School of Pharmacy and the Department of Pharmacology around the study of alcohol was facilitated by the presence of strong researchers in all those entities. IBG had Jerry McClearn as its director. He had developed the short- and long-sleep mice, whose differential sensitivity to a dose of ethanol provided a pathway to understand not only the genetics of this sensitivity but the mechanism of central nervous system sensitivity to ethanol. These mice were ideal subjects for a close examination of the neurochemical actions of ethanol. Faculty of both the School of Pharmacy and the department of Pharmacology were eager to use these animals in paradigms designed to get at basic mechanisms using techniques used for investigations of CNS actions.

The first order of business was to show that differential metabolism of ethanol between the two lines of mice was not the cause of the differences. This was done by Gene Erwin and his students. This resulted in Jerry McClearn's statement that the mechanism was "somewhere above the neck." By combining the expertise in genetics provided by IBG with the neurochemical and neurophysiological acumen in the School of Pharmacy and the Department of Pharmacology, it was possible to obtain one of the first 500 alcohol research centers and a postdoctoral training grant from the National Institute of Alcohol Abuse and Alcoholism (NIAAA). The center grant ran for 26 years, producing a plethora of research articles (probably well over a hundred). A great many faculty members participated in this center and training grant. Roughly 30 faculty and many more postdocs, graduate students and research technicians from many departments participated. The influence that this work had on the field of alcohol research is considerable. I had the privilege of working with all of these people as scientific director or principal investigator for all of these years. Unfortunately, Jerry, Gene and Norm are now gone. It is clear that IBG was a vital aspect of my career at the University of Colorado.

Carol Lynch

Bob and I came to IBG as postdocs in January 1972 and left in August 1973. I had a fellowship from NSF, and Bob had a fellowship from NIH. My advisor was John DeFries, and Bob's was Gerry McClearn. There was a wonderfully eclectic and diverse group of postdocs, graduate students and faculty there at the time. Bob and I shared an office (more on that later), and nextdoor were two other postdocs (they were probably the only other postdocs at the time), Dennis St. John, an ethologist, and Peter Corning, a political scientist. I recall that Dennis had a pet prairie dog named Susy. My taste in pets was equally unusual, as I had a pet mourning dove. (Neither was allowed in IBG!) Bob and I were working on a paper together, as were Peter and Dennis, and we all were somewhat comforted in that we had similar arguments over writing!

Bob had (has always had) a habit of losing his pens and then taking mine. So I put a strip of masking tape diagonally across our office that he was not to cross. That strip stayed there for years, until those rooms were carpeted, and became part of the folklore of IBG. (You will be happy to know that we are still married, sharing a 50-year anniversary with IBG!)

The IBG graduate seminar that year, taught by Gerry McClearn, was on human evolution. It met once a week, and all the grad students and postdocs attended.

We had lots of social events (we were a small group), and Bob organized quite a few, including a Darwin Day picnic in Scott Carpenter Park, and a memorable pig roast at the Gold Hill Inn, which was only a few years old at the time.

My time at IBG was instrumental in my future career, not only because I was able to start my experiment on selection for nest-building in mice, but also because of connections to Douglas Falconer's group in quantitative genetics at the University of Edinburgh, where I established significant research collaborations after my first sabbatical.

IBG 25th anniversary: Dick Deitrich, Gene Erwin, John DeFries and Jim Wilson.

Even if Bob and I had not returned to the University of Colorado in 1992, we would still have maintained close personal friends from those early years. Toni Smolen was already a good friend of ours from the University of Iowa, and we were able to connect her to IBG. She and Andy are among our best friends. David Shern was an undergraduate working in the animal lab when we got to know him. We stayed in touch, and he went on to a distinguished academic career, becoming a dean at the University of South Florida, then president of Mental Health America. We see him and his partner, Mary, several times a year.

IBG played a leading role in the development of the Behavioral Genetics Association—always a great place for students—and also the careers of many distinguished scientists. We value our memories of those early days!

Jim Sikela

I recall a story that appeared in *The Rocky Mountain News* in the late '80s or early '90s. My lab had been working with Adron Harris to try to find genes contributing to alcohol action. We were contacted by a reporter who said the paper wanted to do an article about our research on the genetics of alcoholism. During the interview we told him how we were using a mouse model developed through IBG. These were the "long-sleep" and "short-sleep" mouse lines, which had been bred to show differential responses to alcohol. The reporter wrote up a nice story about our research and its potential to identify important genes relevant to alcoholism. The only problem was that he got the name of the mice wrong. In the story he had us working with the "long-sleeved" and "short-sleeved" mice!

Jason Boardman

It is hard for me to fathom that I officially started my K01 training in July of 2005. I enrolled in John DeFries' course that year and later took courses with Matt McQueen, Matt Keller, Mike Stallings and others. The sociologist, constantly raising his hand, "can you say that again," "what," "I don't understand," "so, linkage and LD are different," "what do you mean by strand," "wait a minute, who is XX and who is XY again," etc. Matt and others kept reminding me that osmotic learning was very real and that I just had to be patient until it started to soak in. Since that time I've been fortunate to play both lead and secondary roles in papers linking sociology and behavior genetics that have appeared in leading genetics, public health and epidemiology, social science, and general science outlets. I've collaborated with colleagues at IBG on large, NIH-funded projects

and developed lifelong professional connections and personal friendships with the remarkably talented researchers and remarkably humble and compassionate individuals at IBG. As I am writing this note, we are officially waiting to hear about the funding of the IBS-IBG T32 through NIA, which will help to formalize the collaborations between the two institutes and their respective disciplines. This was only possible because of the patient mentorship and training that I have and continue to have from the workshops, courses and individual "tutoring" sessions that I have received over the years. It has been a wonderful journey thus far and I am very excited to see where it takes us. Thanks again for picking me up as I hitchhiked my way into the study of behavior genetics.

Christian Hopfer

I credit IBG for making my research career possible. As a psychiatrist interested in genetics, IBG provided me with the collaborations and skills necessary to study clinical populations in a meaningful way. It's a true interdisciplinary place where multiple perspectives are valued and the breadth of research—from animal studies to twins to molecular approaches—provides constant intellectual stimulation. I also really appreciate the collegiality of all the faculty and staff, which has made working with IBG a great experience.

Matt Keller

I think the aspect of IBG I have appreciated the most over the years is the unspoken agreement among faculty, researchers and students about what we, as scientists, are here to do. We're here to try to understand human behavior, wherever that might lead, and to report our findings honestly and frankly. Big publications and big grants, which IBG has been very successful at over the years, are nevertheless consequences of that search for truth, not the end goals. I've really appreciated being in an environment where skepticism and critical thinking are encouraged and expected.

Jeanne Wehner

In 1982 I received a call from John DeFries, the IBG director, offering me a job. With this wonderful offer, I became the first tenure-track woman faculty member on the IBG faculty. I, of course, had some concerns about what my life would be like as the only woman on the IBG faculty as well as the only woman on the basic science faculty of the School of Pharmacy. Accepting the offer was the smartest thing I have ever done in my life.

I was originally trained as a biochemist, but always loved interdisciplinary research because one can address problems related to a big picture. IBG was a unique place for this type of quest because human and animal genetics were being performed in the same institute. The mouse facilities were essential for the success of my research.

In IBG's research environment, I could recruit students and postdoctoral fellows with a range of interests, bringing their knowledge and techniques from neuroscience, pharmacology, biochemistry, cognitive psychology, and molecular biology. These young researchers left IBG understanding the value and necessity of considering genetic variation in their own research. Our collective research on the genetics of learning and memory produced many publications that are frequently cited even in 2017.

Al Collins

After I earned my PhD in pharmacology in 1969 at the University of Wisconsin, I took a postdoc with Richard A. Deitrich, who was a faculty member in the Department of Pharmacology at the Health Sciences Center in Denver. Dick was world-renowned for his studies of alcohol and aldehyde metabolism and had just started studies that ultimately demonstrated that genetic factors modulate phenobarbital-induced increases in rat liver aldehyde dehydrogenase activity. I had done my PhD thesis research in reproductive biochemistry and was bored by it. I was attracted by Dick's studies that were among the first to establish that genetically determined differences in drug metabolism modulate individual differences in sensitivity to drugs in rodents and humans. Dick was a pioneer in pharmacogenetics, and I accepted Dick's job offer even though I knew virtually nothing about alcohol or aldehyde metabolism and even less about genetics. When I joined Dick's group, I learned that he was actively collaborating with IBG faculty members in Boulder, most notably IBG's first director, Jerry McClearn, and Gene Erwin, who was a School of Pharmacy member and IBG faculty fellow.

In 1972, I was recruited to the faculty of the School of Pharmacy. I took the job even though I knew the school did not have an active research program because I was interested in Gene Erwin's developing alcohol research effort. Gene had established an active research laboratory at IBG, and he graciously allowed me to start my research in a corner of his lab (no start-up packages in those days). One of Gene's graduate students, Skip Heston, finished a study during the first few months I was on the Boulder campus that established for the first time that genetic factors influence differences in brain sensitivity to a drug. Skip found that the long-sleep (LS) and short-sleep (SS) mouse lines that Jerry McClearn had been selectively breeding for differences in duration of alcohol-induced loss of the righting response (sleep-time) do not differ in the rate of alcohol metabolism. He found that the SS mice regain the righting response at brain- and blood-alcohol levels that far exceed the righting response levels in the LS mice. Skip and Gene expanded pharmacogenetics into a new area when they concluded that genes modulate differences in tissue (brain) sensitivity to the anesthetic effects of alcohol. This finding was very exciting, and I decided to jump into the fray. I was going to leave the liver to study drug effects on the brain, a tissue that has parts, many parts. I knew almost nothing about the brain, and I was going to use genetics to study it.

I joined the IBG faculty in the summer of 1973. I was attracted to IBG because the students and faculty at the institute were aggressively studying genetic influences on normal, abnormal and drug-related behaviors using human and animal (mostly mouse) models. During those first years, Jerry McClearn, Jim Wilson and Gene Erwin introduced me to the methods used in what has come to be known as forward genetics (identify genes that contribute to variability in a phenotype). Jerry, Jim and Gene taught me how to use inbred mouse strains, derived crosses, congenic strains and selectively bred lines in our studies of alcohol and nicotine actions to identify behaviors that were modulated by genes. Our first nicotine studies, carried out by Patricia Hatchell, my first IBG graduate student, showed that inbred mouse strains differ dramatically in sensitivity to a broad array of nicotine's behavioral and physiological effects, but the strains did not differ markedly in the rate of nicotine metabolism. This simple finding expanded the notion that genetic factors might play a vital role in regulating the sensitivity of the brain to drugs.

In the mid-1990s, we began to acquire mouse strains that had been genetically engineered. We obtained null mutant mice for virtually all of the eight nicotinic receptor subunits that are expressed in brain, as well as several gain-of-function mutants. These mice were used in reverse genetic studies (alter the gene and identify phenotypes that are altered). Once again, I found myself using a technique that was totally foreign to me. Fortunately for me, and IBG, Jeanne Wehner had joined the IBG faculty. Jeanne was one of the very first to use gene knock-out mice to evaluate the role of a gene in modulating behavior. Jeanne had established an international reputation in this new field, and she willingly helped us learn how to use these

mice to test hypotheses and to identify the subunit compositions of eight of the naturally occurring nicotinic receptors, their sites of expression and their neurochemical function.

My lab's research prospered at IBG because we could walk down the hall and get help from willing colleagues. Moreover, IBG's reputation helped us attract graduate students and postdocs from around the world. These students often brought us new methods and techniques that we used in studies that helped us gain a better understanding of the roles that nicotinic receptors play in modulating brain function and behavior. We were continually faced with our own ignorance, but the people of IBG helped us address and answer many important questions related to nicotine, alcohol and nicotinic receptors.

Marissa Ehringer

I was the first student to graduate from the Human Medical Genetics Program at UCHSC in Denver. While I was very happy in the lab of Jim Sikela studying the genetics of the ISS and ILS mice, I was very disappointed in the limited training in statistical genetics available in the new graduate program at that time. We were collaborating with Tom Johnson, who recommended I take John DeFries' Quantitative Genetics course. The experience was a major turning point for my training and career, because I discovered the joy of learning specifically about behavior genetics.

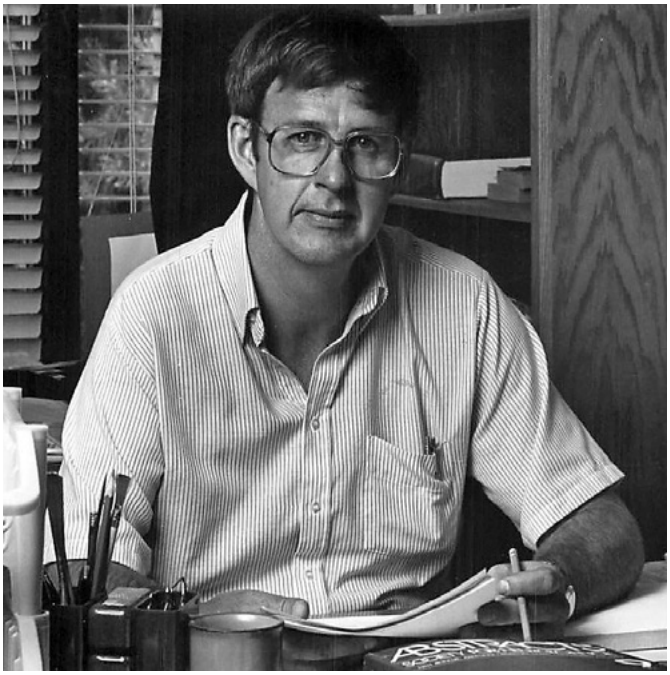
As I considered how to move forward with my training, John DeFries advised me to apply for the BG certificate program. Jeanne Wehner and Toni Smolen encouraged me to apply for a T32 training grant slot, which I was awarded. I thus began the series of courses that would provide a foundation for me to pursue my current position.

IBG faculty members were incredibly supportive. I recall taking Biometrical Genetics with John Hewitt, and he stayed after class (after 5:30 p.m.) to review some concepts with me individually. His enthusiasm for the material, and excitement to share it with me, was quite contagious. A similar attitude was expressed by Mike Stallings in his early QTL course.

Upon completing my degree, I was thrilled to become a postdoc with John Hewitt as my mentor. At the time, I only wanted to do human genetics studies and no more lab work. However, Al Collins arrived in my office on my second day with a grant application for the Colorado Tobacco Research Program, because he wanted me to use the Center for Antisocial Drug Dependence human samples to look at the nicotinic receptor genes for association with smoking. That was funded, and Jeanne provided space in her lab for me to start the studies. This provided preliminary data for a subsequent K01 Mentored Career award under John Hewitt, followed by an independent R01 and joint R21 with Jerry Stitzel, who was jointly hired in 2003 with me. I have been fortunate to be surrounded by colleagues who are leading experts in their respective areas and interested in collaborative projects that bring together multiple approaches to address the genetics of substance abuse.

Robin Corley

39 years at IBG—with appreciation. I arrived in Boulder in 1978 and spent a near-record-tying nine years getting my doctorate (thanks, Scott Painter). Thanks to John DeFries and David Fulker for shepherding me through. What I appreciated most as a graduate student was the collegial feeling among my fellow graduate students (I had the chance to overlap with a substantial number), and the athletic excellence of our intramural teams! I was lucky enough to be offered a role as a research associate during the initial cycles of the MacArthur Longitudinal Twin Study, and have kept true to Chief Niwot's Curse/Blessing by finding myself unable to escape from Boulder Valley (and not just due to the amount of traffic). I've rejoiced in the continuing atmosphere of collegiality I've shared in while here—and hope that it will persist as part of our institution's ethos. With fond memories of everything from Michael Breed's bee colonies in RL4



Al Collins

to the remodeling that gave my plants such a wonderful southern exposure, and with special gratitude for finding my wife, Kim, as a fellow IBGer, I am happy to celebrate the 50th anniversary of this special institution.

Toni Smolen

Following more than 42 years of employment with IBG, I can truthfully say I've experienced everything IBG has to offer. I came to IBG to work as a laboratory technician on a series of alcohol studies in 1972. It was the most exciting and interesting work I'd ever participated in. I was encouraged to apply to graduate school by then-IBG Director Gerald McClearn and faculty supervisor Allan Collins, and I did so in 1975 with a major in behavioral genetics and a minor in neurochemistry.

In graduate school I was a teaching assistant for behavioral genetics and other courses for two years, after which I became a predoctoral trainee in the IBG Training Program. I was supported on an NIH training grant, completing nearly the same training program requirements that our students at IBG do today, even though the courses taught and the direction of the research conducted at IBG have changed dramatically over the years.

It was during that time that I met and married Andrew Smolen, who completed his PhD in the same lab as I, under the mentorship of Al Collins. After finishing my PhD in spring 1982, Andy and I left for postdocs in the Department of Pharmacology at the University of Michigan Medical Center. We enjoyed our time there, and the people we worked with were amazing. However, Andy and I were offered jobs as research associates back at IBG approximately two years later to work, once more, with Al Collins. We were delighted to be back.

Shortly after returning, Al encouraged us to write our own grants. We were both successful—and the rest is history. We were made faculty fellows in 1986, and I became the assistant director and financial manager of IBG about 10 years later under the directorship of John DeFries. John Hewitt assumed the directorship in 2001 and later promoted me to associate director. At the same time, Andy

became the director of the IBG Molecular Biology/Genotyping Lab, and has supported that lab with a series of individual grants and subcontracts for more than 30 years.

During my years at IBG as a research associate and faculty fellow, my primary research interests were in pharmacogenetics and neuropharmacology, specifically the role of adenosine and purinergic systems in the development of alcohol tolerance and dependence. I stepped back from being an active researcher in the early 2000s and focused on my administrative career. I finally retired from the associate directorship and financial management of the institute in February 2016, exactly 35 years from the day I defended my PhD thesis—just around the corner from where my retirement party was held. Friends have remarked how unusual it is that Andy and I have, for the most part, worked in only one place, together, for more than 40 years. But I think I can speak for both of us when I say it has been, truly, a labor of love.

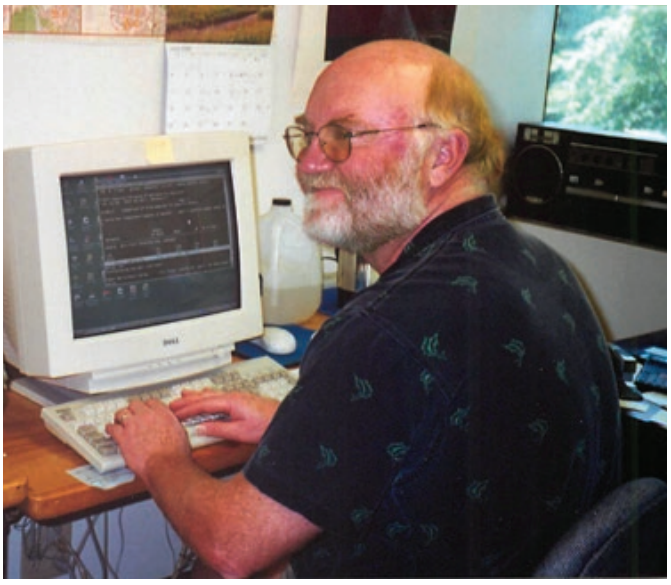
John Crabbe

I can blame my current career almost entirely on the IBG. When I came to Boulder in summer 1968, I was a psychology department student expecting to specialize in social psychology. Well, that didn't work out, and I wound up working in year two for Bruce Ekstrand doing all-night sleep EEG recordings in the Student Health Center for a sleep and memory study. To say I was floundering and largely directionless would not be an overstatement. It was Kurt Schlesinger who found me in a biopsychology proseminar and convinced me to switch into the new biopsychology area and join the almost-that-new IBG in 1970. But it must have been my genetics—I headed right for the alcohol and drugs (and, of course, the mice), and I can't say we've solved the problem yet. The Boulder environment at the time may have slightly contributed. . . . So the IBG was a huge and lasting influence.

Andrew Smolen

"Are you still here? I thought you were retired," is the most common greeting I get these days. Not "hello" or "good morning." Just this. I generally mumble something about grant projects, loose ends and the like, but the truth is that I enjoy coming to work here. Where would I rather spend time? I like the people, the research they are doing and our interactions. It is the people that give an institution its character. When I think back on my 42 years at IBG, the character that I most associate with this institution is the welcoming and collegial atmosphere that it encompasses. It was my first impression, and it was provided by its first director, Jerry McClearn. In September 1974, Al Collins invited me to IBG to tour the facilities. I arrived just as a colloquium in room 210 was ending, the participants were filing out, and Al brought me up to Jerry to introduce me as a prospective graduate student. I was expecting a brief acknowledgement and polite dismissal; instead, he and I talked for quite a while, standing in the hallway just outside of the seminar room. He did not have to do that. I came away impressed that the director would spend so much time just chatting with a prospective student that was not going to be one of his. That brief encounter I had with Jerry cemented my decision to come to Boulder for graduate school. I learned that day that his style was pervasive at IBG, and I am pleased to say that it still is: Office and laboratory doors are open; visitors, be they students, staff or faculty, are welcomed; and people are given credit for their knowledge and expertise regardless of rank.

Toni Smolen



Robin Corley

The spirit of collegiality at IBG extends beyond its walls. In 1996 the institute established a genotyping laboratory that was to be shared among the investigators at IBG. John DeFries, then the director, asked me to oversee that facility. This was a bit surprising to me since, although engaged in genetics research, it involved enzymes, neurochemical receptors and intermediary metabolites, not DNA or RNA. In fact, since nucleic acids interfered with our receptor assays, they had to be eliminated, and Mike Marks and I always called it debris-N-A. I accepted the appointment as director of the Genotyping Laboratory, a largely ceremonial title, but one of which I am nevertheless proud. Along with the title came the usual monetary award. What is not generally known is that at that meeting, John asked me to offer my services to those in the behavior genetics community if asked. I was pleased to make this promise since I've often thought of the behavior genetics community as an extended family, sharing those characteristics I so much like about IBG.

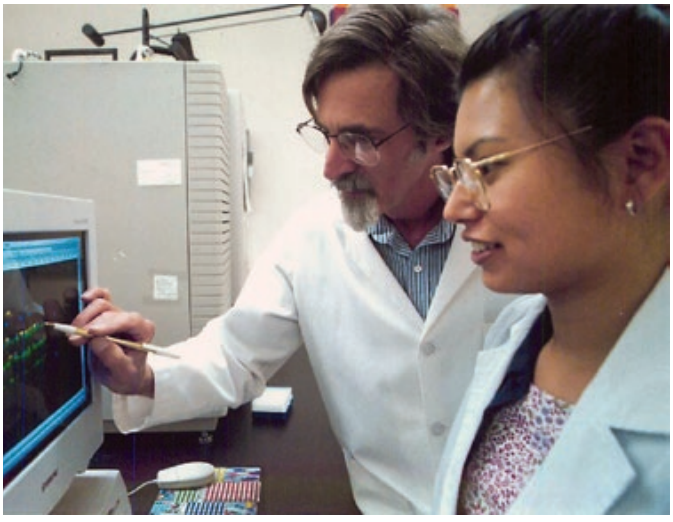
I spent nearly 30 years as chair of the Research Program ("Space") Committee. Clearly, no one else really wanted the job. One of my responsibilities was to adjudicate the assignment of laboratory and office space when requested. In all of those years I do not recall a single contentious incident. All of our faculty were agreed to apportion space by need and not by rank or grant dollars. My other duties included overseeing construction projects that seemed to be always ongoing. This was the tough part. Weekly meetings that went on

long after nothing had been accomplished. But, you learn to watch. You learn to watch that the contractor does not install the ironwork for the new colloquium room (room 120) upside down. (To his credit, it is true that there was no up arrow on the plans, but they did show a floor.) You learn to watch that the plumber actually installs a drain in the shower instead of the simpler flat floor; or that the sprinkler system piping is installed above the ceiling, not below it; or that the mason shores up a wall before removing the bottom tier of bricks. Still, the projects got done and the institute continued to grow in square footage, if not in stature.

It has been a real pleasure to spend the majority of my working life at this institute. Once, at a site visit, one of the site visitors, whose name I have blessedly repressed, asked me: "How does it feel to be in a dead-end job?" I just laughed knowing that there were hundreds who would kill to be in my position. Around the world, for years, mentors have been saying to their students some variation on "ya gotta go to Boulder" sometime in your career. Yep. How lucky have I been?

Sally-Ann Rhea

Jim Wilson and Robert Plomin hired me in 1982 to coordinate an unusual new project at IBG (a human alcohol project). If anyone had told me then that I would spend the rest of life here (OK, my life's not quite over, but so far escape seems impossible), I would have thought they were crazy. I was accepting a job, not a life, something to fill the time while I figured out what I really wanted to do. Turned out, this was what I really wanted to do. I was fortunate to work with many interesting people on many interesting projects. Being a member of the team that kept the Colorado Adoption Project going as a full life-span study, as well as starting IBG's longitudinal twin studies and the mutlisample study of substance use, was an incredible experience. In addition to the all the aspects of data collection, I had the privilege of watching many people launch careers, both here at IBG and others who went on to other things. I am grateful that, despite my lack of formal training in the field, I was afforded the opportunity to contribute to research findings and publishing (though perishing was never on the line for me). But best of all are the friendships—from dancing (really—with John H. in a techno club in Toronto and interpretive dancing with Matt K. at an FAC) to lovely lunches with Al & Jeanne & Annie & Kim, to the many weddings, the sports events, and just having people there when you need them—a person really couldn't have a better "job" than the lifelong engagement at IBG.

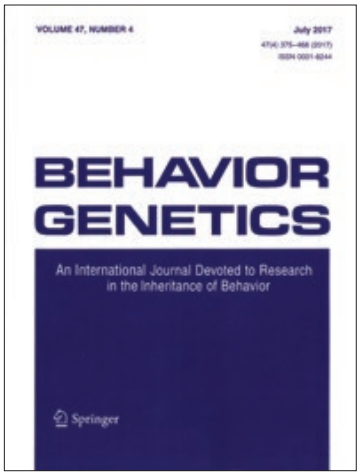


Andrew Smolen and Chinatsu McGeary

Dick Olson

My association with IBG has been the most important and satisfying factor in my academic career since I was first invited by Jerry McClearn and John DeFries to join a program project application to NIH in 1978 to study the etiology of learning disabilities. We were initially funded in 1979, with John DeFries serving as director. The program project, titled Differential Diagnosis in Learning Disabilities, was renewed for the third time in 1989, and in 1990 it became the Colorado Learning Disabilities Research Center (CLDRC), one of four national centers funded by NIH, now in its 27th year of continuous funding. My participation in the program project and subsequent CLDRC was key to my pursuit of several R01 grants through IBG to study computer-based interventions for reading disabilities, and an international longitudinal twin study with collaborators in Australia and Scandinavia. Through all of this I have benefitted immensely from my collaborations with IBG faculty, most prominently with John DeFries over the past 38 years, and more recently with Erik Willcutt. My wife, Jan Keenan, at the University of Denver, joined the CLDRC in 2000 as PI of our reading comprehension component, so IBG has been central to our shared family academic life. Though we have both retired this spring, we look forward to continued research collaboration with our IBG colleagues and staff pending the successful renewal of the CLDRC with Erik Willcutt as PI.

Behavior Genetics



The journal *Behavior Genetics* was founded in 1970, three years after the institute, by John DeFries and Steven Vandenberg, both then IBG Faculty Fellows. On the first page of the new journal they expressed their view that "behavior genetics is simply the intersection between genetics and the behavioral science" but hoped that *Behavior Genetics* will provide a medium for those persons especially interested in the problems which cut across many disciplines." They also, perhaps with an abundance of caution, allowed that that "natural selection shall pass final judgment upon the adaptedness of our new recombinant."

Forty-seven years later, it seems that natural selection has passed at least an interim judgment: More than 2,200 papers on animal and human behavior genetics have been published in the journal, with some papers cited more than a thousand times each. In the last year alone, there were more than 129,000 downloads from the journal. IBG's director, John Hewitt, has been the editor-in-chief since 2001, with IBG research associate Christina Hewitt serving as the managing editor, and the journal has been the official journal of the Behavior Genetics Association since its inception. It has survived through numerous changes of publisher, and is currently published by the powerhouse Springer Nature publishing group. So the journal that was conceived and born during the early years of the institute not only survives but thrives as a venue for rigorous, peer-reviewed science in the field of behavior genetics.

Donors to the Institute for Behavioral Genetics

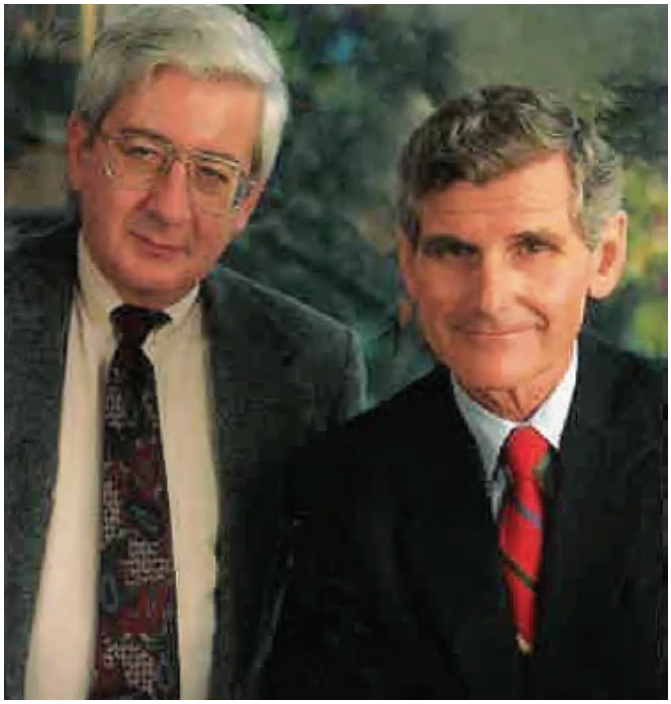
We thank all of our donors, no matter how small or large the contribution may be, for their support of the students, faculty and staff, and the training and research mission of the institute.

If you wish to make a donation to IBG, and be recognized in the online publication or future reports, you can do so by contacting Sean Shelby, or IBG Director John Hewitt, or our CU Foundation representative at Jennifer.Milligan@colorado.edu or at: giving.cu.edu/fund/institute-behavioral-genetics-general-support-fund.

This alphabetical list of donors is based on information provided by the CU Foundation, and, although it is intended to include all of IBG's donors, we are aware that it might be incomplete or that we might have inadvertently used an incorrect title or preferred name. We sincerely apologize for any errors or omissions. If you wish to have information changed, added or removed, please notify Sean Shelby at sean.shelby@colorado.edu or 303-735-3051 so that we can make corrections for the online publication of the Jubilee Report.

Laura Ann Baker
Shirley Cole-Harding
Allan Collins
Agnes Conley
C. Lawson Crowe
John DeFries
Marjorie DeFries
Richard Deitrich
Margaret Deitrich
Marissa Aileen Ehringer
Donald Evans
R. Adron Harris
John Hewitt
Christina Hewitt
Hsiu-Zu Ho
Thomas Johnson
Allan Robert Kuse
Carol Lynch
Robert Lynch
Robert Plomin
Soo Rhee
Kurt Schlesinger
Victoria Simpson
Sandra Singer
Toni Smolen
Andrew Smolen
Michael Stallings
Steven Vandenberg
Sally Jo Wadsworth
Jeanne Wehner
James R. Wilson

Since 1990, the NIMH has supported our annual workshop on Methodology of Twin Family Studies, now called the Workshop on Statistical Genetic Methods for Human Complex Traits. This weeklong workshop now routinely draws about 100 scientists from across the nation and the world, and has become a major event in quantitative behavior genetics. This group photo was taken at the 2001 workshop, a year when distinguished IBG alumnus Professor Lon Cardon was its academic director.



David Fulker and John DeFries

Agnes Conley

Rohan Palmer, Josh Bricker and Detre Godinez

Institute for Behavioral Genetics
447 UCB
University of Colorado Boulder
Boulder, Colorado 80309-0447
Phone 303-492-7362
Fax 303-492-8063