Annual Report

Institute for Behavioral Genetics
University of Colorado at Boulder

2005–2006

Results from the National Longitudinal Study of Adolescent Health

(see research highlight, page 22)

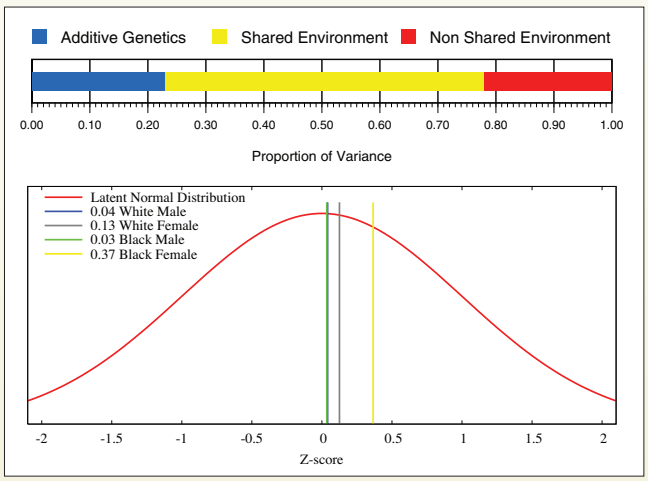

Figure A. Univariate Analysis: Early Marijuana Use. Thresholds show that black and white males have similar prevalences of marijuana use, and that white females, and then black females, have lower prevalences of use.

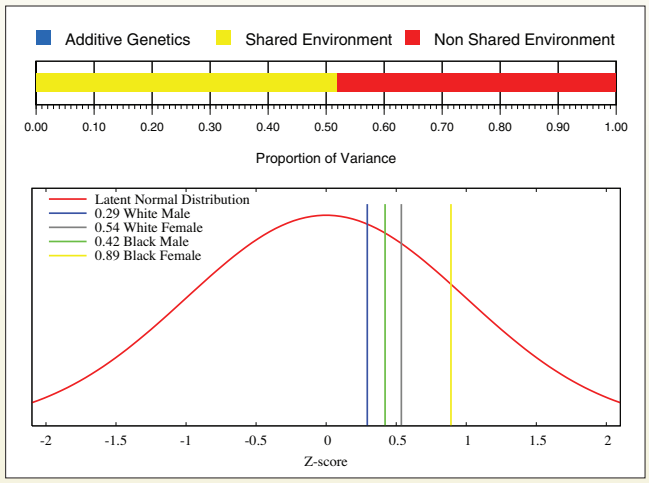

Figure B. Univariate Analysis: Wave 3 Marijuana Use. Across both racial and sex groups, the prevalence rate of marijuana use in young adulthood has decreased. The additive genetic factor has disappeared, and shared environment is the only factor accounting for the siblings' correlation.

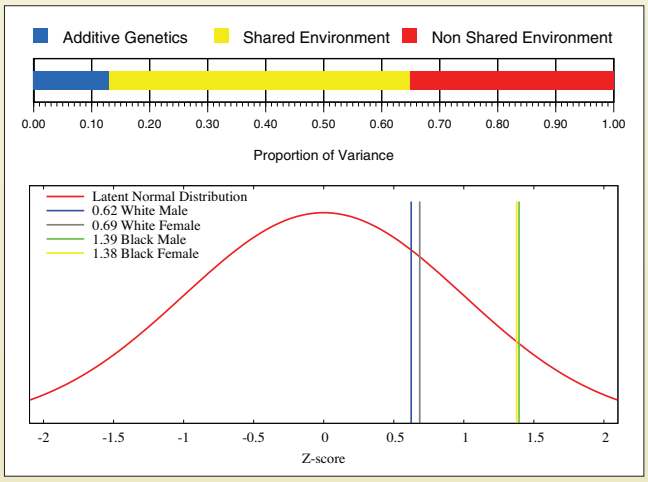

Figure C. Univariate Analysis: Early Hard Drug Use. Early use of hard drugs shows large prevalence differences between whites and blacks, but not between males and females within races. Shared environmental influences are the most important factor in the use of hard drugs.

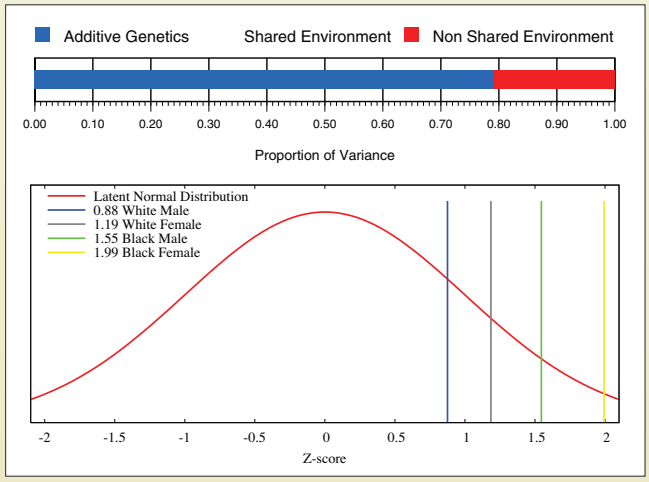

Figure D. Univariate Analysis: Marijuana and Illicit Drug Use. Four different models were examined. The most striking finding is the large additive genetic component for hard drug use during young adulthood (Wave 3). Shared environmental influences are important for marijuana use and for early hard drug use during these ages. Developmentally, there was very little relationship between early marijuana use and later hard drug use.

Annual Report

July 1, 2005–June 30, 2006

Institute for Behavioral Genetics
University of Colorado at Boulder

John K. Hewitt, Director
Toni N. Smolen, Assistant Director

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MISSION

Mission

During IBG's last program review, the Internal Review Committee reported that IBG is ". . . among the strongest of the research institutes on campus. The Institute has an outstanding faculty and research staff that has established unique and highly successful interdisciplinary research programs." The research record of ". . . the resident faculty members . . . is outstanding in terms of international recognition, publications, and extramural funding." The Extramural Review Committee concurred, referring to IBG as ". . . the leading center for human and animal behavioral genetic studies in the U.S. and, arguably, in the world." In its summary findings, the Program Review Panel stated that the ". . . Institute for Behavioral Genetics is an independent academic enterprise that is peerless in its field and a superb asset to the University of Colorado and to the Boulder Campus."

The mission of IBG, an organized research unit of the University of Colorado at Boulder, is to conduct and facilitate research on the genetic bases of individual differences in behavior and to conduct research training in this interdisciplinary area. 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 character, current research at IBG is focused on behaviors of obvious societal relevance.

The human research, in addition to studies of drug-related behaviors, includes large-scale family, twin, and adoption studies of cognitive abilities and personality, and of disorders such as learning disabilities and psychopathology. The detection, localization, and identification of individual quantitative trait loci, using both linkage and association methods, is a high priority.

Laboratory animals are used to study drug-related behaviors, particularly those associated with the use of alcohol and nicotine. For these studies, a large number of different strains and genetically selected stocks of mice are maintained in the IBG specific-pathogen-free mouse laboratory. These include inbred and recombinant strains of mice that provide efficient tools for screening behaviors for genetic influence and mapping quantitative trait loci. Selection studies in which mice are bred for certain characteristics provide definitive proof of genetic influence and also yield animal models that are valuable for subsequent research in functional genomics.

DIRECTOR

From the Director

As the pages of this report show, the institute continues to be a center of excellence and outstanding accomplishment in graduate education, research training, and the creation of new research knowledge about genetic influences on behavior.

During the past year, IBG faculty published 82 journal articles, seven book chapters, and 52 abstracts. The total IBG budget during 2005–06 (including general fund support, grants, and gifts) was $11,809,507. Most significantly, of that amount, $10,364,953 represented research and training awards. As much of our funding derives from the National Institutes of Health, whose budget is facing tight constraints, we may anticipate an increasingly competitive environment. Despite this, we continue to be successful in attracting new research awards and developing new interdisciplinary collaborative research opportunities. A continuing goal is to expand our research portfolio through interdisciplinary collaborations with academic units on the Boulder campus, across campuses, and nationally.

In early 2006 we were able to occupy the completed addition of 5,700 square feet of testing, wet laboratory, and office space, built as an extension of the second floor of the main IBG building. We have migrated a number of activities from the adjacent research building into the new wing, and have now begun renovating the vacated space to provide additional high quality laboratories.

During the year we were conducting a search to fill a new faculty position in statistical behavior genetics and are delighted that Dr. Matt McQueen is joining us from the Harvard School of Public Health. We have very high hopes and expectations for his success and contributions to the institute and the university and warmly welcome him as a faculty fellow and assistant professor of psychology.

The institute holds three separate training grants awarded by the National Institute on Mental Health, the National Institute of Child Health and Human Development, and the National Institute on Drug Abuse. Together these awards allow the institute to fully support 13 graduate students and five postdoctoral trainees in behavior genetics. Additionally, the director of IBG serves as co-PI on an NIAAA postdoctoral training grant, directed by Paula Hoffman at the Health Sciences Center in Denver; this funds seven postdoctoral fellows, including two at IBG during 2005-06. IBG also hosted the annual one-week training workshop in statistical methods for twin and family studies, supported by the National Institute of Mental Health. This is internationally recognized as one of the premier short courses in human statistical genetics for the study of behavior and complex traits, and in March 2006 was attended by 92 trainees and 15 international faculty.

Among honors and awards to IBG students and faculty during 2005–06 were those to Jim Sikela, who received an Award for Excellence in Research from his Department of Pharmacology; to Richard Olson, who received the Geschwind Memorial Lecture Award from the International Dyslexia Association; and to Mike Breed, who was elected a fellow of the Entomological Society of America, and who received the Robert Stearns Award for service to the university and the Herd Teaching Recognition Award. Lara Ray received a Student Merit Award from the Research Society on Alcoholism.

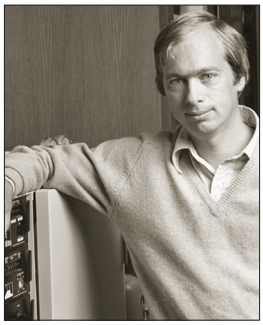
As I do annually, I must thank all of the faculty, staff, and students of the institute for their superb professional and scientific performance and for the collegiality that remains a distinguishing and necessary characteristic of the institute. In particular, I thank John DeFries who served as acting director during my sabbatical leave in the spring of 2006. A special thanks also goes to the assistant director, Dr. Toni Smolen, and to Ms. Elaine Pauly, Ms. Deborah Aguiar, Mr. Sean Shelby, and Mr. Andy Gross for their work in preparing this report.

John K. Hewitt
Director

FELLOWS

Faculty Fellows

Michael D. Breed

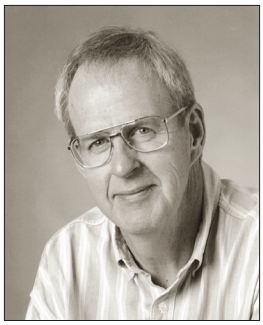


Professor, Department of Ecology and Evolutionary Biology, University of Colorado at Boulder; PhD, University of Kansas, Lawrence, 1977. Professor Breed's research emphasis is the genetics of social recognition systems in animals. His current interests include behavioral and genetic studies of the recognition 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 signatures.

Gregory Carey

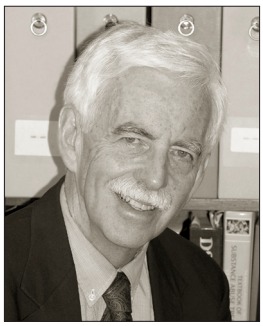
Associate Professor, Department of Psychology, University of Colorado at Boulder; PhD, University of Minnesota, 1978. Dr. Carey's research interests are in the areas of genetics and human psychopathology. Within these areas, his work concentrates on the anxiety disorders and on the development of externalizing 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 interactions.

Allan C. Collins



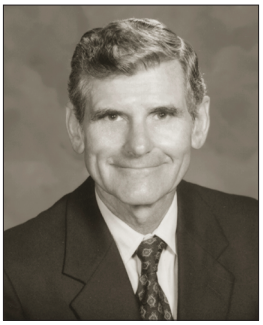
Professor of Psychology and Pharmacology, Department of Psychology, University of Colorado at Boulder; PhD, University of Wisconsin, 1969; NIAAA Research Scientist Award, 1978–83; NIDA Level V Research Scientist Award, 1993–2003. Professor Collins is a biochemical pharmacologist whose primary research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

Thomas Crowley



Professor, Department of Psychiatry; Director, Division of Substance Dependence, School of Medicine, University of Colorado at Denver and Health Sciences Center; MD, University of Minnesota, 1962. Thomas Crowley participates in IBG studies that focus on genetic and environmental influences on the development of behavior problems and substance abuse issues among adolescents. He also conducts studies on risky decision-making in those adolescents, using functional magnetic resonance imaging.

John C. DeFries



Professor, Department of Psychology, University of Colorado at 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. Professor 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.

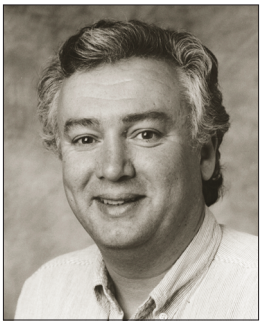
Richard A. Deitrich

Professor, 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, 1977–02; NIAAA Merit Award, 1996–2004. Professor Deitrich is a pharmacologist whose current 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

Assistant Professor, Department of Integrative Physiology, University of Colorado at Boulder; PhD, University of Colorado at Denver and Health Sciences Center, 2001. Dr. Ehringer is a molecular geneticist who utilizes the genomics and bioinformatics resources to study behavior genetics. Her current research involves the study of candidate genes that may underlie genetic mechanisms that contribute to alcohol, tobacco, and substance use.

John K. Hewitt

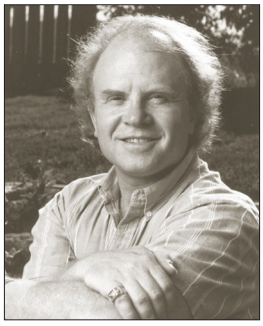


Director of IBG and Professor of Psychology, University of Colorado at Boulder; Professor of Psychiatry (Attendant Rank), School of Medicine, University of Colorado at Denver and Health Sciences Center; PhD, University of London, 1978; President of the Behavior Genetics Association, 2000–01; Editor-in-Chief, *Behavior Genetics*. Professor Hewitt uses cross-sectional and longitudinal studies of twins and families to study behavioral development, and genetic and environmental influences on behavior, personality, and health. His recent research has focused on the development of behavior problems in childhood and adolescence; vulnerability to drug use, abuse, and dependence; genetics and health; and linkage and association studies of behavioral traits.

Kent Hutchison

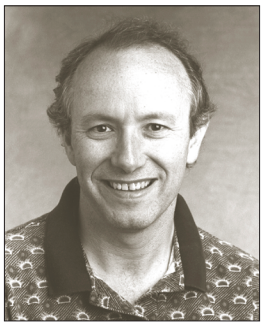
Associate Professor, Department of Psychology, University of Colorado at Boulder; PhD, Oklahoma State University, 1995. Dr. Hutchison is a clinical psychologist whose research examines mechanisms that underlie substance abuse and dependence (e.g., craving and drug reinforcement), individual difference variables that may moderate these mechanisms, and behavioral and pharmacological treatments that may moderate these mechanisms with the intention of reducing substance use. His studies employ research techniques that include: Ecological Momentary Assessment using palm pilot computers to collect daily data from participants in the field; novel medications that are useful for teasing apart the pharmacology of substance abuse as well as treating substance abuse; and novel phenotypic and physiological markers. His lab also has an active interest in how stress may moderate the pharmacological and behavioral effects of alcohol and drugs.

Thomas E. Johnson



Professor of Behavioral Genetics, Department of Integrative Physiology, University of Colorado at Boulder; PhD, University of Washington, 1975; NIH Research Scientist Award, 1994–2004. In 2002 Dr. Johnson received the Kleemeier Award (the premier award in aging research) for his discovery of the first gerontogene, *age–1*, which doubles the life span and opened up a new area of scientific research. He is also cloning quantitative trait loci conferring sensitivity to alcohol in mice. His lab uses multiple techniques: behavioral, biochemical, molecular, pharmacological, quantitative, and genetic, to analyze both aging and the action of genes leading to addiction. He recently discovered a biomarker for aging that explains a three-fold difference in longevity among isogenic worms grown in a common environment. For more information, visit his web site at http://ibgwww.colorado.edu/tj-lab.

Kenneth Krauter



Professor, Department of Molecular, Cellular, and Developmental Biology, University of Colorado at Boulder; PhD, Albert Einstein College of Medicine, 1980. Dr. Krauter is a molecular biologist whose research focuses on two aspects of human genome 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 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 at Denver and Health Sciences Center and the Institute for Behavioral Genetics at the University of Colorado at Boulder.

Carol B. Lynch

Professor, Department of Ecology and Evolutionary Biology, University of Colorado at Boulder; PhD, University of Iowa, 1971. Professor Lynch's research interests are the genetic basis of evolutionary adaptation and brain mechanisms underlying adaptive behaviors. Her current research uses a model system, which has been the study of cold adaptation in mice, with emphasis on nest building. This involves the use of replicated genetic lines of mice that have been selectively bred for over sixty generations for differences in nest building. These lines also differ in genetically correlated traits, such as body weight and litter size, as well as circadian rhythms and brain (hypothalamus) neurochemistry and neuroanatomy. These lines facilitate studies of both constraints on adaptive evolution and the path from genes to behavior.

Richard K. Olson

Professor, Department of Psychology, University of Colorado at Boulder; PhD, University of Oregon, 1970. Professor 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. Professor Olson currently serves as the director of the Colorado Learning Disabilities 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. Professor 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's 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.

Dennis R. Petersen

Professor of Pharmacology and Pharmacogenetics, School of Pharmacy, University of Colorado at Denver and Health Sciences Center; PhD, University of Wyoming, 1974; NIAAA Research Scientist Development Award, 1987–92. Professor Petersen's research concerns biochemical pharmacology and toxicology of alcohols and aldehydes. This research focuses on enzyme systems in liver, kidney, and brain that are involved in the biotransformation of endogenous and exogenous aldehydes. Of particular interest is the interaction of acute or chronic alcohol consumption with these enzymatic pathways. His recent research efforts have emphasized the use of genetics in studying the molecular and biochemical mechanisms underlying the hepatotoxic potential of various drugs and chemicals.

Richard A. Radcliffe

Assistant Professor of Pharmacology, School of Pharmacy, Department of Pharmaceutical Sciences, University of Colorado at Denver and Health Sciences Center; PhD, University of Colorado at Denver and Health Sciences Center, 1996. Dr. 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. Current projects include gene expression microarray analysis of CNS systems involved in alcohol tolerance, the genetic basis of the interaction between methamphetamine sensitization and toxicity, and QTL mapping of various alcohol-related behavioral traits.

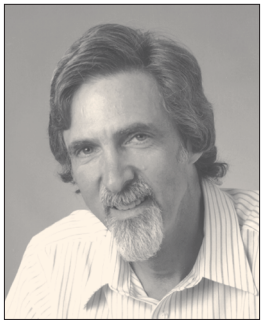
Soo Rhee

Assistant Professor of Psychology, Department of Psychology, University of Colorado at Boulder; PhD, Emory University, 1999. Dr. Rhee's primary research interests are the etiology and development of childhood disruptive disorders, the etiology and development of substance use disorders, the causes of comorbidity between psychiatric disorders and substance use disorders, and the development of methods discriminating correct models for causes of comorbidity.

James Sikela

Professor, Department of Pharmacology and Human Medical Genetics Program, University of Colorado at Denver and Health Sciences Center; PhD, Case Western Reserve University, 1983. Dr. Sikela is a genome scientist and has been a key pioneer in the development of EST technology and large-scale human gene mapping. His laboratory was part of the 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 alcoholism and mental retardation. His laboratory is also involved in the identification of genes important to human and primate evolution, including those that are specific to the human lineage and related to the structure and function of the human brain.

Andrew Smolen

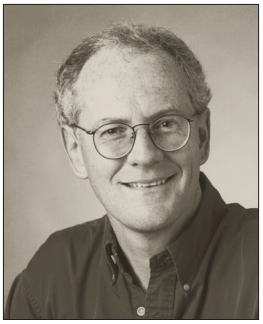


Senior Research Associate, Institute for Behavioral Genetics, University of Colorado at Boulder; PhD, University of Colorado, 1979. Dr. Smolen is a pharmacologist whose primary interests are in the areas of neurochemistry and pharmacogenetics. His current research activities include the assessment of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

Toni N. Smolen

Assistant Director, Institute for Behavioral Genetics, University of Colorado at Boulder; PhD, University of Colorado, 1981. Dr. Smolen's research interests are in the areas of pharmacogenetics and neuropharmacology. Her current projects use genetically inbred and selected lines of mice in studies of biochemical and neurochemical mechanisms that underlie the development of drug tolerance and dependence, the role of the adenosine neuromodulatory system in the mediation of the effects of acute and chronic alcohol administration, and drug metabolism in young and aging mice.

Michael Stallings

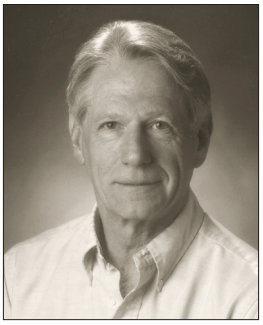


Associate Professor, Department of Psychology and Institute for Behavioral Genetics, University of Colorado at Boulder; PhD, University of Southern California, 1993. Dr. Stallings' research interests include quantitative genetics, substance abuse, and personality. Currently, his primary research program involves studies of twins, families, and adoptive families, utilizing both biometrical modeling and linkage and association methods, to understand genetic and environmental influences on the development of substance use disorders and comorbid psychopathology.

Jerry A. Stitzel

Assistant Professor, Department of Integrative Physiology, University of Colorado at Boulder; PhD, Johns Hopkins University, 1992. Dr. Stitzel is a molecular biologist whose primary interest is the use of genetic strategies to identify the underlying biological bases for the behavioral and physiological actions of drugs of abuse with special emphasis on nicotine. Current projects include the molecular, biochemical, and cellular characterization of naturally occurring variants of neuronal nicotinic receptors and quantitative trait loci mapping of a nicotine preference phenotype.

Boris Tabakoff

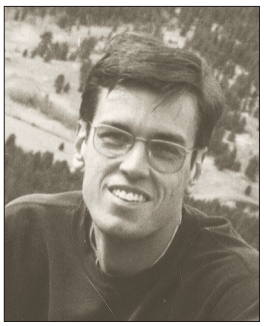


Professor and Chair, Department of Pharmacology, University of Colorado at Denver and Health Sciences Center; PhD, University of Colorado, 1970; President of the Research Society on Alcoholism, 1983–85; President of the International Society for Biomedical Research on Alcoholism, 1986–90; RSA Award for Scientific Excellence in Alcohol Research and Jellinek Award for alcoholism research, 1988; Florence Rena Sabin Award, 2002, University of Colorado at Denver and Health Sciences Center. Member, National Advisory Council for the National Institute on Alcohol Abuse and Alcoholism. Professor Tabakoff's research concerns physiological, pharmacological, and biochemical correlates of alcohol and opiate/cannabinoid abuse. Current studies focus on behavioral genetic factors mediating tolerance development; the involvement of brain glutamate receptors in addiction; and the interaction of addictive drugs with adenylyl cyclase signaling in brain. Studies are pursued with both human and non-human subjects using genetic, molecular genetic, and microarray technology.

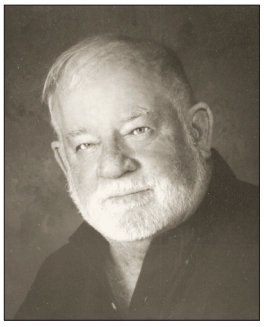
Jeanne M. Wehner

Professor of Psychology, University of Colorado at Boulder; PhD, University of Minnesota Medical School, 1976; NIAAA Research Scientist Development Award, 1991–96; 1997–2002. Professor Wehner is a biochemist whose primary research interests are pharmacogenetics and neurobiology. Current projects include biochemical and genetic studies of learning and memory, the role of nicotinic receptors in modulation of learning, and the role of protein kinase C in alcohol's actions.

Erik G. Willcutt
Assistant Professor of Clinical Psychology, University of Colorado at Boulder; PhD, University of Denver, 1998. Professor Willcutt's current 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 which increase susceptibility to these difficulties.



James R. Wilson
Professor Emeritus, Department of Psychology, University of Colorado at Boulder; PhD, University of California, Berkeley, 1968. Professor 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.



POSTDOCS & ASSOCIATES

Postdoctoral Fellows, Senior Research Associates, and Research Associates

Beth Bennett, PhD, University of Colorado, 1986. Molecular identification of genes underlying initial sensitivity to alcohol and alcohol preference, and neural systems underlying alcohol mediated anxiolysis; development and characterization of the largest existing panel of murine RI strains.

Rebecca Betjemann, PhD, University of Denver, 2005. Cognitive processes involved in learning disabilities; language components including semantics and comprehension in children with reading disability and ADHD.

Barbara Bowers, PhD, University of Colorado, 1990. Evaluation of the role of protein kinase C and its regulation of the serotonergic system in ethanol consumption and behavioral impulsivity. Characterization of genes and proteins involved in ethanol sensitivity and ethanol tolerance in the presence or absence of protein kinase C gamma activity. Investigation of the effects of binge-alcohol exposure during adolescence on protein expression in brain.

Tanya Button, PhD, Kings College London, 2005. Examination of the relationship between conduct problems and substance use problems, and the interplay of genetic and environmental risks for both conduct problems and substance problems.

Nomita Chhabildas, PhD, University of Denver, 2003. Neuropsychological and psychiatric correlates of attention deficit hyperactivity disorder, as well as broader comorbidity issues in childhood psychopathology and learning disabilities.

Robin Corley, PhD, University of Colorado, 1987. Longitudinal analysis of specific cognitive abilities and problem behaviors.

Jim Cypser, PhD, University of Colorado, 2002. Discovery and characterization of biomarkers of aging; e.g., physiological or molecular characteristics that predict individual subsequent life span (in the nematode *C. elegans*). Also the demographic patterns of mortality displayed by long-lived mutants, and the relationship between stress resistance and the rate of aging.

Peter Dobelis, PhD, Colorado State University, 1998. Behavioral and biochemical investigation of the genetic basis for the variability of effects of nicotine and ethanol in mice.

Christopher Downing, PhD, State University of New York at Albany, 2001. Classical and molecular genetic methods, such as QTL analysis, congenic and transgenic mice, and gene expression techniques to identify and evaluate genes mediating drug-related phenotypes.

Maria L. Florez-McClure, PhD, University of Colorado at Denver and Health Sciences Center, 2004. Investigating the role of autophagy in neurodegenerative diseases, especially Alzheimer's disease, using *C. elegans* as a model organism.

Naomi Friedman, PhD, University of Colorado, 2002. Individual differences in working memory and executive functions, and their relations to other cognitive abilities and real-world problems such as attention problems, depression, and sleep problems.

Sharon Grady, PhD, University of Michigan, 1973. Function of nicotine in the central nervous system of mice, specifically, nicotine-stimulated release of neurotransmitters from synaptosomes.

Brett Haberstick, PhD, University of Colorado, 2005. Investigation of functional polymorphisms and their contribution to individual differences in substance use disorders (alcohol, tobacco) and other disinhibited behavioral problems.

Wail Hassan, PhD, The University of Southern Mississippi, 2004. Gene expression profiling of *Caenorhabditis elegans* worms expressing amyloid beta peptide (the main constituent of the senile plaques of Alzheimer's disease).

Christina Hewitt, PhD, Institute of Psychiatry, University of London, 1984. Molecular genetic studies of human behaviors.

Nate Kahn, PhD, University of Denver, 1999. Molecular genetics of stress resistance and aging, using transgenic *C. elegans* for analysis of loci and molecular mechanisms involved in stress responses and longevity.

Michael Lee, PhD, University of Colorado at Denver and Health Sciences Center, 2004. Investigation of nicotinic receptors in the regulation of acoustic startle and prepulse inhibition in null-mutant mice.

Jeffrey Lessem, PhD, University of Colorado, 1999. Research into the methodology for detecting quantitative trait loci, particularly in relation to substance use disorders and conduct disorders.

Christopher Link, PhD, University of Massachusetts, 1981. Molecular genetics; modeling of neurodegenerative diseases using transgenic *C. elegans*.

Michael Marks, PhD, University of Michigan, 1974. Genetic influences on molecular, biochemical, physiological, and behavioral factors mediating the responses to nicotine in mice.

Sharon Mexal, PhD, University of Colorado at Denver and Health Sciences Center, 2005. Elucidation of the molecular biology underlying the behavioral and physiological actions of nicotine. Investigation of the role of neuronal nicotinic acetylcholine receptors in modulating the effects of nicotine.

Junji Mitsushita, MD, PhD, Shinshu University School of Medicine, 2004. General mechanism of longevity by using *Caenorhabditis elegans* as a model animal. Especially, the relationship between oxidative stress and longevity from a view of genetic and/or epigenetic regulation.

Shane Rea, PhD, University of Queensland, 2000. Demographics of aging in the nematode *C. elegans*. Identification of long-lived individuals in genetically homogeneous populations. Elucidation of the molecular basis of life extension in the mitochondrial Mit mutants of *C. elegans*.

Brad Rikke, PhD, University of Texas, 1992. Genetic mapping and identification of genes underlying dietary restriction's ability to retard aging in mice.

Stephanie Schmitz, PhD, University of Colorado, 1996. Genetic and environmental influences on the development of temperament, personality, and problem behavior; behavior genetics of psychopathology and health behaviors, their correlates, antecedents, and possible outcomes.

Gary Stetler, PhD, University of Utah, 1980. The application and development of high-throughput methods for the identification of genes involved in human behavior and learning.

David Timberlake, PhD, University of California, San Diego, 2003. Investigations of heritability of tobacco use and associations between nicotine dependence and candidate genes.

Rolando Tiu, Jr., PhD, Case Western Reserve University, 2003. Exploration of the relationships between general and specific cognitive abilities and achievement.

Natascia Ventura, MD, PhD, University of Rome Tor Vergata, 1999/2001. The paradoxical role of frataxin, a nuclear encoded mitochondrial protein, in the prolongation of life-span in *C. elegans* and apoptosis (programmed cell death) such as that seen in the human inherited recessive condition Friedreich's Ataxia.

Sally Wadsworth, PhD, University of Colorado, 1994. Genetic and environmental influences on development of learning disabilities and academic achievement.

Paul Whiteaker, PhD, University of Bath, UK, 1996. Molecular basis of nicotine's central effects, using a combined biochemical, immunochemical, receptor binding, and gene null mutation approach.

Deqing Wu, PhD, Peking University, 1995. Statistical and genetic analysis of aging in *C. elegans*.

Susan Young, PhD, University of Colorado, 1998. Genetic and environmental factors underlying the development of conduct disorder, ADHD, and substance use problems; links between executive cognitive function and developmental psychopathology.

Joanna Zeiger, PhD, Johns Hopkins University Bloomberg School of Public Health, 2001. Genetic and environmental factors, particularly gene-environment interaction, that increase risk to common diseases.

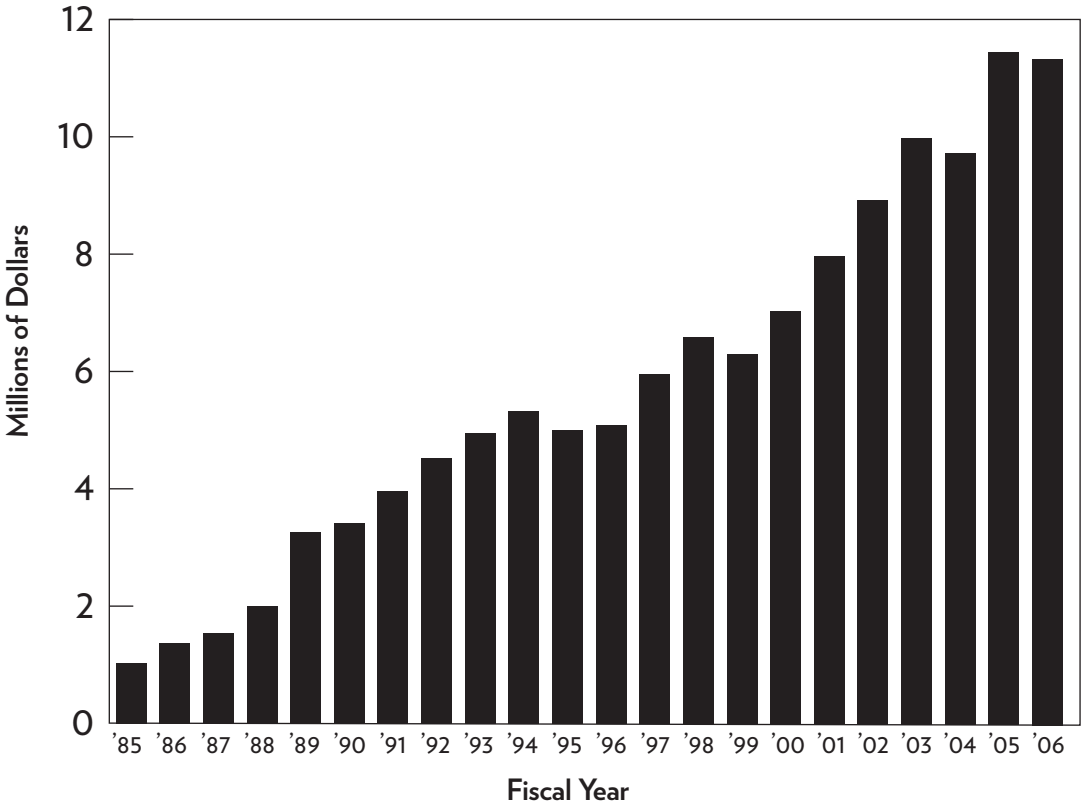
SUPPORT

Research, Training, and Education Support 2005–2006

Source of Funding	Number of Awards	Fiscal Year Dollars	Total Grant Dollars
Federal Agencies			
National Institute on Aging	5	1,512,548	6,951,835
National Institute on Alcohol Abuse and Alcoholism	7	1,966,111	8,709,055
National Institute of Child Health and Human Development	8	1,749,065	17,158,116
National Institute on Drug Abuse	10	2,301,519	11,787,530
National Institute of Mental Health	8	1,086,214	6,967,505
National Eye Institute	1	324,089	1,612,835
National Institute on Deafness and Other Communication Disorders	1	291,121	1,389,925
National Institute of Neurological Disorders and Stroke	1	25,000	100,000
Associations, Foundations, and Programs			
American Cancer Association	1	227,593	347,807
Council on Research and Creative Work	1	5,000	5,000
University of Colorado Tech. Transfer Office	1	9,485	9,485
The Ellison Medical Foundation	1	50,000	200,000
Training Grants			
National Institute of Child Health and Human Development	1	223,729	1,127,085
National Institute on Drug Abuse	1	250,390	1,245,185
National Institute of Mental Health	1	192,110	959,668
Education Grant Program			
National Institute of Mental Health	1	150,979	755,555
TOTAL	49	$10,364,953	$59,326,586

EXPENDITURES

Expenditures



"The most accurate way to make year-to-year comparisons of data on research and other sponsored project activity is to look at actual expenditures."

Office of Contracts and Grants
Annual Report Fiscal Year 2004

Research Activities For Fiscal Year 2005–06

[Dollar figures in parentheses: first figure = total amount for project period; second figure = amount for fiscal year.]

Aging

NIA (AG-008761)-"Oldest Old Mortality–Demographic Models and Analysis" 5/15/04–4/30/09: The research proposed in this P01 (J. Vaupel, PI) is driven by the concepts and methods of demography. All six projects focus on research on exceptional longevity. Longevity has proven to be remarkably plastic: Environmental and genetic alterations can produce large increases in longevity. Our overarching goal is to explore the nature of and limits to this plasticity.

"IBG Subcontract" ($1,129,656; $233,049): The major goal of this subproject is to examine mortality kinetics as a function of age in large populations of normal and mutant nematodes.

Principal Investigator: Thomas E. Johnson

The Ellison Medical Foundation (AG-NS-0169-02)-"QTLs Specifying the Retardation of Reproductive Senescence by Dietary Restriction" ($200,000; $50,000), 8/1/02–7/31/06: The goal of this study is to map quantitative trait loci underlying the extension of female fertility by DR using the LSXSS and LXS recombinant inbred strains.

Principal Investigator: Brad A. Rikke

NIA (AG-012423)-"Transgenic *C. elegans* as Amyloid Disease Model" ($1,380,242; $341,335), 5/1/03–3/31/07: The goal of this project is to understand the cellular and molecular basis of β-amyloid peptide (Aβ) toxicity using genetic and molecular genetic analysis of transgenic *C. elegans* animals expressing the human Aβ peptide.

Principal Investigator: Christopher D. Link

NIA (AG-021037)-"Comparative Modeling of Neurodegenerative Diseases" ($1,143,581; $288,419), 6/1/03–5/31/07: The goal of this project is to use transgenic *C. elegans* models to investigate whether age-associated neurodegenerative diseases (other than Alzheimer's Disease) have a common underlying toxic mechanism.

Principal Investigator: Christopher D. Link

UCTTO (OCG4767B) "Development of a General Probe for Misfolded and Aggregated Proteins" ($9,485; $9,485), 01/15/06-05/15/06: This project employed specific proteins that have naturally evolved to recognize misfolded proteins *in vivo* to develop *in vitro* diagnostic assays to specifically capture and assay misfolded proteins in complex biological samples (e.g., sera).

Principal Investigator: Christopher D. Link

NIA (AG-016219)-"Molecular Genetics of Aging in *C. elegans*" ($1,705,709; $328,974), 9/15/04–7/31/09: The main goal of this project is to extend the understanding of mechanisms underlying the increased life expectancy of long-lived (Age) mutants in the nematode *Caenorhabditis elegans*, these mutants having revealed the relationship between increased longevity and increased ability to respond to stress.

Principal Investigator: Thomas E. Johnson

NIA (AG-024354)-"Genes Specifying Aging and Longevity in the Mouse" ($1,592,647; $320,771), 9/30/04–6/30/09: Under this grant we will determine lifespan on the 77 LXS mouse strains and relate their longevity to physiologic studies of dietary restriction.

Principal Investigator: Thomas E. Johnson
Co-Investigators: Yuji Ikeno, James Nelson, Brad Rikke

Alcohol

NIAAA (AA-008940)-"Mapping of Genes Predisposing to Alcohol Sensitivity" ($2,757,200; $673,012), 5/1/03–4/30/08: The major goals of this project are to continue fine-scale mapping of quantitative trait loci that specify sensitivity to the anesthetic effects of alcohol and to use gene sequence data available for both mice and humans to identify candidate genes in these QTL regions. We also will test the hypotheses that these candidates differ between ILS and ISS and map to the defined Lore interval.

Principal Investigator: Thomas E. Johnson
Co-Investigators: Beth Bennett, James Sikela

NIAAA (AA-013901)-"5HT2 and 5HT1A Receptors in PKC-gamma Null Mutant Mice" ($445,500; $149,000), 7/1/03–6/30/06: The goal of this project is to elucidate the specific role of PKCg in complex behaviors associated with alcohol dependence.

Principal Investigator: Barbara J. Bowers

NIAAA (AA-014250)-"Genetic Association and Stratification: Alcoholism" ($631,479; $223,396), 9/30/03–8/31/06: The main goal of this project is to test for association between three phenotypes related to alcohol dependence and abuse and seven candidate genes while controlling for the effects of population stratification in a nationwide probability sample.

Principal Investigator: Andrew Smolen
Co-Investigators: Marissa A. Ehringer, John K. Hewitt, Jeffrey M. Lessem

NIAAA (AA-014666)-"Mouse Models of Alcohol Induced Behavior" ($1,650,935; $333,070), 4/1/04–3/31/09: This project will provide support for the maintenance and production of mouse stocks that are valuable for alcohol related research.

Principal Investigator: Allan C. Collins
Co-Investigator: Jeanne M. Wehner

NIAAA (AA-014425)-"Genetic Analysis of Ethanol-Mediated Stress Reduction" 6/1/04–5/31/09: The major goal of this proposal (L. Lu, PI) is to extend transcriptome QTL mapping and trait association in RI strains to the hippocampus of the LXS mice under alcohol and stress exposure to test the role of shared genetic mediation of responses to both treatments.

"IBG Subcontract" ($319,775; $36,587): The genetic specification of anxiety and aggression will be examined using the LXS RI mouse panel.

Principal Investigator: Beth Bennett

CRCW (JFDA)-"How Are Running (Exercise) and Alcohol Preference Related in a Mouse Model?" ($5,000; $5,000), 07/01/05-06/30/06: This project attempted to develop a mouse model for studying the interaction between alcohol consumption and exercise.

Awarded to: Marissa Ehringer

The Colorado Adoption Project and Longitudinal Studies

NIMH (MH-063207)-"Behavior Genetic Analyses of Executive Functions" ($1,133,060; $201,076), 6/1/01–5/31/06: The goal of this project is to conduct the first behavioral genetic study of individual differences in executive functions in a genetically informative twin sample already characterized for general and specific cognitive abilities.

Principal Investigator: John K. Hewitt
Co-Investigators: John C. DeFries, Akira Miyake, Susan E. Young

NICHD (HD-031921)-"The National Longitudinal Study of Adolescent Health" 2/1/99–12/31/10: The primary purpose of this study (K. Harris, PI) is to increase understanding of how contextual factors in the lives of adolescents influence their health and risk behaviors.

"IBG Subcontract: Gene*Environment Contributions to Drug Use and Problem Behavior Trajectories" ($883,555; $73,394), 7/1/02–12/31/10: This data analysis subproject will examine the developmental trajectories of drug use and related behaviors, including conduct problems and risky sexual behavior.

Principal Investigator: John K. Hewitt
Co-Investigators: Richard Jessor, Marissa Ehringer, Jeff Lessem

"IBG Subcontract: Project I: Wave IV Data Collection" ($2,769,560; $179,887), 7/1/02–12/31/10: The goal of the proposed project is to trace, locate, and re-interview respondents who participated in Wave I of the National Longitudinal Study of Adolescent Health (Add Health). This subproject is responsible for archiving the DNA and genotyping the Wave IV respondents.

Principal Investigator: Andrew Smolen
Co-Investigator: Gary Stetler

NICHD (HD-010333)-"Determinants of Behavioral Development in Children" ($1,186,507; $271,989), 6/1/03–5/31/07: The broad purpose of this component of the Colorado Adoption Project is to investigate the genetic and environmental etiologies of individual differences in psychological development during late adolescence in the context of a longitudinal prospective "full" adoption, sibling, and twin study spanning 16 years. The continuation to project years 27 through 30 will complete testing of 405 pairs of twins aged 13 through 16, previously tested at 1, 2, 3, 4, 7, 9, 10, 11, and 12 years of age, using many of the same measures as the CAP adoptive and nonadoptive participants.

Principal Investigator: Sally J. Wadsworth
Co-Investigators: Robin Corley, John C. DeFries, John K. Hewitt, Robert Plomin

NICHD (HD-036773)-"Nature and Nurture in Social Demography: An Adoption Study" ($1,637,535; $324,280), 8/6/03–5/31/08: This project addresses familial influences on educational attainment, family determinants of union- and family-formation choices of young adults, and how the quality of early family relationships shapes adult child-parent relationships.

Principal Investigator: Michael C. Stallings
Co-Investigators: Robin P. Corley, John C. DeFries, Scott Hofer, Frank Lawrence, Andrea Piccinin, Robert Plomin, Michael Shanahan, Sally J. Wadsworth

Substance Abuse Vulnerability

NIDA (DA-012845)-"Genetics of Adolescent Antisocial Drug Dependence" 9/1/00–8/31/05: The purpose of this multisite project (T. Crowley, PI) is to conduct a whole-genome search for chromosomal loci influencing early-onset antisocial drug dependence.

"IBG Subcomponent" ($519,861; $89,551): The primary roles of this subcomponent are data collection and monitoring of data collection efforts for the Colorado site, integration and management of the multi-site data from Colorado, and data analysis and the reporting of scientific results.

Principal Investigator: Michael C. Stallings
Co-Investigators: Stacey Cherny, Robin P. Corley, John K. Hewitt

NIAAA (AA-011949)-"NYS Family Study: Problem Alcohol Use and Problem Behavior" 9/30/00–8/31/05: The research (S. Menard, PI) will estimate the heritability of cue-elicited craving; will determine whether the polymorphism influences cue-elicited craving using a within-family design that controls for population effects; will examine how the polymorphism interacts with the environment over a two-year period marked by a transition from initial tobacco use to dependence; and test whether an association between the polymorphism and the transition to dependence is mediated by the effect of the polymorphism on the development of cue-elicited craving.

"IBG Subcomponent" ($1,388,450; $42,692): This project is a major intergenerational and life course study of problem alcohol use and related problem behaviors, including the victimization and perpetration of violent and other criminal offenses, illicit substance use, high risk sexual behavior, and mental health problems.

Principal Investigator: John Hewitt
Co-Investigators: Robin Corley, John DeFries, Andrew Smolen, Michael Stallings, Susan Young

NIDA (DA-011015)-"Antisocial Drug Dependence: Genetics" 8/15/03–4/30/08: This grant supports the Center on Antisocial Drug Dependence (T.J. Crowley, PI). This center was established to study genetic influences on, and treatment of, antisocial drug dependence. The center is a joint program of the Addiction Research and Treatment Service of the University of Colorado Health Sciences Center, the Institute for Behavioral Genetics, and the Department of Molecular, Cellular, and Developmental Biology. It includes six research components and administrative, assessment, and molecular genetics cores:

"Component 1: Adolescent Drug/Alcohol Dependence: Genetics and Treatment" ($64,981; $13,247): The major goal of this component is a whole-genome search for chromosomal loci containing genes influencing early-onset dependence on drugs and antisocial behavior.

Principal Investigator: Thomas J. Crowley
Co-Principal Investigator: Michael C. Stallings
Co-Investigator: John K. Hewitt

"Component 2: Familial Aggregation of Antisocial Substance Dependence" ($1,358,450; $275,271): The goal of this component is a five-year follow-up assessment of 285 families of subjects formerly in treatment for substance use disorder (SUD) and conduct disorder (CD) as adolescents and 200 community control families. The study will provide important information regarding family influences underlying SUD and CD, the generality versus specificity of familial influences on these behaviors, and the identification of family factors that differentiate persistent versus adolescent-limited problem behavior.

Principal Investigator: Michael C. Stallings
Co-Investigators: Robin P. Corley, Soo Rhee

"Component 3: A Longitudinal Adoption Study of Adolescent Substance Experimentation" ($638,564; $128,630): The major goal of this component is to assess genetic and environmental influences on experimentation with tobacco, alcohol, marijuana, and other drugs using a longitudinal adoption design. This study builds on more than 20 years of data collected as part of the Colorado Adoption Project (CAP), and focuses on the transmission of substance use and antecedent behaviors such as conduct disorder symptoms, other behavioral problems, and academic achievement difficulties.

Principal Investigator: Robin P. Corley
Co-Investigators: Gregory Carey, Michael C. Stallings, Susan E. Young

"Component 4: Heritable Early Indicators of Risk for Drug Dependence" ($1,158,855; $234,999): The major goal of this component is to use an augmented twin study to understand how genes and environmental influences contribute to vulnerability to drug abuse and antisocial behavior as they develop during adolescence. A second wave of assessments will be conducted with 1,300 pairs of twins and their siblings five years after the initial interview.

Principal Investigator: John K. Hewitt
Co-Investigators: Soo Rhee, Susan E. Young

"Component 5: Genotyping of Specific Candidate Genes" ($53,365; $53,365): The goal of this component is to provide data on specific candidate genes that will be used to test for associations between those genes and the propensity for drug abuse in adolescents.

Principal Investigator: Andrew Smolen

"Administrative/Educational Core A" ($275,426; $56,151): The major goal of the administrative and educational core is to facilitate interactions among an interdisciplinary group of clinicians, behavioral geneticists, and molecular biologists at the University of Colorado at Denver and Health Sciences Center and University of Colorado at Boulder campuses.

Principal Investigator: Thomas J. Crowley
Co-Principal Investigator: John K. Hewitt

"Assessment Core B" ($261,922; $52,081): The major goal of this assessment core is to ensure that the genetic phenotypic information from each of these components is collected, organized, and stored in a way that facilitates direct comparisons across components and combined analyses among components.

Principal Investigator: Robin P. Corley
Co-Principal Investigator: Susan Mikulich
Co-Investigator: Michael C. Stallings

NIDA (DA-014642)-"Progression of Craving and Addiction: Genetic Factors" 9/30/01–6/30/07: Our preliminary research (K. Hutchison, PI) has suggested that the DRD4 VNTR polymorphism influences cue-elicited craving for tobacco and alcohol and that this effect is specifically related to dopamine neurotransmission. This research will estimate the heritability of cue-elicited craving to determine whether the polymorphism influences cue-elicited craving using a within-family design that controls for population effects.

"IBG Subcomponent" ($438,412; $69,425): This project investigates the heritability of cue-elicited craving for tobacco and whether the DRD4 VNTR polymorphism influences craving during nicotine consumption.

Principal Investigator: Andrew Smolen
Co-Investigators: John Hewitt, Michael Stallings

NIDA (DA-015522)-"A Family Study of Substance Use and Conduct Disorder" 9/10/03–6/30/08: This family study of adjudicated adolescent boys and girls with substance use and conduct disorder (C.J. Hopfer, PI) has two primary goals. The first is to test competing models of the comorbidity between substance use and conduct disorder and the second is to examine the familial transmission of these disorders.

"IBG Subcomponent" ($121,539; $23,087): This study examines the familial transmission of risk for substance dependence and antisocial behavior and investigates whether common risk factors may account for the co-aggregation of these problem behaviors in families.

Principal Investigator: Michael C. Stallings
Co-Investigators: Robin P. Corley, Soo Rhee

Learning Disabilities

NICHD (HD-038526)-"A Longitudinal Twin Study of Early Reading Development" ($2,372,158; $384,560), 3/1/99–2/28/06: This research will assess the etiology of individual differences in prereading and early reading development, and their covariation with individual differences in attention/hyperactivity.

Principal Investigator: Richard K. Olson
Co-Investigators: Brian Byrne, John C. DeFries, Bruce F. Pennington, Sally Wadsworth, Erik G. Willcutt

NIMH (MH-062120)-"DSM-IV ADHD in an Ethnically Diverse Community Sample" ($1,581,867; $21,438), 8/1/00–7/31/05: The goal of this project is to assess ethnic group differences in the manifestation of DSM-IV ADHD. A large community sample of children will be ascertained in the Denver metropolitan area to test the internal and external validity of DSM-IV ADHD in an ethnically diverse population that includes a large proportion of African American and Hispanic children.

Principal Investigator: Erik G. Willcutt
Co-Investigators: John C. DeFries, Andrew Smolen

NICHD (HD-027802)-"Differential Diagnosis in Learning Disabilities" ($6,661,612; $584,966), 3/20/01–11/30/06: The long-range objectives of this Learning Disabilities Research Center (J.C. DeFries, PI) are the identification, characterization, validation, and amelioration of etiologically distinct subtypes or dimensions of learning disabilities. The center includes five research projects and an administrative core unit:

"Twin Studies" ($909,542; $80,258): The objectives of this research project are to collect psychometric test data from twin pairs. The data will be used to assess the genetic and environmental etiologies of reading deficits, ADHD, and their comorbidity, as well as their covariation with measures of other psychopathologies, reading and perceptual processes, mathematics performance, and executive functions.

Principal Investigator: John C. DeFries
Co-Investigators: Sally J. Wadsworth, Erik G. Willcutt

"Reading and Language Processes" ($1,481,997; $129,967): The objectives of this research project are to assess component processes and knowledge in reading and related language skills in twins and siblings selected for deficits in reading and/or ADHD, and in normal-range control twins.

Principal Investigator: Richard K. Olson
Co-Investigators: Donald Compton, Janice M. Keenan

"Validity of Subtypes of ADHD" ($1,204,642; $108,127): The overall goal of this research is to test the internal and external validity of subtypes of ADHD using converging methods.

Principal Investigator: Bruce F. Pennington
Co-Investigator: Erik G. Willcutt

"Genomic Analyses" ($944,537; $82,301): The goal of this project is to compare the contributions of loci influencing reading disability to the contributions of candidate genes that have been identified as contributing to ADHD in order to determine the genetic basis of comorbidity for these traits.

Principal Investigator: Shelley D. Smith

"Early Reading, Language and Attention Development" ($698,636; $58,759): This research will assess genetic and environmental influences on the early development of reading and attention, in order to identify the specific psychological processes that mediate these influences.

Principal Investigator: Richard K. Olson
Co-Investigator: Bryan Byrne

"Administrative Core Unit" ($1,414,088; $121,895): This unit is responsible for coordinating the four research projects as well as maintaining communication among them, ascertaining and scheduling subjects, obtaining questionnaire data, managing a master file of combined data sets, and administering the center budget and other fiscal matters.

Principal Investigator: John C. DeFries
Co-Investigator: Richard K. Olson

NIMH (MH-063941)-"Validity of DSM-IV ADHD Subtypes in a Community Sample" ($1,679,145; $338,517), 9/1/01–8/31/06: A study of 750 children with ADHD and 150 children without ADHD designed to test the validity and etiology of ADHD subtypes.

Principal Investigator: Erik Willcutt
Co-Investigators: Caryn L. Carlson, John C. DeFries, Andrew Smolen

NIDCD (DC-05190)-"Longitudinal Twin Study of Reading Disability" ($1,389,925; $291,121), 2/15/02–1/31/07: This project will initiate the first longitudinal twin study of reading disability and its relation with ADHD and other psychopathology.

Principal Investigator: Sally J. Wadsworth
Co-Investigators: John C. DeFries, Richard K. Olson, Erik G. Willcutt

Nicotine

NIAAA (AA-013018)-"Role of Nicotinic Receptors in Effects of Alcohol" ($2,236,440; $421,758), 5/1/02–3/31/07: The goal of the study is to determine whether any nicotinic receptors mediate the action of alcohol using null mutants and conditional null mutants.

Principal Investigator: Jeanne M. Wehner
Co-Investigator: Allan C. Collins

NIDA (DA-012242)-"Alpha-Conotoxin MII: A Selective Nicotinic Receptor Probe" ($1,304,186; $260,160), 7/1/02–6/30/07: The goal of this project is to investigate the nicotinic receptors that interact with α-conotoxins.

Principal Investigator: Michael J. Marks
Co-Investigator: Paul Whiteaker

NIDA (DA-015663)-"Studies with Nicotinic Null Mutant Mice" ($1,467,164; $294,839), 5/1/03–1/31/08: This is a program project which provides support for the production and maintenance of multiple nicotine receptor knockout mouse strains.

Principal Investigator: Allan C. Collins
Co-Investigators: Michael J. Marks, Jeanne M. Wehner

NINDS (NS-042196)-"Cognitive Dysfunction after TBI: Role of alpha7 nAChrs" 4/1/02–3/31/06: The focus of this study (J. Pauly, PI) is the role of nicotinic receptors in responses of the brain to head injury.

"IBG Subcomponent" ($100,000; $25,000): This study evaluates the effects of chronic nicotine administration on cognitive deficits induced by chronic brain injury.

Principal Investigator: Michael Marks

NIDA (DA-019375)-"Nicotinic Ligands for Smoking Cessation" 10/01/06-09/30/10: This is a cooperative project with the laboratory of Dr. Henry Lester at Cal Tech and Targecept to develop compounds with selectivity for defined subtypes of nicotinic receptors.

"IBG Subcontract" ($1,554,616; $223,500): The IBG component will evaluate potential drugs using biochemical measures, determine the responses of mice to chronic exposure to several promising compounds, and evaluate the effects of promising compounds in mice expressing altered nicotinic receptors.

Principal Investigator: Michael Marks
Co-Investigators: Paul Whiteaker, Sharon Grady

American Cancer Society (RSG-01-139-01-CNE)-"Genetic Analysis of Nicotine Preference in Mice" ($347,807; $227,593), 1/1/04–6/30/06: The goal of this project is to perform QTL (quantitative trait locus) analysis and subsequently fine map genes that influence nicotine oral self-selection in mice.

Principal Investigator: Jerry Stitzel

NIDA (DA-003194)-"Genetics of Nicotine Tolerance: Role of Receptors" ($1,749,893; $229,479), 7/15/04–4/30/09: The major goal of this research is to use genetic strategies to study the development of tolerance to and physical dependence on nicotine.

Principal Investigator: Allan C. Collins
Co-Investigators: Sharon Grady, Michael Marks

NIDA (DA-014369)-"Identification of Functional nAChR Variants in Mice" ($437,318; $126,988), 7/16/04–1/31/07: In this proposal we will screen a large set of inbred mouse strains for amino acid-altering polymorphisms in several nAChR subunit genes. All identified variants will be assessed for pharmacological and functional properties using electrophysiological techniques.

Principal Investigator: Jerry A. Stitzel

NIDA (DA-019655)-"Immunochemical Protocols for Nicotinic Receptors" ($404,342; $163,686), 4/1/05–3/31/07: This project aims to develop antibody-based protocols for isolating nicotinic receptors on the basis of their subunit composition, and quantitating subunit protein expression using Western blotting.

Principal Investigator: Paul Whiteaker

Schizophrenia

NIMH (MH-066115)-"Abnormal Eye Movement in Schizophrenia: Genome-wide Scan" 1/9/04–12/31/08: The aims of the proposal (R. Ross, PI) are to perform a genome-wide scan looking for a linkage to a schizophrenia-associated endophenotype, an elevated frequency of leading saccades during a smooth pursuit eye movement (SPEM) task. SPEM abnormalities have been associated with schizophrenia for almost 100 years, and have been suggested as a potential marker of genetic risk for over 20 years.

"IBG Subcomponent" ($122,145; $24,052): The purpose of this subcomponent is to assist Dr. Randal Ross in conducting extended pedigree and sibling-pair linkage analyses to detect quantitative trait loci that increase risk for schizophrenia.

Principal Investigator: John K. Hewitt
Co-Investigator: Erik G. Willcutt

NIMH (MH-068582)-"Molecular Neurobiology of Schizophrenia" 9/27/04–6/30/09: This proposal (R. Freedman, PI) examines the neurobiological effects of genetic polymorphisms in genes associated with schizophrenia.

"IBG Subcomponent" ($567,316; $110,652): The aim of this subcomponent is to provide genetically modified mice to other components of the CONTE Center for schizophrenia research.

Principal Investigator: Allan C. Collins
Co-Investigator: Jerry Stitzel

Sleep Studies

NIMH (MH-075814)-"Longitudinal Effects of Sleep Problems on Cognition" ($146,840; $6,208), 06/01/06-05/31/08: This project examines developmental patterns of sleep problems from ages 4 to 17, and their relations to concurrent and later cognitive abilities, including multiple executive functions.

Principal Investigator: Naomi Friedman

Statistical Models

NEI (EY-012562)-"Variance Components Models for Mapping QTLs" ($1,612,835; $324,089), 9/1/02–8/31/07: The goal of this project is to further extend the methodology of variance components analysis to accommodate more general data structures and models that are of practical importance to the design and analysis of modern genetic studies, and to integrate these into a comprehensive software package.

Principal Investigator: John K. Hewitt
Co-Investigators: Goncalo Abecasis, Lon Cardon, Stacey Cherny, Shaun Purcell, Fruhling Rijsdijk, Pak Sham

Research Career Awards and Fellowships

NIAAA (KO1-AA-015336)-"Molecular Genetics and Behavior: Alcohol and Tobacco Use" ($667,726; $129,288), 9/15/05-8/31/10: The training focus of this grant is to learn computational bioinformatics methods to examine the possible functional importance of single nucleotide polymorphisms, and to apply quantitative genetic analyses to genotypic data of complex traits. The research focus is to investigate single nucleotide polymorphisms in five neuronal nicotinic receptor subunit genes that may be involved in alcohol and tobacco use in a national longitudinal young adult sample.

Awarded to: Marissa A. Ehringer

NIDA (K01-DA-013956)-"Causes of Comorbidity: Substance Use Disorder, ADHD & CD" ($498,497; $96,611), 9/1/01–8/31/06: This award allows the PI to examine the causes of comorbidity among substance use disorders (SUD), attention-deficit/hyperactivity disorder (ADHD), and conduct disorder (CD).

Awarded to: Soo Rhee

NIMH (K01-MH-001865)-"Executive Function: Links to Drug Use and Psychopathology" ($550,625; $112,282), 12/17/01–11/30/06: The major goal is to investigate the possible genetic link between executive cognitive function and substance use disorders and externalizing psychopathology.

Awarded to: Susan E. Young

Research Training and Education Grant Program Awards

NIMH (MH-019918)-"Workshop on Methodology of Twin and Family Studies" ($755,555; $150,979), 7/1/03–6/30/08: The major goal of this project is to hold a series of international workshops on the methodology of twin studies at the Institute for Behavioral Genetics in Boulder, Colorado.

Principal Investigator: John K. Hewitt

NIDA (DA-017637)-"Research Training—Genetics of Substance Abuse" ($1,245,185; $250,390), 7/1/04–6/30/09: This training program, which supports four pre- and two postdoctoral trainees, is geared toward training pre- and postdoctoral fellows who will pursue research careers that focus on the study of genetic influences on substance abuse.

Principal Investigator: Allan C. Collins

NIMH (MH-016880)-"Research Training—Biological Sciences" ($959,668; $192,110), 7/1/04–6/30/09: This institutional training grant (supporting four pre- and one postdoctoral trainee) is for training in the field of behavior genetics. The goals of behavior genetics are to elucidate the genetic and environmental components that regulate individual differences for a multitude of complex normal and abnormal phenotypes.

Principal Investigator: John K. Hewitt

NICHD (HD-007289)-"Research Training—Developmental Behavioral Genetics" ($1,127,085; $223,729), 5/2/05– 4/30/10: This training grant (supporting five pre- and one postdoctoral trainee) is for training in the field of developmental behavioral genetics. Developmental behavioral genetics integrates the perspectives of quantitative genetics, molecular genetics, neurobiology and, increasingly, the resources of bioinformatics, into the study of behavioral development.

Principal Investigator: John K. Hewitt

Workshop participants conduct multivariate genetic analysis during the five-day International Workshop on Methodology of Twin and Family Studies.

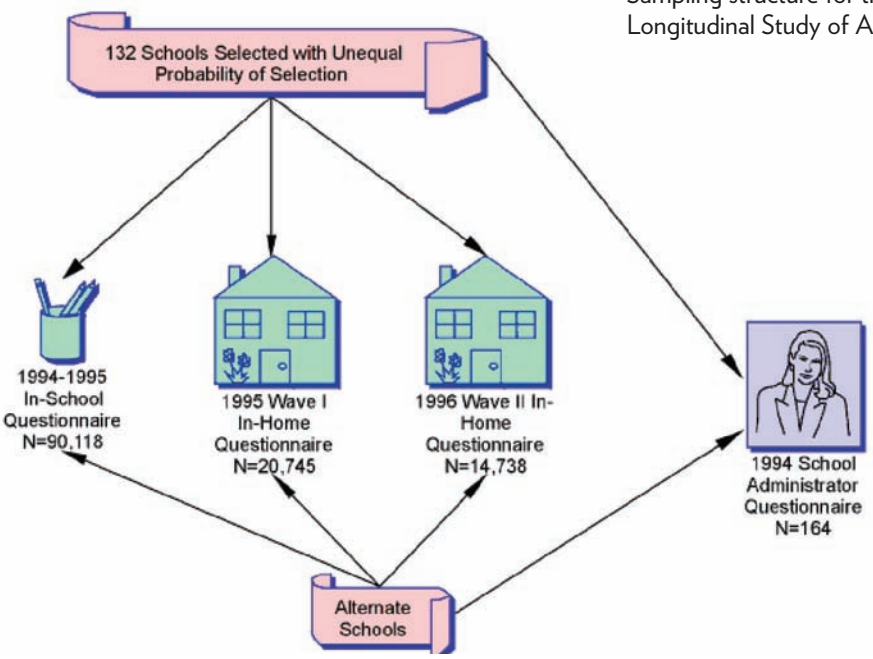
Research Highlight

The National Longitudinal Study of Adolescent Health

The National Longitudinal Study of Adolescent Health (Add Health) is an ongoing study of a nationally representative sample of more than 20,000 individuals that began with in-school questionnaires administered to adolescents in grades 7–12 in the United States in 1994–95. The in-school survey was followed by three waves of in-home interviews in 1995, 1996, and 2001–02, and a fourth wave is planned for 2008 when the sample will be aged 24–32. Add Health provides unique samples of twins that are nationally representative and followed longitudinally from early adolescence into young adulthood. The design of Add Health included an embedded genetic sample of more than 3,000 pairs of individuals with varying genetic resemblance, including monozygotic twins, dizygotic twins, full siblings, half siblings, and adolescents with no biological relationship but who were raised in the same household.

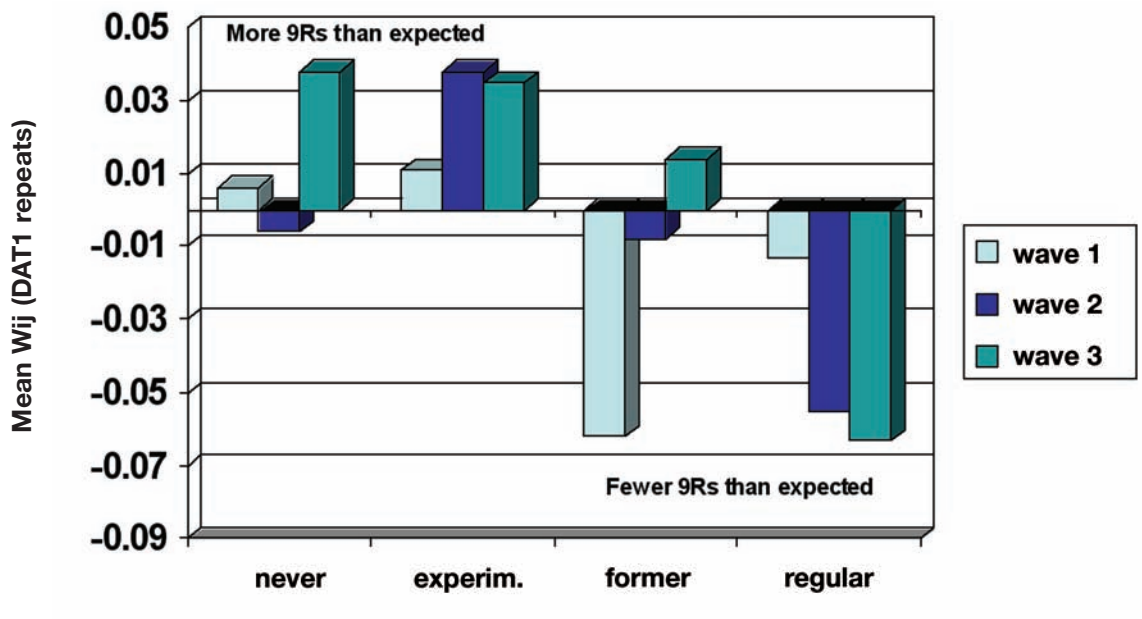
The Add Health Program Project is conducted out of the Carolina Population Center at the University of North Carolina at Chapel Hill under current PI and Add Health Director Kathleen Mullan Harris. For more information on the study design, see www.cpc.unc.edu/addhealth.

Add Health is an omnibus study that attempted to measure all the domains relevant to the specific developmental stage of the Add Health cohort at the time of the interview, with a particular focus on causes and consequences of health and health behavior. Innovative features of the Add Health research design included the collection of contextual data on the family, neighborhood, community, school, friendships, peer groups, and romantic relationships. Data were gathered from adolescents themselves, their



Sampling structure for the National Longitudinal Study of Adolescent Health

Within family transmission (W_{ij}) of the 9-repeat allele of the Dopamine Transporter by smoking status



There are fewer than expected 9 repeat alleles in chronic smokers. The 9 repeat allele appears to protect against becoming a chronic smoker. (Timberlake et al., 2006a)

parents, siblings, friends, romantic partners, fellow students, and school administrators. Twins and all genetic pairs have school context, peer network, family, partner and relationship, and spatial data.

During Wave III, buccal cell DNA samples were collected from a subsample of the genetic pairs by Add Health Program Project Investigator Dr. David C. Rowe of the University of Arizona. Respondents identified as full siblings or twins at Wave I and eligible for the Wave III sample (N=3,139) were asked to supply saliva specimens for DNA analysis. Compliance was high (83 percent), resulting in 2,612 respondents with DNA samples comprising the genetic pairs subsample. Shortly before Dr. Rowe's untimely death in February 2003, the samples were transferred to the Institute for Behavioral Genetics where genotyping efforts were initiated. The collection of DNA expanded the utility and power of this sub-sample substantially by allowing behavior genetic studies of adolescent health to move from variance decomposition into anonymous components, to the testing of specific hypotheses about the influence of individual genes and their expression.

Understanding how genetic and environmental factors interact to influence a trait or behavior is an important first step for more advanced molecular genetic studies. To this end, Timberlake et al. (2006b) examined whether self-reported religiosity moderated the impact of genetic influences on smoking initiation. Controlling for gene-environment correlation, higher self-reported religiosity was found to attenuate the additive genetic effects on smoking initiation. In a separate study of current young adult smokers, Timberlake et al. (2006) reported small additive genetic and shared environmental influences that did not differ as a function of gender and a large non-shared environmental contribution. In a test of the gateway theory of marijuana use, Lessem et al. (2006) found that marijuana users were twice as likely to use illicit

drugs as young adults than non-users of marijuana. Using the twin and sibling sub-sample, shared environmental factors were found to mediate much of the relationship between adolescent marijuana use and young adult drug use. This association remained after controlling for familial environmental and other measured factors. Finally, Timberlake et al. (2006a) reported that the 9R allele of the DAT1 was negatively correlated with a quantitative measure of smoking frequency and quantity, suggesting that this allele has a protective effect that reduces the likelihood that these individuals will become chronic smokers.

During the Wave IV data collection which will commence in January 2008, we will collect DNA from the entire Add Health sample (approximately 17,000 individuals) and will increase the overall genotyping effort substantially by covering more genes and loci within selected genes. The combination of longitudinal phenotypic information, genetic data, twin, family, and national probability sample designs inherent in the Add Health population will enable examination of more complex predictive models and should provide a valuable resource for many years to come.

Brett C. Haberstick
Post-Doctoral Fellow

Acknowledgement

Add Health is a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due to Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 www.cpc.unc.edu/projects/addhealth/data.

References

Lessem, J.M., Hopfer, C.J., Haberstick, B.C., Timberlake, D.S., Ehringer, M.A., Smolen, A., and Hewitt, J.K. (2006). Relationship between adolescent marijuana use and young adult illicit drug use. *Behavior Genetics* 36, 498–506.

Timberlake, D.S., Haberstick, B.C., Lessem, J.M., Smolen, A., Ehringer, M., Hewitt, J.K. Hopfer, C.J. (2006a). An association between the DAT1 polymorphism and smoking behavior in young adults from the National Longitudinal Study of Adolescent Health. *Health Psychology*, 25, 190–197.

Timberlake, D.S., Rhee, S.H., Haberstick, B.C., Hopfer, C., Ehringer, M., Lessem, J.M., Smolen, A., Hewitt, J.K. (2006b) The moderating effects of religiosity on the genetic and environmental determinants of smoking initiation. *Nicotine & Tobacco Research*, 8, 123–133.

ANIMAL

Animal Production

A 4,000-square-foot specific-pathogen-free laboratory provides space for the development and production of unique selected lines and inbred strains of mice at IBG.

Ongoing work includes the development of congenic lines for several alcohol-related phenotypes, made by intergressing chromosomal regions containing QTLs for the traits from an ILS or ISS inbred background onto the opposite background (supported by NIAAA grants to Dr. Thomas E. Johnson).

These breeding studies are complemented by the availability of other selected lines, inbred strains, and an outbred population used in behavioral genetic research:

- A/Ibg, BALB/CBy Ibg, C57BL/6Ibg, DBA/2Ibg, C3H/2Ibg, and 129 Svev/Taconics inbred strains, C58/J
- Heterogeneous Stock (HS)
- Open-field Activity lines
- Long-Sleep (LS) and Short-Sleep (SS) selected lines
- ILS and ISS inbred strains
- LSXSS recombinant inbred strains
- Nesting behavior lines
- PKC null mutants
- ISS X ILS recombinant inbred strains
- High Acute Functional Tolerance (HAFT 1)
- Low Acute Functional Tolerance (LAFT 1)
- Congenic ILS.Lore Short & ISS.Lore Long Bilineal Selection
- B6.D2 Congenic for voluntary ethanol consumption
- D2.H2 Nicotinic Congenics
- Nicotinic Knockouts

Faculty Director:
Jerry Stitzel

Lab Supervisor:
Samuel Scott Richeson

Staff:
Mark Conner
Ryan Morrow
Jerry Salazar
Cornell Strover
William van Morter
Jean C. Yu

Professional Research Associates:
Vanessa Crittenden
Heather Henderson
Colin Larson
Christine Martin
Cathy Ruf

Colin Larson of the Specific-Pathogen-Free Laboratory.

FACILITIES

Research Facilities

The institute's research facilities include:

- A specific-pathogen-free mouse laboratory that produces genetically defined lines of mice for behavioral and pharmacological investigations;
- Biochemistry and pharmacology laboratories that are used in studies of neurotransmitter receptor regulation and function, enzyme mechanisms, alcohol and nicotine actions, learning and memory, and mechanisms of aging;
- Facilities for interviewing and testing subjects enrolled in family, twin, and adoption studies of personality traits, cognition, and reading abilities;
- A core genotyping and sequencing laboratory that is used for analysis of human, mouse, and invertebrate DNA.

These facilities house a wide variety of equipment that is used in a broad range of behavioral genetic, pharmacogenetic, neurobiological, and molecular genetic studies, for example:

- an autoradiographic image analyzer;
- chromatography (HPLC, FPLC, and GC) and electrophoresis systems;
- automated DNA sequencers;
- thermocyclers and a laboratory robot;
- centrifuges, ultracentrifuges, and cell harvesting systems;
- spectrophotometers, fluorometers, microplate readers, and scintillation and gamma counters;
- video-monitored and computerized behavioral testing apparatuses; and
- Nomarski Interference CDIC and fluorescent microscopes.

IBG provides over three terabytes of redundant central storage. All saved data is backed up both onsite and offsite to provide data integrity in any exigency. Faculty, staff, and students have access to the central storage from their desktop workstations. Additionally, IBG's central server supports web-based lab information management systems, which allow comprehensive access to lab data at all levels of the scientific process, from data entry and acquisition to analysis and reporting.

Brad Pemberton of the Smolen Genotyping Laboratory.

GRADUATE

Graduate Training

IBG provides graduate training that interacts synergistically with the many research projects, both human and nonhuman, conducted under the auspices of its faculty. The research projects emphasize many areas related to behavioral genetics, including developmental psychology, neurobiology, neuropharmacology, pharmacogenetics, quantitative genetics, molecular biology, and evolutionary biology. Complementing intensive research training is a core program of courses in which students learn to apply the principles and techniques of behavioral genetics to the analysis of behavior.

The goal of this Graduate Interdisciplinary Certificate Program in Behavioral Genetics is to train scientists in the study of genetic and environmental contributions to individual differences in behavior. Because IBG is not a degree-granting unit of the Graduate School, each trainee must be a degree candidate in an academic department of the university. The institute has faculty and graduate student liaisons with several departments within the College of Arts and Sciences including the Department of Psychology, Department of Integrative Physiology, and the interdisciplinary Neuroscience program. The institute also has research and training links with the Department of Psychology at the University of Denver, and with both the School of Pharmacy and the Department of Pharmacology at the University of Colorado at Denver and Health Sciences Center.

The training program requires completion of four core courses (genetics, behavioral genetics, statistics, and scientific ethics) and three additional courses from electives including: quantitative genetics, molecular genetics and behavior, biometrical methods in behavioral genetics, bioinformatics and genomics, quantitative trait loci analysis, and concepts or seminar courses in behavioral genetics. All trainees and postdoctoral students are required to complete a course in scientific ethics and participate in the weekly journal club/colloquium series. Each trainee is expected to complete the requirements for the MA or MS degree near the end of year two.

Trainees are expected to serve as teaching assistants in a course judged by their advisory committee to be relevant to their professional specialty. This teaching requirement is usually completed during the second year of graduate training. All students are encouraged to ensure breadth of experience by becoming involved in the research of IBG faculty members in addition to that of their advisor. Trainees are expected to conduct their master's thesis and doctoral dissertation research on topics of direct relevance to animal or human behavioral genetics under the supervision of an IBG faculty member. Each trainee is expected to have completed the requirements for the PhD degree by the end of year four. Upon successful fulfillment of the requirements of the IBG training program, the student will receive a Certificate of Interdisciplinary Study in Behavioral Genetics.

Students wishing to become IBG trainees must submit an application for admission into the program to the director of the Behavioral Genetics Training Program. Excellence of record and promise are the principal criteria for selection of trainees. A further important consideration for acceptance is the diversity of background and training that is essential for the success of an interdisciplinary program.

Acceptance into the training program is contingent on acceptance by the Graduate School and by an academic department of the university. Therefore, application must be made directly to the department of choice as well as to the institute. Applicants are encouraged to write to the appropriate department for application information. For application forms for admission into the IBG training program, or for further information, you are encouraged to visit our website at ibg.colorado.edu/graduatetraining/certificate-program.html or write to: Director, Behavioral Genetics Training Program, Institute for Behavioral Genetics, 447 UCB, University of Colorado at Boulder, Boulder, CO 80309-0447. If you prefer to call, the telephone number is 303-492-7362.

STUDENTS

Graduate Students

Raven Astrom (PhD program, Psychology). Genetic and environmental influences on reading ability and disability and the stability of reading difficulties and long-term outcome.

L. Cinnamon Bidwell (PhD program, Clinical Psychology). Genetic and neurocognitive pathways in the etiology of developmental disorders, such as attention-deficit hyperactivity disorder and schizophrenia.

Joshua Bricker (PhD program, Psychology). Genetic and environmental influences on age of sexual initiation and measures of risky sexual behavior: twin and family studies.

Kimberly Brodsky (PhD program, Psychology). Functional magnetic resonance imaging techniques and the neurocognitive and genetic correlates of childhood ADHD and schizophrenia.

Robert Buchwald (PhD program, Ecology and Evolutionary Biology). Genetic diversity and evolution of nestmate recognition pheromones in bees.

Victoria Cosgrove (PhD program, Clinical Psychology). Personality constructs and their genetic relationship to comorbidity between adolescent internalizing and externalizing disorders.

Jennifer Drapeau (PhD program, Integrative Physiology). Molecular and cellular characterization of a naturally occurring polymorphism in the nicotinic acetylcholine receptor alpha4 subunit gene to establish how the polymorphism affects receptor function and subsequently sensitivity to nicotine.

Angela Friend (PhD program, Psychology). Genetic and environmental influences on reading and reading-related skills.

Rebecca Gaffney-Brown (PhD program, Psychology). Etiology and treatment implications for the comorbidity of attention deficit hyperactivity disorder, conduct disorder, and reading disability.

Heather Gelhorn (PhD program, Psychology). Defining a maximally heritable phenotype for conduct disorder, and aspects of adolescent drug and alcohol abuse as they relate to CD: twin and family studies.

Detre Godinez (PhD program, Psychology). Genetic and environmental influences on the executive systems and its relationship with substance abuse and other comorbid disorders.

Renee Good (PhD program, Toxicology). Environmental and genetic influences of sub-acute neurotoxic methamphetamine exposure in periadolescent mice and behavioral drug response in adulthood.

Jesse Hawke (PhD program, Psychology). Differential genetic etiology of reading difficulties as a function of age and gender in the Colorado Twin Study of Reading Disability.

Tristan McClure-Begley (PhD Program, Integrative Physiology). Regulation of neuronal nicotinic receptors and their interactions with other neurotransmitter signalling pathways.

Rohan Palmer (Ph. D. program, Psychology). Genetic and environmental influences on psychosocial disorders as well as the persistent and transient problems leading into substance dependency.

Clarissa Parker (PhD program, Neuroscience). The genetic and environmental determinants of substance abuse and related phenotypes such as impulsivity, aggression, and anxiety, with an emphasis on the interaction between alcohol and the HPA axis, and individual differences in response to alcohol and stress.

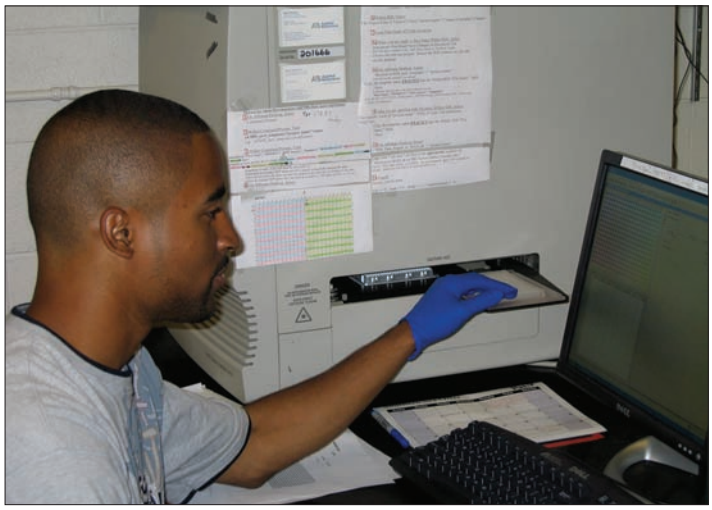
Isabel Schlaepfer (PhD program, Integrative Physiology). The study of candidate genes for nicotine and alcohol use in young adults, with special interest in behavioral disinhibition phenotypes and molecular functional studies of genetic variations in the nicotinic acetylcholine receptor subunit genes.

Jay Schulz-Heik (PhD program, Clinical Psychology). Genetic and environmental influences on trauma and childhood maltreatment and their relationship to adverse outcomes.

Laura Sobik (PhD program, Clinical Psychology). The genetic influences of cue-elicited craving for food.

Visiting Student

Garland Deshazer, a PhD student from Emory University, visited IBG in 2006 to examine candidate genes for acohol behaviors while controlling for population stratification.



Visiting student Garland Deshazer

Graduate Students from the IBG Training Program. Front row (seated): Detre Godinez, Raven Astrom, Kimberly Brodsky, and Cinnamon Bidwell. Back row (standing): Jennifer Drapeau, Joshua Bricker, Clarissa Parker, Rohan Palmer, Jesse Hawke, and Angela Friend.

COURSES

Courses Taught by Faculty Fellows

Fall 2005

Mike Breed	EBIO 3240, UCB	Animal Behavior
	HONR 1001, UCB	Co-seminar: General Biology I
Greg Carey	PSYC 3102, UCB	Behavioral Genetics
Thomas Crowley	PSCH 8001/8610, UCDHSC	Big Six Substance Problems in Primary Care Medicine (Course Dir)
Marissa Ehringer	IPHY 2600, UCB	Introduction to Research Methods
Kenneth Krauter	MCDB 4520, UCB	Bioinformatics & Genomics
Richard Olson	PSYC 7215, UCB	Seminar: Experimental Psychology
Bruce Pennington	PSYC 4525, DU	Prosem in Developmental Neuropsychology
Richard Radcliffe	TXCL 7323, UCDHSC	Principles of Toxicology II
	PHSC 7353, UCDHSC	Drug Metabolism and Pharmacogenetics
James Sikela	DSBS 6600, UCDHSC	Dental Pharmacology (6 lectures)
	PHCL 7600, UCDHSC	Frontiers in Pharmacology (1 lecture)
	PHCL 7605, UCDHSC	Ethics in Research (Co-director)
Jerry Stitzel	IPHY 5232, UCB	Molecular Genetics and Behavior
Boris Tabakoff	DSBS 6600, UCDHSC	Dental Pharmacology (2 lectures)
	PHCL 6000, UCDHSC	Medical Pharmacology (4 lectures)
	PHCL 7600, UCDHSC	Frontiers in Pharmacology (1 lecture)
	PHCL 7605, UCDHSC	Ethics in Research (9 lectures)
James Wilson	BIOL/PSYC 4104, UCDHSC	Behavioral Genetics (online course)

Spring 2006

Greg Carey	PSYC 5741, UCB	General Statistics
	PSYC 7291, UCB	Multivariate Analysis
John DeFries	PSYC 5122, UCB	Quantitative Genetics
Richard Deitrich	PHCL 7620, UCDHSC	Principles of Pharmacology (Co-Director)
Thomas Crowley	PSCH 8001/8610, UCDHSC	Big Six Substance Problems in Primary Care Medicine (Course Dir)
	No course #, UCDHSC	UCDHSC Substance Abuse (for 3rd year Psychiatry Residents)
Kent Hutchison	PSYC 4011, UCB	Senior Thesis
	PSYC 5082, UCB	Seminar: Biological Psychology
Thomas Johnson	IPHY 5102, UCB	Genetics of Physiology
Richard Olson	PSYC 4001, UCB	Honors Seminar 2
Richard Radcliffe	PHRD 3750, UCDHSC	Integrated Organ Systems 1: Physiology
	PHRD 4740, UCDHSC	Integrated Organ Systems 8: Central Nervous System Pharmacology
	TXCL 7326, UCDHSC	Current Concepts and Comprehensive Reviews of Physiology
Soo Rhee	PSYC 5102, UCB	Behavioral Genetics
James Sikela	HMGP 7600, UCDHSC	Molecules to Medicine 3 (1 lecture)
Toni Smolen	PSYC 5112, UCB	Concepts in Behavioral Genetics
Mike Stallings	PSYC 5242, UCB	Biometric Methods in Behavioral Genetics
Jerry Stitzel	IPHY 2600, UCB	Introduction to Research Methods
Boris Tabakoff	PHCL 7620, UCDHSC	Graduate Pharmacology (3 lectures)
	PHCL 6000, UCDHSC	Medical Pharmacology (4 lectures)

Summer 2006

Mike Breed	EBIO 4350, UCB	Biological Field Studies
Greg Carey	PSYC 3102, UCB	Behavioral Genetics
Tom Crowley	PSCH 8001/8610, UCDHSC	Big Six Substance Problems in Primary Care Medicine (Course Dir)
James Wilson	BIOL/PSYC 4104, UCDHSC	Behavioral Genetics (online course)

Colloquia, Informal Talks, and Special Events

Fall 2005

Mouse Day. Mouse Day is devoted to the exchange of information among researchers who work with mice on the University of Colorado campuses.

Thomas E. Johnson (PhD, Professor of Behavioral Genetics, Department of Integrative Physiology, and Faculty Fellow, Institute for Behavioral Genetics, University of Colorado, Boulder). "Genes Environment and Chance Interact to Determine Individual Life Span."

Robert W. Williams (PhD, Department of Anatomy and Neurobiology, Dunavant Chair: Developmental Genetics, Department of Pediatrics, University of Tennessee Health Science Center, Memphis, Tennessee). "A Systems Genetics Approach to Genes, Brains, and Behavior."

David Goldman (MD, Senior Investigator, Laboratory of Neurogenetics, National Institute on Alcohol Abuse & Alcoholism , National Institutes of Health, Rockville, Maryland). "Addictions: Linkage of Functional Alleles and Haplotypes to Intermediate Neurobiologies and Complex Behaviors."

Nicholas J. Schork (PhD, Professor, Departments of Psychiatry and Biostatistics, Associate Director, University of California, San Diego, Center for Human Genetics and Genomics). "Molecular, Clinical, and Population Profiling via Similarity Matrix Analysis."

Spring 2006

Brion Maher (PhD, Assistant Professor, Center for Craniofacial and Dental Genetics, Division of Oral Biology, School of Dental Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania). "ADHD, Endophenotypes and the Dopamine System."

Matthew McQueen (PhD, Postdoctoral Fellow, Departments of Epidemiology and Biostatistics, Harvard School of Public Health, Boston, Massachusetts). "Mapping Genetic Determinants of Bipolar Disorder."

Gregory A. Petsko (Gyula and Katica Tauber Professor of Biochemistry and Chemistry; Director, Rosenstiel Basic Medical Sciences Research Center, Brandeis University, Waltham, Massachusetts). "The Structural Enzymology of Parkinson's Disease."

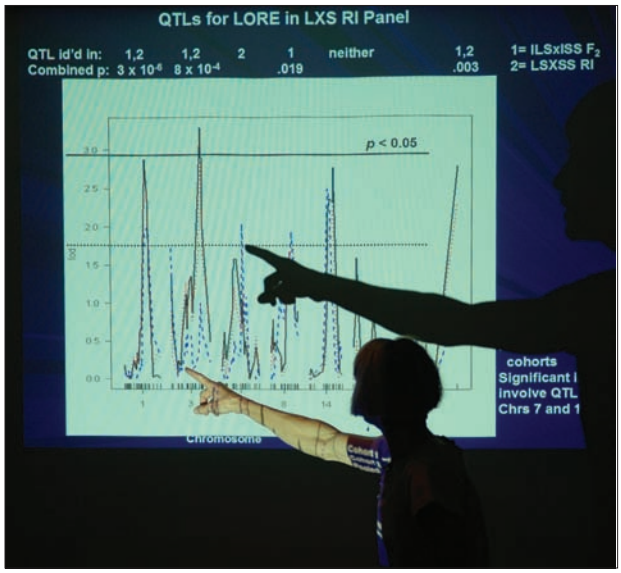
Jeesun Jung (PhD, Postdoctoral Associate, Division of Statistical Genetics, Department of Human Genetics, University of Pittsburgh, Pittsburgh, Pennsylvania). "Combined Linkage and Linkage Disequilibrium Mapping of Quantitative Trait Loci."

Jeesun Jung (PhD, Postdoctoral Associate, Division of Statistical Genetics, Department of Human Genetics, University of Pittsburgh, Pittsburgh, Pennsylvania). "Gene Dropping vs. Empirical Variance Estimation: A Comparative Study of Standardization Methods for Allele-Sharing Statistics."

Summer 2006

2006 Super Mouse Group Meeting—Sponsored by Beth Bennett. The Super Mouse Group Meeting involves researchers giving 15-minute presentations on their current projects (including work mapping ethanol sensitivity genes), with discussion following.

IBG Orientation and Poster Day Celebration. Faculty, researchers, and students display posters they presented at professional meetings during the previous year. This provides an opportunity to introduce the new members of the institute to the breadth of research at IBG.



Beth Bennett presents Quantitative Trait Loci findings during a presentation at the Super Mouse Group Meeting.

STAFF

Research and Administrative Staff

Researchers

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Lindly Alston
Mary Beeson
Heather Bosler
Matthew Bowker
Alexis Bowles
Robert Brown
Blake Buhlig
Kathryn Burleson
Sarah Buss
Clint Carlson
Coral Carosone-Link
Phyllis Carosone-Link
Rick Casey
Matthew Cirbo
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Mark Conner
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Chris Duffy
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Patricia Townsend
Jennifer Tripodi
Stephanie Tseeng
William van Morter
Schuyler vanEngelenberg
Rex Villanueva
Julia Wigert
Josh Wilcox
Sarah Witherell
Corinne Wright
John Yerg
Tracey Young
Jean Yu

Student Hourly

Vjera Adkins
Chris Bennett
Megan Canon
Graham Carlson
Ho Yun Chan
Kathy Fitzpatrick
Brittany Ganser
Christina Gaudreau
Michael Gleason
Angela Goldrick
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Tamaru Hiromitsu
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Adya Mishra
Daniel Oliver
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Tyffanie Rojas
Stacy Romero
Sam Severance
Katherine Shaw
Doug Simon
Shannon Spanarella
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Priyanka Thummalapally
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Paula Villar
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Thomas Wisniewski

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Debbie Aguiar
Bobbie Atkinson
Dawn Caillouet
Kathy Huckfeldt
Kendra Locher
Elaine Pauly

Family Studies Research Staff. Top: Dan Ryan, Blake Buhlig, Sam Severance, Rob Schroder, Drew Goldberg, Matt Bowker. Middle: Jen Keith, Scott Sabella, Sarah Lingafelter, Alexis Bowles, Laurie Reitsema, Amy Ledbetter, Lauren Farnham, Annie Johnson, Donna Moore, Matt Cirbo, Bonnie Gross. Bottom: Paula Lewis, Corinne Wright, Leza Clymer, Andy Gross, Margaret Spring, Carrie Liston, Patricia Townsend, Sally Ann Rhea, Elizabeth Gooding, Erin Thorpe, Clint Carlson, Missy Roark, Heather Bosler.

Publications

July 1, 2005–June 30, 2006

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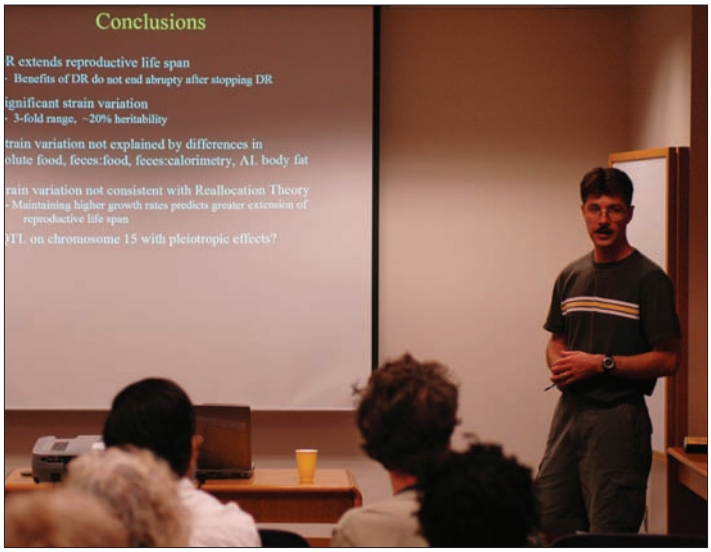

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